

SEVEN

PUBLICAÇÕES ACADÊMICAS
2024

MULTIDISCIPLINARY RESEARCH AND PRACTICE



Seven Publicações
(Organização)

SEVEN

PUBLICAÇÕES ACADÊMICAS
2024

MULTIDISCIPLINARY RESEARCH AND PRACTICE



Seven Publicações
(Organização)

EDITOR-IN-CHIEF

Prof^o Me. Isabele de Souza Carvalho

EXECUTIVE EDITOR

Nathan Albano Valente

BOOK ORGANIZER

Seven Publications LTDA

EDITORIAL PRODUCTION

Seven Publications Ltda

2023 by Seven Editora

Copyright © Seven Publisher

Text Copyright © 2023 The Authors

Edition Copyright © 2023 Seven Publisher

TEXT EDITING

Stefanie Vitoria Garcia de Bastos

ART EDIT

Alan Ferreira de Moraes

COVER IMAGES

AdobeStok

LIBRARIAN

Bruna Heller

AREA OF KNOWLEDGE

Multidisciplinary

The content of the text and its data in its form, correctness and reliability are of the author's sole responsibility and does not necessarily represent the official position of Seven Academics Events and Publishing Company. The work can be downloaded and shared if credit is given to the author, but without the possibility of altering it in any way or using it for commercial purposes.

All manuscripts were previously submitted to blind peer review, members of the Editorial Board of this Publisher, and were approved for publication based on criteria of neutrality and academic impartiality.

Seven Publications is committed to ensuring editorial integrity at every stage of the publication process, preventing plagiarism, fraudulent data, or results, and preventing financial interests from compromising the ethical standards of publication. Suspected situations of scientific misconduct will be investigated with the highest academic and ethical rigor.



The contents of this book have been submitted by the author for open access publication, in accordance with the terms and conditions of the Creative Commons 4.0 Attribution License International.

EDITORIAL BOARD

EDITOR-IN-CHIEF

Prof^o Me. Isabele de Souza Carvalho

EDITORIAL BOARD

Pedro Henrique Ferreira Marçal - Vale do Rio Doce University
Adriana Barni Truccolo - State University of Rio Grande do Sul
Marcos Garcia Costa Morais - State University of Paraíba
Mônica Maria de Almeida Brainer - Federal Institute of Goiás Ceres Campus
Caio Vinicius Efigenio Formiga - Pontifical Catholic University of Goiás
Egas José Armando - Eduardo Mondlane University of Mozambique
Ariane Fernandes da Conceição - Federal University of Triângulo Mineiro
Wanderson Santos de Farias - University for Sustainable Development
Maria Gorete Valus - University of Campinas
Luiz Gonzaga Lapa Junior - University of Brasilia
Janyel Trevisol - Federal University of Santa Maria
Irlane Maia de Oliveira - Federal University of Mato Grosso
Paulo Roberto Duailibe Monteiro - Fluminense Federal University
Luiz Gonzaga Lapa Junior - University of Brasilia
Yuni Saputri M.A - Nalanda University, India
Arnaldo Oliveira Souza Júnior – Federal University of Piauí, CEAD
Anderson Nunes Da Silva - Federal University of Northern Tocantins
Adriana Barretta Almeida - Federal University of Paraná
Jorge Luís Pereira Cavalcante - Iberoamerican University Foundation
Jorge Fernando Silva de Menezes - University of Aveiro
Antonio da Costa Cardoso Neto - University of Flores, Buenos Aires
Antônio Alves de Fontes-Júnior - Cruzeiro do Sul University
Alessandre Gomes de Lima - Faculty of Medicine of the University of Porto
Moacir Silva de Castro - Pontifical Catholic University of São Paulo
Marcelo Silva de Carvalho- Federal University of Alfnas
Charles Henrique Andrade de Oliveira - University of Pernambuco
Telma Regina Stroparo - State University of Ponta Grossa
Valéria Raquel Alcantara Barbosa - Fundação Oswaldo Cruz
Kleber Farinazo Borges - University of Brasília
Rafael Braga Esteves - University of São Paulo
Inaldo Kley do Nascimento Moraes - State University of Southwest Bahia
Mara Lucia da Silva Ribeiro - Federal University of São Paulo

S498m

Seven Editora.

Multidisciplinary Research and Practice [electronic resource] / Seven Editora. – São José dos Pinhais, PR: Seven Editora, 2024.

Electronic data (1 PDF).

Includes bibliography.

ISBN 978-65-6109-080-3

1. Scientific research. 2. Multidisciplinarity. I. Title.

CDU 001.89

Indexes for systematic catalogue:

1. CDU: Scientific research 001.89

Cataloguing at source: Bruna Heller (CRB10/2348)

Seven Publications Ltda

CNPJ: 43.789.355/0001-14

editora@sevenevents.com.br

São José dos Pinhais/PR

AUTHOR'S STATEMENT

The author of this work DECLARES, for the following purposes, that:

You do not have any commercial interest that creates a conflict of interest in relation to the content published;

Declares to have actively participated in the construction of the respective manuscripts, preferably under the following conditions: "a) Study design, and/or data acquisition, and/or data analysis and interpretation; b) Preparation of the article or review to make the material intellectually relevant; c) Final approval of the manuscript for submission";

Certifies that the published text is completely free of fraudulent data and/or results and authorship defects;

Confirms the correct citation and reference of all data and interpretations of data from others Research;

Acknowledges that it has informed all sources of funding received to carry out the research; Authorizes the editing of the work, including catalog registrations, ISBN, DOI and other indexers, visual design and cover creation, internal layout, as well as its release and dissemination according to the criteria of Seven Academics Events and Publishing Company.

PUBLISHER'S STATEMENT

Seven Publications DECLARES, for the purposes of rights, duties and any methodological or legal meanings, that:

This publication constitutes only a temporary transfer of copyright, constituting a right to publication and reproduction of the materials. The Publisher is not co-responsible for the creation of published manuscripts, under the terms established in the Copyright Law (Law 9610/98), in article 184 of the Penal Code and in article 927 of the Civil Code; The author(s) is solely responsible for verifying such copyright and other issues, holding the Publisher harmless from any civil, administrative, and criminal damages that may arise.

Authorizes the DISSEMINATION OF THE WORK by the author(s) in lectures, courses, events, concerts, media and television, provided that there is due recognition of the authorship and editing and without any commercial purpose, with the presentation of the due CREDITS to SEVEN PUBLICATIONS, being the author(s) and publisher(s) responsible for the omission/exclusion of this information;

All ebooks are open access, so don't sell them on your website, partner sites, e-commerce platforms, or any other virtual or physical medium. Therefore, it is exempt from copyright transfers to authors, since the format does not generate other rights beyond the didactic and advertising purposes of the work, which can be consulted at any time.

All members of the editorial board have doctors and are linked to public institutions of higher education, as recommended by CAPES to obtain the Qualis book;

Seven Academic Events does not assign, sell, or authorize the use of the names and e-mails of the authors, as well as any other data of theirs, for any purpose other than the dissemination of this work, in accordance with the Civil Rights Framework for the Internet, the General Data Protection Law and the Constitution of the Federative Republic.

AUTHORS

Adailton Nogueira da Silva Júnior
Adilson Machado Enes
Adoniram Nunes Pereira Junior
Adriana D. Nogueira
Adriana Leonor Sarango Bravo
Aécio Sebastião Borges
Afonso Pelli
Alan Farley Prates Oliveira
Alana Pires Dale
Alex Alves Camargo
Alexandre Cristiano Santos Júnior
Alexandre Simoes Lorenzon
Alexandre Walmott Borges
Aléxia Oliveira Leite
Alexia Rayane Bento Ribeiro
Aline Gomes Sidrone
Aline Gonçalves Leão
Allan Elias da Silva
Allana Tereza Mesquita de Lima
Amanda Ellen Gomes Amaral
Amanda Gabriele Sebaio
Amanda Silva Souza de Araujo
Ana Beatriz Conti
Ana Carolina Donda Oliveira
Ana Carolina Rodrigues Nunes de Souza
Ana Carolina Siqueroli
Ana Cristina Pereira dos Santos
Ana Flavia Rocha de Oliveira
Ana Lúcia Pires Teixeira
Ana Luiza Ruschel Nunes
Ana Luiza Silva Lôbo
Ana María Vázquez Álvarez
Ana Paula Amazonas Soares
Ana Paula Franco Pacheco
Anderson Medeiros dos Santos
André Pereira Fernandes
André Sobrinho de Souza
Andreia Lopes Assis
Andreia Oliveira Santos
Ângela Celis de Almeida Lopes
Anne Karoliny Silva Balbino
Aquiles Simões
Arthur Senna
Assiane Gabriela Anceles da Rocha
Beatriz dos Santos Faria
Beatriz Georgina Montemayor Flores
Bruna Mayane Martins Ferreira
Bruno Felipe Vargas Julião
Camila Campêlo de Sousa
Camila Nobre de Barros
Camilla Christian Gomes Moura
Camilly Campos Vasconcelos
Carlos Humberto Aires Matos Filho
Carlos Magno da Costa Maranduba
Carolina Gabriela Ocampo Aguiar
Celmira Lange
Celyanne Geyse Cardoso Furtado
Charles Sarmento Abreu
Ciro Bachtold
Clarimar Santos Motta Junior
Claudio Kleber Juiz de Souza
Cristiellen Elisa Silva Batista
Daiane de Oliveira Teixeira
Daisy Moreira Cunha
Damares Araújo Teles
Daniel Florence Giesbrecht
Daniela Pertel Milleri
Danilo Lourenço de Albuquerque
Darah Sathler Alvim Moraes
Debora Ferreira de Sousa
Diego Alexandre Divardim de Oliveira
Écio Souza Diniz
Eder D. Silva
Edson Roberto Arpini Miguel
Eduarda Moro Alexandre
Eduardo Antônio Ferreira
Eduardo Fernandes Arruda
Eduardo Henrique Moraes Santos
Elaine Cristina Arantes
Eliane A. Pereira de Abreu
Elielza Guerreiro Menezes
Elizabeth Artmann
Elizabeth Ferreira Cartaxo
Enrique Agnese
Ernani Lopes Possato
Ethel Zimberg Chehter
Eulírio de Farias Dantas
Ézio Sargentini Júnior
Felicia Siemsen
Felippo Ataíde dos Santos
Fellipe Watanabe Martins
Fernanda Moreira Henriques
Fernando de Sá Silva
Fernando Ramos Bernardes Dias
Francisco Fábio Mesquita Oliveira
Freddy Alberto Cabrera Patiño
Frederico Santos de Santana
Gabriel Cerqueira Teixeira
Gabriel Melo Maia
Gabriela Fernández Saavedra
Gabriela Pinheiro de Andrade
Gabriela Silva Miyakawa
Gabrielly Quito Campos
Geovanna Aguiar Alves Dias
Giana Maria Silva Aveiro
Giovani Manso Ávila

Gislaine Leão Parreira
Gislanne Brito de Araújo Barros
Gizelly Ayumi Yamamoto
Gonzalo Xavier Fernández Mancero
Guilherme Victor Nippes Pereira
Gustavo Bigetti Guergoletto
Gustavo Vieira Veloso
Hassan Ali Srour
Henrique Budib Dorsa Pontes
Henrique Rodrigues Correia Bacchi
Heroldes Bahr Neto
Ieda Cristina Borges
Igor Carreiro Ramalho
Igor Macedo de Oliveira
Ilsa Maria Valois Coelho
Iolanda Bezerra dos Santos Brandão
Isabel Cristina Rodrigues da Silva
Isabela Pereira Roque
Janaína Rodrigues da Rocha
Jander Menezes Cavalcanti
Jaqueline dos Santos Sousa
Jardel Oliveira Santos
Jason Silva de Almeida Junior
Javier Pérez Corona
Jayne da Silva Nunes
Jean Louchard Ferreira Soares
Jessé David Nascimento da Costa
João Manuel de Souza Will
João Paulo Allain Teixeira
João Ricardo Gomes Porciúncula Barbosa
Jocelyn Maribel Alencastro Placencia
José Baldin Pinheiro
José Dino Costa Cavalcante
José Ribamar de Assunção Filho
José Rossini Campos do Couto Corrêa
Joselito Trevisan
Juan Rodrigues Nina Monteiro Monteiro
Julia Fernanda Cotta de Amorim
Júlia Inácio Pedro Sampaio
Julia P.N. Silva
Juliana Cassaro Vieira
Juliana Rezende
Juliana Vale Ferreira
Juliano Serger Falcão
Julie de Souza Xavier
Kalid Stefano Vargas-Silva
Kartesiany Silva Balbino
Kathiuska Stefany Vargas-Silva
Késsio Guerreiro Furquim
Keyla Cristina Teixeira dos Santos
Kilder Carmo dos Santos
Laís Martins Brandão
Lara Quintiliano de Carvalho
Lariza Pivetta
Lelles de Paula Lemos

Leonardo Costa Pereira
Leonardo Perovano-Camargo
Lidia de Oliveira Xavier
Lídia Ketry Moreira Chaves
Lilian Frassinetti Correia Cananéa
Lívia Cortez Braga
Lívia Maria dos Santos
Lucas Dalle Rocha
Lucas Nogueira do Rêgo Monteiro Villa
Lages
Luciana Carvalho dos Reis Fim
Luiz Fabrício Zara
Luiza Guarnieri Sabadin
Mara Rúbia Gusson Vittorazzi
Marcela Maria Cavalcanti Lira
Marcelo Simão Ferreira
Márcia Perini Valle
Márcia Schiavo
Márcio Gonçalves dos Santos
Marcos Alexandre Bolson
Marcos Aurélio Matos Lemões
Marden Junior Sousa Ferreira
Margo Gomes de Oliveira Karnikowski
Maria Carolina de Souza Minholi
Maria Clara Gomes Batista
Maria do Socorro Almeida Flores
Maria Laura Alvares França Miranda
Maria Luiza Gomes de Jesus
María Oralia Acuña Dávila
María Virginia Aquino Santiago
Mariana Malheiro Negrão Bandeira
Mariana Sodário Cruz
Marileusa Dosolino Chiarello
Marina Porto Ferreira Junqueira
Marinalva de Oliveira Teixeira
Mario Mollo Neto
Marlúcia Carriço dos Santos
Martha Verónica Placencia-Ibadango
Mateus de Melo Lima Waterloo
Maurin Almeida Falcão
Mauro Karnikowski
Mayons Pessin Zagoto
Michelly Dias de Oliveira
Miguel Vieira de Melo Neto
Milton Leonardo Espíndola Kasprike
Moises Leão Gil
Moisés Steven Zambrano-Burbano
Monique Moreira Moulin
Nara Sarmento Macedo Signorelli
Patricia Azevedo Castelo Branco Vale
Pedro Henrique de Almeida Barbosa
Pedro Machado Pelli
Peterson Rodrigues Macêdo Vilar
Priscila Célia Giacomassi
Raimundo Nonato Oliveira Silva



Ramon Marques Macedo
Ramón Miguel Vargas-Vera
Raquel de Oliveira Mendes
Raquel Marques
Regina Lucia Ferreira Gomes
Ricardo Denck
Ricardo Noboru Katsumata
Ricardo Rodrigues Bacchi
Rita de Cássia Antunes Gomes
Mascarenhas
Roberto Carlos Dalongaro
Roberto Neves Baptista Campos
Rodrigo Carlo Toloí
Rodrigo Miranda Zamora
Rogerio Alves Ferreira
Rudson Domingos Bueno
Saul Alexander Alencastro Placencia
Sebastião Lourenço de Assis Júnior
Silvia Braña Lopez
Silvia Maribel Placencia-Ibadango
Sônia Maria Lemos
Stefany Letícia Coutinho Lima

Suely dos Santos Silva
Sylvana Lima Teixeira
Tainá Ribeiro Silva
Tais Kaybers
Tania Machado da Silva
Tania Stoltz
Thayane Nataly Maia de Albuquerque
Thiago Humberto da Silva Pires
Thiago Martins Machado
Tiago Henrique de Souza Echternacht
Ubirajara Santana Assunção
Valfran José Santos Andrade
Vanessa Cervi da Silva
Vinícius Mastelini
Wagner Barbosa de Oliveira
Wanessa Eduarda Ribeiro de Jesus
Wanessa Ferreira Boabaid
Wellington Gonzaga do Vale
William Gomes Lisboa da Costa Filho
Willian Ferreira de Sousa
Yurgel Pantoja Caldas

SUMMARY

RICHTER'S HERNIA: A CASE REPORT



Mariana Malheiro Negrão Bandeira, Eduardo Fernandes Arruda, Gizelly Ayumi Yamamoto, Claudio Kleber Juiz de Souza, Juliano Serger Falcão, Henrique Budib Dorsa Pontes, Julie de Souza Xavier and Kilder Carmo dos Santos

  <https://doi.org/10.56238/sevened2024.029-001>

.....1-6

BRAIN ORGANOID: HISTORY, MORPHOFUNCTIONAL ASPECTS AND APPLICATION PERSPECTIVES



Igor Carreiro Ramalho, Carlos Magno da Costa Maranduba and Fernando de Sá Silva

  <https://doi.org/10.56238/sevened2024.029-002>

.....7-59

APPLIED DICTICS IN COMMUNICATION AND ORGANIZATIONAL BEHAVIOR



Lelles de Paula Lemos

  <https://doi.org/10.56238/sevened2024.029-003>

.....60-79

MAJOR NEUROLOGICAL DISEASES IN SMALL ANIMALS



Lídia Ketry Moreira Chaves, Luiza Guarnieri Sabadin, Maria Clara Gomes Batista, Lívia Cortez Braga, Danilo Lourenço de Albuquerque, Maria Laura Alvares França Miranda, Francisco Fábio Mesquita Oliveira, Michelly Dias de Oliveira, Wanessa Ferreira Boabaid, Andreia Oliveira Santos, Alexia Rayane Bento Ribeiro and Mateus de Melo Lima Waterloo

  <https://doi.org/10.56238/sevened2024.029-004>

.....80-89

CHRONIC OROFACIAL PAIN AND ENDODONTICS: DIAGNOSTIC AND THERAPEUTIC CHALLENGES



Nara Sarmiento Macedo Signorelli, Hassan Ali Srouf and Camilla Christian Gomes Moura

  <https://doi.org/10.56238/sevened2024.029-005>

.....90-116

THE PHILOSOPHY OF ALL OF US: THE MEANING OF LIFE ACCORDING TO AYN RAND



Milton Leonardo Espíndola Kasprke

  <https://doi.org/10.56238/sevened2024.029-006>

.....117-130

THE CHALLENGES OF THE NURSE PROFESSIONAL IN THE APPLICABILITY OF ACTIVE TEACHING METHODOLOGIES AND EDUCATIONAL LEARNING TECHNOLOGIES



Alex Alves Camargo and Edson Roberto Arpini Miguel

  <https://doi.org/10.56238/sevened2024.029-007>

.....131-149

GENE INFLUENCE OF ACTN3 AND NOS3 ON SERUM LEVELS OF NITRIC OXIDE AND ON THE CAROTID CALIBER AFTER ECCENTRIC EXERCISE IN QUILOMBOLAS OVER 50 YEARS OLD

Leonardo Costa Pereira, Marileusa Dosolino Chiarello, Mauro Karnikowski, Eduardo Antônio Ferreira, Isabel Cristina Rodrigues da Silva, Frederico Santos de Santana and Margo Gomes de Oliveira Karnikowski

  <https://doi.org/10.56238/sevened2024.029-008>

.....150-167

THE PROCESSES OF WELCOMING VERY YOUNG CHILDREN AND PARENTS: AN INTEGRATIVE LITERATURE REVIEW

Felicia Siemsen and Tania Stoltz

  <https://doi.org/10.56238/sevened2024.029-009>168-188

CELL ADHESION MECHANICS: A WINDOW INTO THE EVOLUTION OF MULTICELLULARITY

Henrique Rodrigues Correia Bacchi, Anderson Medeiros dos Santos, Geovanna Aguiar Alves Dias, Maria Luiza Gomes de Jesus, Guilherme Victor Nippes Pereira and Ricardo Rodrigues Bacchi

  <https://doi.org/10.56238/sevened2024.029-010>189-195

VEGETABLE CULTIVATION AND AGROBIODIVERSITY CONSERVATION: CHARACTERIZATION OF URBAN BACKYARDS IN VARGEM GRANDE, MA

Allana Tereza Mesquita de Lima, Raimundo Nonato Oliveira Silva, Gislanne Brito de Araújo Barros, Alexandre Cristiano Santos Júnior, Monique Moreira Moulin and Jardel Oliveira Santos

  <https://doi.org/10.56238/sevened2024.029-011>196-209

COMPARATIVE STUDY OF THE MEANS OF TRANSPORT USED IN SELECTIVE COLLECTION

Moises Leão Gil and Giovani Manso Ávila

  <https://doi.org/10.56238/sevened2024.029-012>210-215


INCLUDE LABORATORY: CONTRIBUTIONS TO THE SCHOOL EDUCATION OF STUDENTS FROM THE MUNICIPAL EDUCATION NETWORK OF LINHARES-ES

Ana Carolina Rodrigues Nunes de Souza, Marlúcia Carriço dos Santos and Márcia Perini Valle

  <https://doi.org/10.56238/sevened2024.029-013>216-242

LUHMANN'S SYSTEMS THEORY APPLIED TO DATA PROTECTION IN THE DIGITAL AGE: A MULTIPLE CASE STUDY IN TECHNOLOGY COMPANIES

Tiago Henrique de Souza Echtermacht and João Paulo Allain Teixeira

  <https://doi.org/10.56238/sevened2024.029-014>243-266

EVALUATION OF LOSSES IN COTTON HARVEST AT DIFFERENT HARVESTER SPEEDS

Adailton Nogueira da Silva Júnior, Wellington Gonzaga do Vale, Valfran José Santos Andrade, Adilson Machado Enes, Patricia Azevedo Castelo Branco Vale and Thiago Martins Machado

  <https://doi.org/10.56238/sevened2024.029-015>267-283



THE IMPORTANCE OF DEVELOPING A GROWTH MINDSET

Ricardo Noboru Katsumata and Sylvana Lima Teixeira

  <https://doi.org/10.56238/sevened2024.029-016>284-294

SYSTEMIC PRACTICE IN ACTION: TRANSFORMING THE COMMUNITY MANAGEMENT OF ARTISANAL FISHING IN CAMETÁ



Jean Louchard Ferreira Soares, Aquiles Simões and Maria do Socorro Almeida Flores

  <https://doi.org/10.56238/sevened2024.029-017>

.....295-308

GENETIC DIVERSITY AMONG SOYBEAN GENOTYPES CULTIVATED UNDER TROPICAL CONDITIONS



Ubirajara Santana Assunção, José Ribamar de Assunção Filho, Camila Campêlo de Sousa, Carlos Humberto Aires Matos Filho, José Baldin Pinheiro, Regina Lucia Ferreira Gomes, Jardel Oliveira Santos and Ângela Celis de Almeida Lopes

  <https://doi.org/10.56238/sevened2024.029-018>

.....309-322

INTRA-ABDOMINAL GOSSYPBOMA RETAINED FOR 30 YEARS, MIMICKING RETROPERITONEAL TUMOR: CASE REPORT



Pedro Henrique de Almeida Barbosa, Ana Flavia Rocha de Oliveira, Gabriel Cerqueira Teixeira, Aléxia Oliveira Leite, Laís Martins Brandão, Igor Macedo de Oliveira, Assiane Gabriela Anceles da Rocha, Debora Ferreira de Sousa, Roberto Neves Baptista Campos, Marcela Maria Cavalcanti Lira and Fernanda Moreira Henriques

  <https://doi.org/10.56238/sevened2024.029-019>

.....323-327

SUSTAINABILITY IN FAMILY FARMING: CHALLENGES AND OPPORTUNITIES – A CASE STUDY OF FAMILY FARMERS IN CAIUÁ/SP



Allan Elias da Silva

  <https://doi.org/10.56238/sevened2024.029-020>

.....328-353

TIME AND MEMORY: AN ANALYSIS OF THE CHRONICLES OF JOSÉ CHAGAS



Celyanne Geysse Cardoso Furtado and José Dino Costa Cavalcante

  <https://doi.org/10.56238/sevened2024.029-021>

.....354-373

ANALYSIS OF SCHOOL VIOLENCE IN BRAZIL



Ana Paula Amazonas Soares, João Ricardo Gomes Porciúncula Barbosa, Eliane A. Pereira de Abreu and Arthur Senna

  <https://doi.org/10.56238/sevened2024.029-022>

.....374-394

URBANIZATION AND LOCAL AND REGIONAL DEVELOPMENT OF SOUTHEASTERN MEXICO



Javier Pérez Corona

  <https://doi.org/10.56238/sevened2024.029-023>

.....395-413

APPLICATION FOR WATER QUALITY ANALYSIS FOR TILAPIA FISH FARMING IN CAGES



Vinícius Mastelini and Mario Mollo Neto

  <https://doi.org/10.56238/sevened2024.029-024>

.....414-435

EFFECTIVENESS OF BLENDED TEACHING OF PROBLEM-BASED LEARNING (PBL) AND ERROR-BASED LEARNING (ABE) IN GYNECOLOGY



Ramón Miguel Vargas-Vera, Freddy Alberto Cabrera Patiño, Silvia Maribel Placencia-Ibadango, Saul Alexander Alencastro Placencia, Martha Verónica Placencia-Ibadango, Adriana Leonor Sarango Bravo, Jocelyn Maribel Alencastro Placencia, Kalid Stefano Vargas-Silva, Gonzalo Xavier Fernández Mancero, Kathiuska Stefany Vargas-Silva and Moisés Steven Zambrano-Burbano

  <https://doi.org/10.56238/sevened2024.029-025>

.....436-453

BEYOND RHETORIC: CHALLENGES AND OPPORTUNITIES FOR THE DEVELOPMENT OF THE AMAZON



Ilsa Maria Valois Coelho, Raquel Marques and Elizabeth Ferreira Cartaxo

  <https://doi.org/10.56238/sevened2024.029-026>

.....454-472

GOVERNANCE AND MUNICIPAL MANAGEMENT: A LOOK AT THE HUMANIZATION AND CITIZENSHIP OF THE POPULATION OF PALMAS FROM THE PERSPECTIVE OF PUBLIC ADMINISTRATION



João Manuel de Souza Will

  <https://doi.org/10.56238/sevened2024.029-027>

.....473-490

GLYCASPIS BRIMBLECOMBEI (HEMIPTERA: APHALARIDAE) IN EUCALYPTUS FOREST PLANTATIONS: A REVIEW



André Pereira Fernandes, Alexandre Simoes Lorenzon, Ernani Lopes Possato, Sebastião Lourenço de Assis Júnior, Gustavo Vieira Veloso and Écio Souza Diniz

  <https://doi.org/10.56238/sevened2024.029-028>

.....491-516

IMPACTS OF INNOVATION EVENTS ON THE DEVELOPMENT OF ENTREPRENEURIAL SKILLS: A CASE STUDY OF CAMPUS PARTY BRASIL



Márcio Gonçalves dos Santos, Elaine Cristina Arantes, Priscila Célia Giacomassi, Gustavo Bigetti Guergoletto, Roberto Carlos Dalongaro, Lívia Maria dos Santos, Ciro Bachtold and Rodrigo Carlo Tolo

  <https://doi.org/10.56238/sevened2024.029-029>

.....517-540

IMPACT OF THE COVID-19 PANDEMIC ON PEDIATRIC DENTAL CARE AND THE USE OF MINIMALLY EVASIVE PROCEDURES IN BRAZIL



André Sobrinho de Souza, Anne Karoliny Silva Balbino, Darah Sathler Alvim Moraes, Gabriela Silva Miyakawa, Julia Fernanda Cotta de Amorim, Kartesiany Silva Balbino, Lariza Pivetta and Daniela Pertel Milleri

  <https://doi.org/10.56238/sevened2024.029-030>

.....541-555

THE DEPENDENT STATE AND SOCIAL POLICIES: A RELATIONSHIP OF CONFLICTS IN THE FACE OF (ULTRA) NEOLIBERALISM



Eduardo Henrique Moraes Santos, Alan Farley Prates Oliveira and Raquel de Oliveira Mendes

  <https://doi.org/10.56238/sevened2024.029-031>

.....556-569

CHILDREN'S LITERATURE: STIMULATING THE TASTE FOR READING



Damara Araújo Teles

  <https://doi.org/10.56238/sevened2024.029-032>

.....570-583

ENSURING ETHICS IN THE USE OF SENSITIVE DATABASES: A SCOPING REVIEW



Leonardo Costa Pereira, Ana Paula Franco Pacheco, Iolanda Bezerra dos Santos Brandão, Beatriz dos Santos Faria, Lucas Dalle Rocha, Lidia de Oliveira Xavier, Margo Gomes de Oliveira Karnikowski and Mariana Sodário Cruz

  <https://doi.org/10.56238/sevened2024.029-033>

.....584-599

THE PURSUIT OF EXCELLENCE



Leonardo Perovano-Camargo

  <https://doi.org/10.56238/sevened2024.029-034>

.....600-608

MULTIDISCIPLINARITY AS A STRATEGY IN THE FACE OF THE PANDEMIC. FROM SCHOOL EXAM TO REALITY TEST



Gabriela Fernández Saavedra, María Oralia Acuña Dávila, Ana María Vázquez Álvarez, Rodrigo Miranda Zamora and Beatriz Georgina Montemayor Flores

  <https://doi.org/10.56238/sevened2024.029-035>

.....609-615

METHODOLOGICAL INTERSECTIONS: SCHOOL OF ANNALES, "CONTENT ANALYSIS" AND CONTROLLED HERMENEUTICS


Daniel Florence Giesbrecht

  <https://doi.org/10.56238/sevened2024.029-036>

.....616-628

CLINICAL AND EPIDEMIOLOGICAL STUDY OF HIV CO-INFECTION AND PARACOCCIDIOIDOMYCOSIS IN A BRAZILIAN TEACHING HOSPITAL



Juliana Rezende, Aécio Sebastião Borges and Marcelo Simão Ferreira

  <https://doi.org/10.56238/sevened2024.029-037>

.....629-640

CANDUNGA, BY BRUNO DE MENEZES: A UTOPIAN AND UNIVERSAL NOVEL IN THE AMAZON OF PARÁ


Willian Ferreira de Sousa and Yurgel Pantoja Caldas

  <https://doi.org/10.56238/sevened2024.029-038>

.....641-654

DISSOCIATIVE IDENTITY DISORDER: A NARRATIVE REVIEW



Felippo Ataíde dos Santos, Júlia Inácio Pedro Sampaio, Adoniram Nunes Pereira Junior and Ana Luiza Silva Lôbo

  <https://doi.org/10.56238/sevened2024.029-039>

.....655-661

ASH SOAP PRESERVING THE ENVIRONMENT



Joselito Trevisan and Ana Cristina Pereira dos Santos

  <https://doi.org/10.56238/sevened2024.029-040>

.....662-668

TEACHER TRAINING AND INTERDISCIPLINARITY: REFLECTIONS ON A HUMANIZING PATH FOR EDUCATION

Diego Alexandre Divardim de Oliveira and Ana Luiza Ruschel Nunes

  <https://doi.org/10.56238/sevened2024.029-041>

.....669-679

BALANCE AND FLEXIBILITY IN CURRICULUM PLANNING: ANALYSIS OF PAULO TOMAZINHO'S MODEL AND ITS IMPLICATIONS FOR THE QUALITY OF EDUCATION



Luciana Carvalho dos Reis Fim, Mayons Pessin Zagoto, Márcia Schiavo, Wagner Barbosa de Oliveira and Mara Rúbia Gusson Vittorazzi

  <https://doi.org/10.56238/sevened2024.029-042>

.....680-692

STRATEGIES TO COPE WITH REPETITIVE WORK IN THE TEXTILE INDUSTRY



Alana Pires Dale and Daisy Moreira Cunha

  <https://doi.org/10.56238/sevened2024.029-043>

.....693-719

EVALUATION, IN A SENSORY PANEL, OF A CEREAL BAR ENRICHED WITH ATTA SEXDENS (LINNAEUS, 1758)



Ana Beatriz Conti, Ana Carolina Siqueroli, Ana Lídia Pires Teixeira, Cristiellen Elisa Silva Batista, Daiane de Oliveira Teixeira, Eduarda Moro Alexandre, Gabrielly Quito Campos, Giana Maria Silva Aveiro, Isabela Pereira Roque, Juliana Cassaro Vieira, Lara Quintiliano de Carvalho, Maria Carolina de Souza Minholi, Pedro Machado Pelli, Ramon Marques Macedo, Stefany Letícia Coutinho Lima, Tainá Ribeiro Silva, Thiago Humberto da Silva Pires, Wanessa Eduarda Ribeiro de Jesus and Afonso Pelli

  <https://doi.org/10.56238/sevened2024.029-044>

.....720-733

SELF-PERCEPTION OF AGING AND OLD AGE OF URUGUAYAN ELDERLY LIVING IN HOUSING PROJECTS



María Virginia Aquino Santiago, Celmira Lange, Marcos Aurélio Matos Lemões, Carolina Gabriela Ocampo Aguiar and Enrique Agnese

  <https://doi.org/10.56238/sevened2024.029-045>

.....734-750

IMPLEMENTATION AND INSTRUMENTALIZATION OF THE AQUARIUM FOR EXPERIMENTS RELATED TO ICHTHYOFAUNA



Miguel Vieira de Melo Neto, Ézio Sargentini Júnior, Marcos Alexandre Bolson, Tania Machado da Silva and Luiz Fabrício Zara

  <https://doi.org/10.56238/sevened2024.029-046>

.....751-760

PUBLIC POLICIES AND THE CONFRONTATION OF INEQUALITIES IN BRAZIL – CONSTITUTIONAL TELEOLOGY VERSUS ECONOMIC AND SOCIAL RESISTANCE: THE LONG ROAD



William Gomes Lisboa da Costa Filho

  <https://doi.org/10.56238/sevened2024.029-047>

.....761-776

INFANT MORTALITY IN THE MUNICIPALITY OF RIO VERDE



Aline Gonçalves Leão, Ana Carolina Donda Oliveira, Gislaine Leão Parreira, Késsio Guerreiro Furquim, Marina Porto Ferreira Junqueira, Rogerio Alves Ferreira and Vanessa Cervi da Silva

  <https://doi.org/10.56238/sevened2024.029-048>

.....777-795

LIFE AS A SCANDAL OF TRUTH: MICHEL FOUCAULT'S PHILOSOPHICAL TESTAMENT



Lucas Nogueira do Rêgo Monteiro Villa Lages

  <https://doi.org/10.56238/sevened2024.029-049>

.....796-818

FUNCTIONAL IMPACT IN PATIENTS WITH ACUTE BRAIN INJURY



Amanda Ellen Gomes Amaral, Tais Kaybers, Marden Junior Sousa Ferreira, Jason Silva de Almeida Junior, Juan Rodrigues Nina Monteiro Monteiro, Jayne da Silva Nunes, Gabriel Melo Maia, Janaína Rodrigues da Rocha, Thayane Nataly Maia de Albuquerque, Jaqueline dos Santos Sousa, Camila Nobre de Barros and Bruna Mayane Martins Ferreira

  <https://doi.org/10.56238/sevened2024.029-050>

.....819-828

FROM FEUDALISM TO THE DIGITAL AGE: A HISTORY OF TAX CONSTITUTIONALISM AND THE SEARCH FOR TAX JUSTICE AND HUMAN RIGHTS



José Rossini Campos do Couto Corrêa, Maurin Almeida Falcão, Charles Sarmento Abreu, Rudson Domingos Bueno, Heroldes Bahr Neto, Eulírio de Farias Dantas, Clarimar Santos Motta Junior and Rita de Cássia Antunes Gomes Mascarenhas

  <https://doi.org/10.56238/sevened2024.029-051>

.....829-852

EDUCATIONAL RADIO AS A MEDIATOR BETWEEN COMMUNICATION, HEALTH AND EDUCATION: REFLECTIONS FROM A REGIONAL EXPERIENCE



Ieda Cristina Borges

  <https://doi.org/10.56238/sevened2024.029-052>

.....853-865

THE PROGRESSION OF THE REGIME AFTER THE ENTRY INTO FORCE OF THE ANTI-CRIME PACKAGE – LAW NO. 13,964/2019, PROGRESSION OF THE SPECIAL REGIME AND ITS BENEFICIAL ASPECTS



Lilian Frassinetti Correia Cananéa and Peterson Rodrigues Macêdo Vilar

  <https://doi.org/10.56238/sevened2024.029-053>

.....866-876

LABOR PROTECTION AND ITS IMPORTANCE FOR THE GENERATION OF BIOFUELS



Fernando Ramos Bernardes Dias and Alexandre Walmott Borges

  <https://doi.org/10.56238/sevened2024.029-054>

.....877-910

FAMILY HOLDING COMPANY: SUCCESSION PLANNING AND REDUCTION OF THE TAX BURDEN



Ricardo Denck

  <https://doi.org/10.56238/sevened2024.029-055>

.....911-935

IMPACT OF QUALITY CERTIFICATION ON THE VISIBILITY AND COMPETITIVENESS OF COFFEE PRODUCTION IN THE CERRADO MINEIRO



Amanda Gabriele Sebaio

  <https://doi.org/10.56238/sevened2024.029-056>

.....936-952

THE EFFECTS OF HELICOBACTER PYLORI ERADICATION THERAPY ON THE INCIDENCE OF GASTRIC ADENOCARCINOMA



Fellipe Watanabe Martins and Ethel Zimberg Chehter

  <https://doi.org/10.56238/sevened2024.029-057>

.....953-966

THE CITY OF PYRRHO: THE FORMATION OF THE PATRIMONIAL IDENTITY OF ARACAJU IN THE NINETEENTH CENTURY



Adriana D. Nogueira, Eder D. Silva and Julia P.N. Silva

  <https://doi.org/10.56238/sevened2024.029-058>

.....967-983

CHALLENGES TO THE BRAZILIAN NETWORK OF HUMAN MILK BANKS: INTERFACE BETWEEN PRIMARY AND TERTIARY CARE



Juliana Vale Ferreira, Elizabeth Artmann and Silvia Braña Lopez

  <https://doi.org/10.56238/sevened2024.029-059>

.....984-999

TEACHERS' AND STUDENTS' PERCEPTION OF TECHNOLOGY-MEDIATED CARE IN THE FIGHT AGAINST COVID-19: AN ANALYSIS OF MENTAL HEALTH



Camilly Campos Vasconcelos, Eielza Guerreiro Menezes, Sônia Maria Lemos, Jessé David Nascimento da Costa, Gabriela Pinheiro de Andrade, Bruno Felipe Vargas Julião, Aline Gomes Sidrone, Amanda Silva Souza de Araujo and Jander Menezes Cavalcanti

  <https://doi.org/10.56238/sevened2024.029-060>

.....1000-1014


CINEMA AND EDUCATION: CONTRIBUTIONS TO HUMANIZING YOUNG PEOPLE

Andreia Lopes Assis, Keyla Cristina Teixeira dos Santos, Marinalva de Oliveira Teixeira and Suely dos Santos Silva

  <https://doi.org/10.56238/sevened2024.029-061>

.....1015-1029

RICHTER'S HERNIA: A CASE REPORT

 <https://doi.org/10.56238/sevened2024.029-001>

Mariana Malheiro Negrão Bandeira¹, Eduardo Fernandes Arruda², Gizelly Ayumi Yamamoto³, Claudio Kleber Juiz de Souza⁴, Juliano Serger Falcão⁵, Henrique Budib Dorsa Pontes⁶, Julie de Souza Xavier⁷ and Kilder Carmo dos Santos⁸

ABSTRACT

Introduction: Richter's hernia is a rare condition characterized by the protrusion of part of an intestinal loop with entrapment or strangulation of the antimesenteric border through a small defect in the abdominal wall. Case report: An elderly patient with an acute obstructive abdomen due to an incarcerated femoral hernia, diagnosed as an intraoperative Richter's hernia. The case highlights the importance of early diagnosis and rapid treatment to avoid complications.

Keywords: Richter's hernia. Rare condition. Antimesenteric border.

¹ General Surgery Resident

Maria Aparecida Pedrossian University Hospital of the Federal University of Mato Grosso do Sul. (HUMAP/UFMS)

E-mail: Mariananegraobandeira@gmail.com

² Professor of the General Surgery Residency at HUMAP/UFMS

Maria Aparecida Pedrossian University Hospital of the Federal University of Mato Grosso do Sul. (HUMAP/UFMS)

E-mail: Arrudix@hotmail.com

³ General Surgery Resident

Maria Aparecida Pedrossian University Hospital of the Federal University of Mato Grosso do Sul. (HUMAP/UFMS)

E-mail: Gizellyyamamoto@gmail.com

⁴ General Surgery Resident

Maria Aparecida Pedrossian University Hospital of the Federal University of Mato Grosso do Sul. (HUMAP/UFMS)

E-mail: Claudio.ziuj@gmail.com

⁵ General Surgery Resident

Maria Aparecida Pedrossian University Hospital of the Federal University of Mato Grosso do Sul. (HUMAP/UFMS)

E-mail: Julianosfalcao@hotmail.com

⁶ General Surgery Resident

Maria Aparecida Pedrossian University Hospital of the Federal University of Mato Grosso do Sul. (HUMAP/UFMS)

E-mail: Henriquedorsa01@gmail.com

⁷ Medical Student, Federal University of Mato Grosso do Sul

Maria Aparecida Pedrossian University Hospital of the Federal University of Mato Grosso do Sul. (HUMAP/UFMS)

Email: Juliesouza2105@gmail.com

⁸ General Surgeon graduated at HUMAP/UFMS

Maria Aparecida Pedrossian University Hospital of the Federal University of Mato Grosso do Sul. (HUMAP/UFMS)

E-mail: Kilder.med@gmail.com

INTRODUCTION

Richter's hernia is a rare clinical condition, accounting for 5-15% of all strangulated hernias¹. In this condition, only part of the circumference of the intestinal wall is strangled (most commonly antimesenteric border), without complete obstruction. However, due to the atypical presentation, its evolution can occur quickly to ischemia, necrosis, and intestinal perforation. This type of hernia occurs most frequently in elderly women, between 60 and 80 years of age; however, they can manifest at any age; femoral hernia being the most common site. In this report, we describe a case of Richter's hernia in an elderly patient who presented with signs of partial intestinal obstruction at the Maria Aparecida Pedrossian University Hospital (HUMAP).

METHODOLOGY

The information presented in this case report was obtained through a review of medical records, interviews with the patient, records of the diagnostic methods to which the patient was submitted, and a literature review.

CASE REPORT

A 71-year-old female patient sought the emergency services of the HUMAP complaining of constipation and elimination of flatus for five days, associated with inappetence, nausea and vomiting, including reports of fecaloid vomiting. The patient reported significant diffuse abdominal pain before the administration of intravenous analgesia, but at the time of care, she reported attenuation of this pain. She denied urinary complaints or significant weight loss. His history of comorbidities included only systemic arterial hypertension, he denied previous surgeries. Upon entry, it was necessary to use vasoactive drugs (after an attempt at volume expansion) and passage of a nasogastric tube.

On physical examination, the patient was in a regular general stage, regular nutritional status, emaciated, lucid and oriented in time and space. She had signs of dehydration (2+/4+) and pale (1+/4+), with no jaundice, cyanosis, or fever. In vital signs, she presented tachycardia and hypotension, even after the use of noradrenaline. On abdominal physical examination, the patient was flat, flaccid, with reduced bowel sounds, painless on superficial and deep palpation, and reduced nasogastric tube output.

The imaging method chosen was non-contrast tomography, which showed a herniated small intestine segment with adjacent fat blurring (Figures 1 and 2).

Figure 1 – Herniated small intestine segment with adjacent fat blurring



Personal collection

Figure 2 – Herniated small intestine segment with adjacent fat blurring



Personal collection

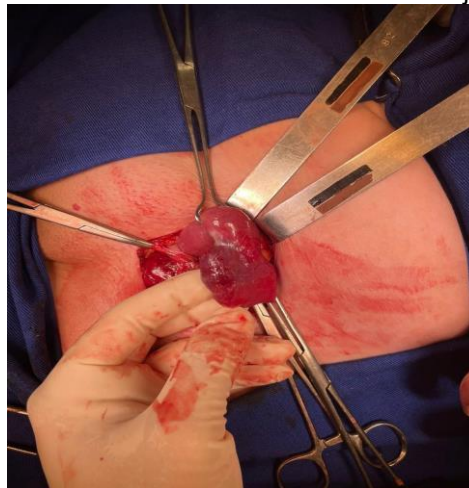
Figure 3 - Herniated small intestine segment with adjacent fat blurring



Personal collection

The best conduct taking into account the patient's clinical practice and physical examination was urgent surgery. An oblique incision was chosen, parallel to the inguinal ligament, in order to identify the herniated intestinal segment and its viability. The left femoral hernia was visualized incarcerated with a segment of the small intestine, characterized as a Richter's hernia (Figures 3 and 4). The herniated segment was surgically treated with polypropylene mesh, without the need for intestinal resection and without other complications.

Figure 4 - Segment of herniated small intestine with adjacent fat blurring



Personal collection

The patient remained intubated for six days after the procedure. During his hospitalization, he developed flu-like symptoms and tested positive for COVID-19. Despite this, the patient evolved satisfactorily, with clinical stabilization, and was discharged after 31 days of hospitalization.

DISCUSSION

Richter's hernia is a rare but potentially serious condition characterized by the entrapment or strangulation of a portion of the antimesenteric border of the small intestine through a small hernia defect. It is more common in older women.

This type of hernia differs from others in that it involves only part of the circumference of the intestine, without causing total obstruction, which presents a diagnostic challenge. However, despite the absence of complete obstruction, intestinal ischemia can occur rapidly due to vascular compromise, which increases the risk of perforation and peritonitis if there is no immediate intervention (Anson et al., 2018).

The rapid evolution of severe complications in Richter's hernia highlights the need for early diagnosis and surgical treatment. Due to the often insidious clinical presentation, with



mild symptoms such as localized abdominal pain and absence of abdominal distension, early recognition can be challenging. However, delays in intervention significantly increase mortality, especially when intestinal necrosis occurs, which reinforces the importance of the emergency surgical approach as soon as the diagnosis is suspected (Aydin et al., 2017).

Urgent surgical management is critical to avoid catastrophic outcomes, such as perforation and diffuse peritonitis, which increase mortality and complicate patient prognosis. Clinical studies indicate that the rate of serious complications, including the need for extensive bowel resections, can be significantly reduced when the intervention occurs in the first hours after diagnosis (Strang et al., 2020) 7. Thus, the speed of diagnosis and treatment of Richter's hernia is essential to optimize the prognosis and prevent fatal complications.


CONCLUSION

Richter's hernia should be considered a diagnostic hypothesis, especially in elderly patients with symptoms of intestinal obstruction. Early diagnosis and prompt surgical treatment are key to preventing serious complications and improving prognosis.



REFERENCES

1. Boughey, J. C., Nottingham, J. M., & Walls, A. C. (2003). Richter's hernia in the laparoscopic era: Four case reports and review of the literature. *Surgical Laparoscopy, Endoscopy & Percutaneous Techniques, 13*(1), 55–58.
2. Xia, X., Li, W. J., & Yin, W. M. (2016). Richter's femoral hernia with spontaneous enterocutaneous fistula: A case report. *International Journal of Clinical and Experimental Medicine, 9*(8), 16901–16903.
3. Anson, J. (2018). Hérnia de Richter: Diagnóstico e tratamento cirúrgico. *Journal of Surgical Case Reports, 2018*(9).
4. Aydin, I. (2017). Cirurgia de emergência para hérnia de Richter: Série de casos e revisão da literatura. *International Journal of Surgery Case Reports*.
5. Strang, M. (2020). Resultados da intervenção cirúrgica precoce versus tardia em pacientes com hérnia de Richter. *American Journal of Surgery, 2020*(5).

BRAIN ORGANOID: HISTORY, MORPHOFUNCTIONAL ASPECTS AND APPLICATION PERSPECTIVES <https://doi.org/10.56238/sevened2024.029-002>**Igor Carreiro Ramalho¹, Carlos Magno da Costa Maranduba² and Fernando de Sá Silva³****ABSTRACT**

One of the main goals of neurobiology is to understand the development and dysfunction of the human brain. Many of the tools and techniques that have informed our understanding of human brain development cannot fully capture the unique and dynamic features of human brain development. Recent advances in stem cell technologies that allow the generation of human brain organoids from pluripotent stem cells (PSCs) promise to profoundly change our understanding of human brain development and enable a detailed study of the pathogenesis of hereditary and acquired brain diseases. In this review, we will overview the development of brain organoid technology, its current progress and applications, and future prospects of this technology.

Keywords: Brain organoids. Neurodevelopment. Neurodegenerative diseases. Stem cells. Vasculature.

¹ Universidade Federal de Juiz de Fora, Campus Juiz de Fora, Instituto de Ciências Biológicas, Rua José Lourenço Kelmer, s/n, São Pedro, CEP: 36036-900, Juiz de Fora, MG, Brazil.

ORCID: 0000-0003-1227-2321

² Universidade Federal de Juiz de Fora, Campus Juiz de Fora, Instituto de Ciências Biológicas, Rua José Lourenço Kelmer, s/n, São Pedro, CEP: 36036-900, Juiz de Fora, MG, Brazil.

ORCID: 0000-0001-7327-1934

³ Universidade Federal de Juiz de Fora, Campus Governador Valadares, Departamento de Ciências Básicas da Vida, Rua São Paulo, 745, Centro, CEP: 35010-180, Governador Valadares, MG, Brazil.

ORCID: 0000-0003-0821-5535



INTRODUCTION

There is a growing concern in modern medicine to better understand how the brain forms and functions, as well as the mechanisms that promote and sustain neurological diseases, in order to develop and improve interventions and treatments for human frailties. However, studying neurodevelopment, neural circuits, and associated neurological disorders is highly challenging. The brain is an organ of great complexity and, to this day, remains difficult to access for experimental investigations in humans. Such access is primarily limited to post-mortem tissue samples or surgically removed tissues, as well as the use of non-invasive methods such as neuroimaging, transcranial magnetic stimulation, and electrophysiological monitoring (Komssi & Kähkönen, 2006; Stan et al., 2006; Brammer, 2009; Eyal et al., 2016). All these methods have limitations, necessitating the development of new procedures. Other constraints relate to the existence of differences in brain circuits and anatomical variations stemming from the interplay between individuals' genetic heterogeneity and exposure to the environment, as well as variations in techniques for processing and preserving tissues from the human central nervous system (CNS) (Adams et al., 2019).

Post-mortem analysis of CNS tissue has historically been the most accessible means of studying phenotypes in neuropathological conditions. While the foundations of modern neuroscience rely on centuries of examinations of human post-mortem tissues, enabling the study of specific features of the human brain, such as neuroanatomy (Moon et al., 2010), this approach is insufficient in providing insights into neural functioning and development (Kelava and Lancaster, 2016a; Adams et al., 2019). However, working with in vivo human brain tissues is extremely challenging yet essential for studies on the biological principles of human brain development and pathologies. Consequently, functional neuroimaging and animal models (primarily rodents and primates) have emerged as the most viable alternatives today (Jay et al., 2011; Partridge and Rossmeisl, 2019; Seeman and Madras, 2013). Nonetheless, significant species differences exist, compounded by the heterogeneity of age, sex, and pathology within the species under investigation, posing considerations that must be weighed in the challenge of interpreting what is consistent among scientific findings (Elston et al., 2001; DeFelipe et al., 2002; Roth and Dicke, 2005; Herculano-Houzel, 2009; Mohan et al., 2015; Muotri, 2016; Kelava and Lancaster, 2016b; Adams et al., 2019).

Consequently, researchers have endeavored to develop and optimize in vitro systems for culturing neural cells, aiding in the understanding of CNS development, functioning, and the underlying pathogenesis of neurological diseases. The advancement of



technologies related to the acquisition, manipulation, and cultivation of stem cells (SCs) has emerged as a new alternative for CNS study. Human embryonic stem cells (hESCs) can be induced into neural stem cells and subsequently differentiated into more specialized cells, such as neurons and glial cells. However, due to the ethical concerns surrounding their procurement, hESCs have been minimally adopted in vitro studies. Another option involves considering the use of adult stem cells, commonly known as pluripotent stem cells (PSCs), responsible for the renewal and repair of adult tissue. However, this type of cell is known to be less versatile than hESCs, and unable to mimic CNS development, limiting its use in such research. Cellular reprogramming, however, presents a viable alternative to these challenges. This technique involves the reversal of specific somatic cells from a donor's tissue, through manipulation of gene expression using stem cell transcription factors, to a pluripotent state, resulting in the formation of induced pluripotent stem cells (iPSCs). iPSCs carry the donor's (or patient's) genotype and possess the same differentiation capacity as hESCs, being inducible into the aforementioned cell types. Therefore, iPSCs allow for direct, non-invasive modulation of relevant cellular phenotypes related to the clinical aspects of the diseases of interest, representing a non-invasive, patient-specific, and ethically acceptable modeling system. Additionally, new genome editing techniques, such as the CRISPR/Cas9 system, which aims to specifically alter the genetic information of human cells (Hockemeyer and Jaenisch, 2016), have proven to be significant allies in this regard.

Despite the existence of various in vitro neuronal differentiation protocols, most are based on a two-dimensional culture system (also known as 2D culture or monolayer culture). One of the advantages is the uniform accessibility of SCs to growth and differentiation factors, as well as the uniform differentiation of SCs, aiding in achieving homogeneity in study results. However, among the disadvantages of 2D culture, especially in simulating human brain development, the absence of cell-cell and cell-matrix interactions stands out, which regulate important stages of neurological development (Koo et al., 2019).

Therefore, it became necessary to develop a model system that is more faithful to the human brain's developmental environment. These processes culminated in the generation of 'organoid technology'. Organoids are structures obtained through three-dimensional (3D) cultures, which undergo some level of self-organization and resemble, at least in part, in vivo organs and their specific cell types. The brain organoids currently being developed are still quite distinct from the human brain (which is much more complex) but can mimic, to some extent, in vitro, characteristics present in neurodevelopment and neuropathologies in vivo (Lancaster and Knoblich, 2014a; Qian et al., 2019).

Thus far, a diversity of protocols for organoid generation has been developed and published for different purposes, such as modeling cortical development (Lancaster et al., 2013; Birey et al., 2017), as well as modeling the development of other specific areas and regions of the human brain, for example, the hippocampus (Sakaguchi, H. et al., 2015), midbrain (Monzel et al., 2017), cerebellum (Muguruma et al., 2015), among others. One of the objectives of organoids is precisely to produce models of neurological diseases that affect specific brain regions. Further applications for brain organoids are more thoroughly addressed by Adams (Adams et al., 2019).

Organoid technology has significantly advanced research on diseases related to neurological development, as well as the investigation of neurodegenerative diseases. Despite its potential, however, many technical challenges and limitations remain (DiLullo and Kriegstein, 2017; Pasca, 2018). This technology is still in its early stages. The current protocols are only sufficient to generate organoids that mimic the human fetal brain around the second trimester of development, in terms of cellular and molecular composition (Camp et al., 2015; Pasca et al., 2015; Qian et al., 2016). Further challenges and limitations will be addressed later, including the difficulty of developing a vascularization network alongside the organoid. There is still a need for additional improvements to overcome the limitations of using these organoids, making them more reliable.

This review provides a brief historical overview of the central nervous system through brain organoid models, as well as a general view of some of the neuropathologies that have been studied using these models, highlighting their limitations, as well as hypotheses and strategies being developed to overcome the challenges of in vitro modeling.

DEVELOPMENT OF ORGANOID TECHNOLOGY:

The initial attempts to create in vitro models of neurological diseases were based on the cultivation of neural cells in monolayers (2D culture). Neural cells (neurons and glial cells) were obtained through differentiation from neural progenitor cells (NPCs), which in turn were derived from the differentiation of iPSCs or ESCs (Chambers et al., 2009). Both iPSCs and PSCs have the capability to form large multicellular aggregates, known as embryoid bodies, a natural ability of ESCs. These embryoid bodies undergo development similar to that of an embryo (Pettinato et al., 2015). In 2001, a study used ESCs to generate embryoid bodies that were subsequently directed toward a neural lineage, resulting in NPCs (Zhang et al., 2001). NPCs have the capacity to self-organize into rosettes, a group of polarized neural progenitor cells that can form structures resembling the embryonic



neural tube (critical for the development of the neocortex in human embryos) (Zhang et al., 2001; Shi et al., 2012).

Self-organization is characterized by the ability to form specific cellular structures without external interference, solely through intrinsic and spontaneous processes. It is a crucial factor in organ formation (Werner et al., 2017). In 2003, a study demonstrated that ESCs produced neural precursors even in the absence of inductive signals, such as growth factors. Subsequently, it was shown that some of these cells acquired neural identity during differentiation. It is important to note that only a fraction of the ESCs were able to acquire neural identity, requiring the treatment of the rest with retinoic acid, which is important in neural differentiation. The study also demonstrated that this restricted differentiation of cells into NPCs did not depend on multicellular aggregation (Ying et al., 2003). Thus, protocols were developed for generating cortical neurons from 2D cultures (Chambers et al., 2009). However, as introduced in this article, the 2D culture of neural cells has limitations in producing the connectivity observed in vivo. Efforts to overcome these limitations led to the development of 3D brain organoids that were capable of representing more advanced in vitro models, more accurately recapitulating the connectivities of the human brain, along with its high complexity.

It is worth noting that the pioneers in creating what is now known as the cerebral organoid were a group of stem cell researchers from the laboratory of Yoshiki Sasai at the RIKEN Center for Developmental Biology in Japan. These researchers laid the groundwork for the research that has been conducted since then (Eiraku et al., 2008; Watanabe et al., 2005). It was in 2011 that the group used human ESCs in a 3D neural culture system to generate cup-shaped self-organizing structures that exhibited characteristics similar to retinal tissue (Eiraku et al., 2011).

Other pioneering works have advanced the field of brain organoids (Lancaster et al., 2013; Qian et al., 2016; Paşca et al., 2015; Lindborg et al., 2016). The work by Qian and colleagues demonstrated that three-dimensionally cultured structures exhibited cortical regions that displayed an organization similar to that of the human cortex in early development, both structurally and in terms of cellular behavior (Qian et al., 2016). Among various studies, new protocols were developed, such as growing organoids using embryoid bodies in Matrigel matrix cultivated in a rotating bioreactor. This matrix was intended to serve as a support to assist in the formation and expansion of tissues, while the bioreactor was used to facilitate gas and nutrient exchanges between the organoids and the medium, resulting in the production of larger and more viable structures. These exhibited growth for longer periods, maintaining viability for up to 100 days (Grebenyuk and Ranga, 2019;

Lancaster et al., 2013; Qian et al., 2016). It is worth noting that new bioreactor models have been developed with the aim of achieving the neural subtypes found in the six cortical layers, adding even more complexity to the model (Qian et al., 2016). All of this has made organoid technologies a model system for the study of the human brain, its development, and related diseases.

Today, the production of organoids can occur in two ways: one is termed non-standardized or whole-brain organoids, and the other, standardized or region-specific brain organoids. Non-standardized organoids, typically cultivated in an extracellular matrix, self-organize into structures from different regions of the brain through the activity of specific endogenous cues from the cell culture itself (Lancaster et al., 2013; Renner et al., 2017). Standardized organoids aim to generate specific regions of the brain by adding specific external growth factors (Paşca et al., 2015; Qian et al., 2016). Indeed, in current protocols, both growth factors and scaffolds composed of extracellular matrix molecules are of great importance (Lancaster et al., 2013; Qian et al., 2016; Quadrato et al., 2017). Some protocols are capable of producing brain spheroids without the presence of scaffolds, solely through extrinsic neural induction. These spheroids undergo both neurogenesis and astrogliogenesis, thereby more faithfully replicating the neural cell diversity, a critical aspect of cortical development (Paşca et al., 2015).

Another aspect that must be considered when studying the development of organoid technology, which is crucial for self-organization, is guided cell migration. This process is essential for the proper assembly of the functional neural circuit, driven by neurotrophic factors and intercellular interactions (Valiente and Marín, 2010). As a result of successful cell migration, we observe successful generation of neurons from NPCs in their respective original locations, as well as their redirection to the expected sites. For example, excitatory neurons migrating to the cortical plate simultaneously with inhibitory neurons, which also migrate to connect with the excitatory neurons in the cerebral cortex to modulate neuronal activity (Kriegstein and Noctor, 2004). Fluorescence labeling confirms the modeling of the migration process in vitro (Bagley et al., 2017).

Approaching a decade of history, cerebral organoids and associated technology have already begun to strongly impact modern medicine. It is expected that this model will become invaluable for a better understanding of the fundamental biology of brain development, function, and disorders.

LIMITS AND ADVANCES

Organoide technology, represented by three-dimensional (3D) culture systems, is the most recent technological development in modeling the central nervous system (CNS), addressing some of the needs not previously met by the analysis of *in vivo* tissues or the use of 2D cell cultures. Since the creation of this technology, many advances have been made in the development of these models, such as the ability to recapitulate increasingly later milestones of brain development and extend the capacity for the cultivation and maintenance of these organoids. *In vivo* transplantation is currently a subject of discussion among many researchers. This topic is still subject to ethical and epistemological considerations regarding the potential development of consciousness in organoids (Lavazza and Massimini, 2018; Shepherd, 2018).

Although the benefits of using cerebral organoids represent an advantageous culture system in many respects, with an incredible diversity of neural cells that help us model intercellular interactions during organogenesis as closely as possible, it is important to note that the technology suffers from certain limitations, which are constantly being brought to attention, serving as a starting point for new research aimed at improvement (DiLullo and Kriegstein, 2017).

Regarding reproducibility, organoid development protocols can result in variable batches, presenting differences in the compositions of cells representing certain brain regions, resulting in morphofunctional variabilities (Lancaster and Knoblich, 2014b). Differences have been noted when comparing the same region between two organoids from different batches, and even within the same batch, in terms of cell distribution, density, and composition (Di Lullo and Kriegstein, 2017; Kelava and Lancaster, 2016a). This leads to different regional identities in the organoids, which in turn raises significant concerns about the reproducibility and accuracy of the protocols (Kelava and Lancaster, 2016a).

Indeed, the variability among organoid models can have serious implications when used for disease modeling, drug testing, or studies focused on neurological development, as heterogeneity implies inconsistency in the analyzed phenotypes. This issue can be mitigated by increasing repetitions in quantitative analyses, but this would raise the cost of experiments. On the other hand, qualitative analyses, such as morphology by microscopy, for example, would still be compromised. For this reason, as suggested by Kelava and Lancaster, when investigating phenotypes related to genetic diseases using organoids, the results must be robust enough to be considered (Kelava and Lancaster, 2016b). It is worth noting that improvements in organoid generation protocols are currently being developed to

reduce heterogeneity and optimize reproducibility (Qian et al., 2016; Sloan et al., 2018; Yoon et al., 2019).

A factor that limits the development of organoids in relation to the early stages of organogenesis is the absence or minimal presence of relevant cell subtypes (Pasca et al., 2015; Qian et al., 2016). Various types of non-neural cells make up the human brain, and these cells are not necessarily neural cells derived from the neuroectoderm. Non-neural cells, such as microglia, endothelial cells, hematopoietic cells, as well as meninges, are largely absent in organoids because most current protocols induce the neuroectodermal fate in the embryoid body. Consequently, brain functions or disorders that originate from non-neuronal cells or from interactions between non-neuronal cells and neural cells cannot be adequately modeled in cerebral organoids. A study conducted by Ormel and colleagues, using a lower concentration of heparin (a neuroectoderm stimulant), delaying transfer to matrigel, and not applying brain-derived neurotrophic factor (BDNF) in the cerebral organoid differentiation protocol, obtained mesodermal progenitor cells capable of differentiating into mature microglia. The authors attributed this to the microenvironment of the organoid itself, which presented conditions similar to the CNS that allowed the development of these microglia. Temporal monitoring of organoid development led to the observation that the mesodermal cells present at the beginning originated microglia in subsequent stages. The group highlighted that factors known to drive microglial development in rodents, such as CSF1, IL34, and TGF β 1 (typically used to generate microglia from iPSCs), are the same factors expressed inherently by cerebral organoids. The results showed organoids with functional synapse formation and the detection of microglial ramifications very close to neuronal processes and synaptic structures (Ormel et al., 2018). Other methods of co-culturing differentiated microglia in 2D or introducing these cells into cerebral organoids can also be used in disease modeling or to investigate interactions between microglia and neural cells (Lin et al., 2018).

All of this concern stems from the crucial need to understand whether cerebral organoids recreate the neural circuitry observed in the human brain (or at least possess the necessary cellular diversity for such and in proportion close to the ideal), enabling us to advance in the comparison and understanding of the pathophysiological findings in human cerebral organoids.

Another issue related to the absence of mesodermal cells is the resulting lack of vascularization, which poses a significant obstacle in the development and maintenance of organoids. The late-stage developing brain is highly dependent on vascularization for the diffusion of nutrients and oxygenation. Additionally, neural cell groups and vascularization

are intertwined in the brain structure. Given that cerebral organoid models lack an inherent circulatory system with blood vessels, they rely on simple diffusion of the culture medium for the supply of gases and nutrients. When cultivated for extended periods, a significant number of cells within the organoids, particularly in their interior, undergo apoptosis due to oxygen and nutrient deficiency (Lancaster and Knoblich, 2014a). The absence of vascularization also disrupts certain endogenous patterning cues necessary for the differentiation of neural progenitors and the proper development of the organoids. These cues are extremely important for the late-stage development of neural structures. Furthermore, it is noteworthy that some of the neural progenitor cell niches are located near blood vessels.

Confronted with this issue, it becomes imperative to refine existing protocols by simulating the physiological environment, altering the culture conditions, and employing bioengineering to provide vascularization, thereby establishing a nutrient flow system, as well as to promote the emergence and preservation of patterning cues in the organoids (Kelava and Lancaster, 2016a).

Recent vascularization techniques have shown promise in addressing these challenges, demonstrating the generation of blood vessel organoids from human PSCs, containing endothelial cells that have the capacity to self-assemble, forming capillary networks. Following the transplantation of these organoids into mice, the formation of a well-defined vascular system was reported (Cakir et al. 2019, Mansour et al. 2018, Pham et al. 2018, Wimmwe et al. 2019).

It is known that adequate blood supply is essential for the normal functioning of the brain, and a failure in the cerebral vascular network can result in damage and loss of function in brain tissues. The cerebral vascular network is composed of the blood-brain barrier (BBB), which protects the tissue from infections, regulates the passage of nutrients, and removes metabolic waste (Zhao et al., 2015). In addition to the BBB, we can highlight some indispensable functions that glial cells - particularly microglia and astrocytes - perform in the CNS under normal conditions. Microglia serve as the brain's immune monitor and, when activated, release inflammatory cytokines and perform phagocytic functions (Solito & Sastre, 2012). Astrocytes, on the other hand, are involved, among other things, in the secretion of growth factors and the regulation of oxidative stress, as well as synaptic remodeling, energy supply, and homeostasis (Wyss-Coray & Rogers, 2011). Both cell types are involved in the repair, maintenance, and permeability of the blood-brain barrier (BBB) (Abbott et al., 2006). Given the complexity of the biological mechanisms related to the pathophysiology of the many disorders that affect the CNS (many of which are already

reproducible through organoid culture techniques, as will be seen below), it is important to emphasize that future research aiming to model such disorders in vitro should not only focus on the production of cell types such as neurons and glia within the models, but also on the contribution of these cells associated with the cerebral vascular system to understand the onset and progression of pathologies.

There are currently several methods for generating vascularization in organoid models. Pham et al. (2018) generated vascularization in cerebral organoids by incorporating them into Matrigel droplets containing endothelial cells previously derived from iPSCs. Mansour et al. (2018) also achieved vascularization by grafting in vitro-developed cerebral organoids into in vivo murine cortices. This work demonstrated the potential of organoids, as it observed vascular structure and synaptic connections between the organoid and the host CNS, as well as facilitating the study of vascularization and grafting processes in general (Mansour et al., 2018).

As previously mentioned, in addition to the formation of blood vessels, another important component that must be emphasized and developed alongside vascularization is the blood-brain barrier (BBB). Present at all levels of the vascular tree and formed by a continuous monolayer of endothelium surrounded by mural cells, the BBB restricts the endothelial transport of most molecules (especially macromolecules) from the blood, as well as the entry of blood cells (such as leukocytes) and microbial pathogens, thus maintaining the integrity of the brain tissue (Zhao et al., 2015). Some groups did not address the absence or presence of the BBB when generating vascularized organoids, while others have already developed viable BBB models, including the presence of one to three cell types (Cho et al. 2015, Helms et al. 2016, Mansour et al. 2018, Pham et al. 2018, Wang et al. 2016). Similar to organoid models, improved performance is expected when providing the model with greater cellular complexity. Thus, the importance of developing in vitro BBB models can be considered. These models can be used for testing new drugs and therapeutic approaches related to the treatment of neurological diseases, providing more specific data regarding the ability of the molecules used to cross the BBB and their subsequent actions, such as glial and neural cytotoxicity. Another important aspect is to provide a better understanding of the interactions between the BBB and the adjacent brain tissue (Nzou et al., 2018). In summary, these models represent a promise for the in vitro modeling of neurodegenerative conditions and injuries, such as amyotrophic lateral sclerosis, Alzheimer's disease, and stroke.

Therefore, organoids have shown promise for investigating neurodevelopment-related diseases, also holding enormous potential for testing personalized medications for



certain brain disorders. In the following sections, the main disorders related to neurological development and neurodegeneration will be briefly presented, discussing the main approaches and challenges related to the study of these disorders. Later on, the focus will be on autism spectrum disorder (ASD), Alzheimer's disease, the production of neuroglia, and the development of the cerebral vascular network.

UTILIZATION OF BRAIN ORGANOIDS IN MODELING NEUROLOGICAL DISORDERS: ADVANCES AND CHALLENGES

For several years, brain organoids have been widely used as a means to investigate disorders affecting the human brain. Due to the resemblance between the developmental stages - especially in the initial phase - that both undergo, organoids have, in most cases, been considered the most suitable models for investigating disorders related to neurological development. Moreover, in modeling neurodegenerative disorders, organoids are excellent for bridging the gap between patients and animal models. Other utilities, such as modeling the progression of brain cancer, coupled with studies for drug development, genomic editing, and epigenomic remodeling, give organoids the status of a promising experimental model for reproducing and standardizing brain disorders ((Bershteyn et al., 2017; Pacitti et al., 2019; Sachs et al., 2018; Sun & Ding, 2017; Yan et al., 2018).

Indeed, since their creation, organoids have been the subject of an exponential number of publications. Pacitti and colleagues (2019), in their review, report the popularity of organoids over the years. As mentioned earlier, while animal models have been extremely important for our current understanding of the pathological mechanisms of many brain disorders, such as the relationship between mutated genes and phenotype, these models have limitations regarding the translation of their findings to humans. One of these limitations is the different cellular composition between organisms. There are cases where disease phenotypes are found in both animal models and organoids, and such cases are important for validating (or not) both models (Bershteyn et al., 2017). Furthermore, organoids can provide knowledge about specific human phenotypes, as well as cellular subpopulations that are not easily observed in other mammals. In addition, organoids have other significant advantages, such as the possibility of using them as models of living tissues and studying cellular functionality or behavioral dynamics more easily and accessibly (compared to in vivo neural tissues). In organoids, functional synapses can be found after 6 months of culture, as well as considerable neuronal maturation, with well-formed dendrites and active neural networks after nine months (Wang, 2018). The possibility of genome editing offers more precise creation of mutations or repairs, further

expanding the modeling of many diseases (Sun & Ding, 2017). As organoids are a relatively new technology, but showing rapid and significant expansion as *in vitro* disease modeling tools, this section of this review will be dedicated to advances in this field.

What we refer to as neurodevelopmental disorders (NDDs) are all the diseases that compromise some brain functions, such as learning, sociality, and motor coordination, and that originate from the impairment of normal development processes caused by some kind of disturbance. In other words, they are a group of early-onset neurological disorders. Manifestations of diseases resulting from abnormalities in development processes include disorders such as epilepsy, microcephaly, intellectual disability, and language disorders. Also included are disorders such as Autism Spectrum Disorder (ASD), attention deficit/hyperactivity disorder (ADHD), schizophrenia, bipolar disorder, Tourette's syndrome, Rett syndrome, and developmental coordination disorder (Savatt & Myers, 2021). It is said that NDDs affect 4 to 5% of the world's population (Mitchell, 2011), and can be attributed to mutations at more than 1000 loci (Tărlungeanu & Novarino, 2018).

Currently, there are limitations regarding the understanding of the etiology of NDDs. These limitations range from the difficult delineation of the components involved in heredity to the identification of the mechanisms by which specific cellular factors lead to the disorder, including the definition of these factors. The clinical diagnosis of these disorders, often a time-consuming and costly process, is still limited by the heterogeneity in the clinical presentation that patients show (de la Torre-Ubieta et al., 2016). Therefore, understanding the causes of NDDs, such as identifying genetic risk factors as well as environmental factors, and establishing an appropriate preclinical model for the development of new treatments, represent an important step towards the development of personalized therapeutic approaches.

Models of NDDs in animals have certainly been essential for the current understanding of the mechanisms related to the pathology of these disorders. However, there are differences between a human model and an animal model that limit the use of the latter, including biological characteristics related to development, cellular composition, and genetics. Many cognitive and behavioral diseases have polygenic origins and multifactorial environmental influences, making it challenging to study models of evolutionarily different species, such as rodents, with respect to their intellectual and behavioral abilities compared to the human species. Therefore, there is a clear advantage in using *in vitro* models for these disorders (DiLullo and Kriegstein, 2017). As we saw earlier, the use of hESCs and iPSCs in generating neurons *in vitro* has allowed researchers to recapitulate and reproduce in the laboratory various neuronal synaptic defects related to NDDs. One advantage of

using stem cell-based models is the fidelity of modeling diseases directly from affected individuals. Thus, the *in vitro* model, in addition to having the same genetic information as the patient, can reproduce with a high degree of reliability the cellular and molecular phenotypes associated with the disease in question. Another advantage is the generation of stem cell lines, which implies an unlimited source of cells. However, these methods are mostly limited due to the low complexity generated by 2D systems, which results in a lack of high-order connectivity, an immature identity of differentiated neurons *in vitro*, and high heterogeneity among clones derived from iPSCs (Sun & Ding, 2017). These limitations are being overcome as organoid technology gains ground. Later on, we will see examples of how organoids are contributing as additional tools for studying the underlying mechanisms of NDDs.

Currently, the protocols used for organoid production report the presence of neurons from all six cortical layers in a temporally structured manner. In other words, cortical neurogenesis in the organoid, concerning the emergence of neuron subtypes, appears to respect the timing and sequence of *in vivo* development (although they are not arranged in the same way as *in vivo*). The production of radial glial cells and intermediate progenitors is also reported (Lancaster et al., 2013; Qian et al., 2016), as well as the production of human cell subpopulations that are absent in the development of animal models such as rats (Di Lullo & Kriegstein, 2017).

A concern regarding the validation of organoid models is the understanding of the reproducibility of cell types, as well as their cellular diversity in *in vitro* models. This has led scientists to profile single-cell genomes during neurodevelopment both *in vivo* and *in vitro*. The investigation is carried out by observing changes related to cellular diversity and the enrichment of gene expression when comparing organoids at different stages of development (Quadrato et al., 2017). Another concern is the understanding of self-organization, a phenomenon not yet well understood. Seeking to highlight this issue, studies have identified organizing centers of different brain-like structures in organoids (Renner et al., 2017).

There is another major issue, the establishment of reliable neural circuits, especially in the cortical region. Although few, some studies demonstrate the presence of functional synaptic junctions in organoids (Quadrato et al., 2017). Many neurological diseases manifest their phenotype postnatally, such as problems in the formation and refinement of circuits and synaptic pruning. Considering that the maturation of these processes can take years to form the neural networks observed *in vivo*, the ability of organoids to faithfully

portray these complex characteristics related to human brain development and maturation is questionable.

As seen earlier in this review, organoid technology as a model better represents the early stages of neurological development. Thus, its use is more advantageous for modeling early-onset neurological diseases during fetal or embryonic stages. In fact, in vitro modeling of neurodevelopmental disorders is perhaps currently the most impactful approach in the use of organoids. This approach allows the study of the onset and progression of the disease during neurodevelopment, enabling a greater understanding of the underlying pathological mechanisms. Organoids constitute a versatile model, as their use allows the modeling of diseases through both genetic factors and those mediated by the environment. New techniques, such as the development of functional networks, promise to broaden studies to understand intracellular mechanisms and cell-cell interactions in more detail (Trujillo et al., 2018^a). Below are some examples of disorders that are more amenable to in vitro modeling.

MICROCEPHALY

Microcephaly is a condition characterized by a reduced head size and is accompanied by intellectual disability and seizures. This disease was the first neurodevelopmental disorder to be modeled using brain organoids. Lancaster and colleagues (2013) generated microencephalic organoids derived from iPSCs from a patient with a mutation in a gene related to the coding of Cyclin-Dependent Kinase 5 Regulatory-Associated Protein 2 (CDK5RAP2), known as a genetic risk factor for microcephaly. A difference in size was demonstrated between the microencephalic organoids and those in the control group. As expected, the smaller organoids were from the microencephalic patient, showing premature neural differentiation and reduced proliferation in their neural progenitor cells (NPCs). This study and its results were of paramount importance for organoid models, as they indicated them as useful tools for modeling brain disorders, presenting them as a means to understand the underlying mechanisms of the phenotype observed in patients (Lancaster et al., 2013).

ZIKA VIRUS INFECTION

Some neurological diseases, including microcephaly, can be promoted by environmental factors that compromise the normal development of the fetal brain. A highly studied example is viral infection during pregnancy. In 2016, the Zika virus was epidemiologically linked to congenital microcephaly in children of mothers infected during

pregnancy (Heymann et al., 2016). Due to the lack of experimental evidence confirming the causality hypothesis in humans, brain organoids and 2D culture of neural progenitor cells were key elements in understanding the mechanisms and pathways by which the virus induced damage to the fetal brain. When exposing iPSC-derived organoids to the Zika virus, it was discovered that the virus has tropism for NPCs, and the infection resulted in reduced organoid growth and decreased NPC numbers (Cugola et al., 2016; Garcez et al., 2016; Qian et al., 2016). Cell signaling pathways during infection were also discovered using organoids through transcriptome analysis (Cugola et al., 2016; Watanabe et al., 2017). However, considering the limitation of the models in depicting the complexity of a human brain (cellular composition, tissue architecture, etc.), the data were not sufficient for a complete understanding of the infectious process. The use of primary tissue, in addition to presenting tropism for NPCs, identified infection and vulnerability in astrocytes and microglia (Retallack et al., 2016), contrary to research conducted in organoids, which showed occasional infection in these cell types (likely due to an underrepresentation of astrocytes and microglia in the organoids). Retallack and colleagues also used primary tissues to demonstrate the vulnerability of astrocytes and radial glial cells to infection via the AXL receptor (a tyrosine-protein kinase receptor abundant in these cell types).

These examples, in addition to highlighting the utility of organoids for investigating the etiology of neurodevelopmental disorders, also emphasize the need for constant improvement in human brain organoid production protocols to ensure better accuracy in results. As we will present later, new protocols aiming to create glial cells within organoids can resolve this impasse.

MACROCEPHALY

Like microcephaly, the macroencephalic phenotype is also the result of some mutations. In this case, silencing of the PTEN gene is the main factor (Butler et al., 2005). The use of PTEN knockout hESCs for the production of brain organoids resulted in organoids with larger volume and surface area accompanied by increased neuroepithelial cells, increased cell proliferation, and delayed neuronal differentiation (Li et al., 2017).

CONGENITAL LISSENCEPHALY OR MILLER-DIEKER SYNDROME

Miller-Dieker Syndrome (MDS) is a congenital form of lissencephaly, a neurological development disorder characterized by the absence of normal brain convolutions, resulting in intellectual disability and seizures (Blazejewski et al., 2018). Studies conducted with the help of brain organoids identified underlying mechanisms of the syndrome phenotype.

Iefremova and colleagues (2017) developed organoids from iPSCs of patients with MDS. The organoids showed reduced size and slower expansion rate compared to controls, as well as other structural modifications. Another study also modeled the syndrome through patient cells and observed a deregulation of neuronal migration and the mitotic axis of glial and neuroepithelial cells (Bershteyn et al., 2017). These data suggest that organoids may recapitulate important cellular and molecular mechanisms in the formation of the disease.

SANDHOFF DISEASE

Sandhoff disease is a neurodevelopmental disorder characterized by lysosomal accumulation of GM2 ganglioside and is related to a defect in the hexosaminidase enzyme due to a mutation in the HEXB gene (Sandhoff et al., 1971). In addition to developmental delay, patients with this disease present macrocephaly and seizures (Allende et al., 2018). Allende et al. (2018) produced brain organoids from cells of an affected patient and from isogenic iPSCs with a HEXB mutation generated by CRISPR/Cas9. The organoids derived from the patient's cells exhibited an increase in organoid size parallel to increased cell proliferation compared to the control.

RETT SYNDROME

Rett Syndrome, a neurodevelopmental disorder, is most commonly caused by mutations occurring on the X chromosome, in the MECP2 gene that encodes the methyl-CpG-binding protein 2 (a protein that specifically binds to methylated DNA sequences, with its main function being transcriptional repression). Clinically, symptoms vary by sex; females experience motor and language impairments, while males suffer from severe congenital encephalopathy and typically have an early death (Ip et al., 2018). Brain organoids from patients with the syndrome were instrumental in identifying the role of over-regulated microRNAs (miR-199 and miR-214) in important signaling pathways for neurogenesis and neural differentiation. The organoids from patients with Rett syndrome exhibited an increased ventricular area with a decrease in ventricular wall thickness, as well as an increase in the number of neural progenitors due to exacerbated proliferation, leading to the increased cell density typically observed in patients with the syndrome (Mellios et al., 2018).

TIMOTHY SYNDROME

Another example concerns Timothy syndrome (TS). It is a neurodevelopmental disorder characterized mainly by the presence of abnormal inhibitory neurons. The

syndrome is caused by a mutation in the *CACNA1C* gene, which encodes proteins that compose calcium channels, especially the L-type, related to the migration of interneurons, regulating the frequency and termination of migration. Birey et al. (2017) were responsible for the first study based on a fused organoid system to investigate interactions between different brain regions (a subject discussed later). In this syndrome, there is a deficit in GABAergic interregional cell migration from the ventral to the dorsal prosencephalon. To reproduce this migration, organoids from different regions were generated from patient iPSCs and subsequently fused. Fluorescent marker tests revealed that inhibitory neurons had impaired tangential migration. When a ventral prosencephalon organoid was fused with a dorsal prosencephalon organoid, both obtained from TS patient cells, the number of hops required for migration increased, as the hop amplitude was significantly reduced compared to control organoids.

SCHIZOPHRENIA

2D models have been important for studying underlying mechanisms of schizophrenia (Brennan et al., 2011). These findings are being complemented with studies that used brain organoid models. For example, one study observed that in organoids derived from patients with a mutation in the *DSC1* gene, there was a delay in mitosis. The gene in question is associated with schizophrenia and has one of its functions as regulating mitotic events (Ye et al., 2017).

AUTISM

Autism spectrum disorder (ASD) is a complex neurobiological developmental disorder commonly observed early in an individual's life. It is characterized mainly by neuropsychological and behavioral deficits such as cognitive impairment related to social communication difficulties and the presence of repetitive or stereotyped behaviors. For a better understanding of the main characteristics found in an autistic patient, see Mukherjee (2017). The most likely accepted hypothesis for the causality of autism is the interaction or conjunction of multiple factors, such as genetic, epigenetic, and environmental factors (Fett-Conte et al., 2016). It is worth noting that one of the possible genetic origins of ASD occurs through mutations in genes on the X chromosome, such as *PTCHD1*, responsible for approximately 1% of ASD cases (Noor et al., 2010). To some extent, these factors lead to an imbalance of neurotransmitters, as well as an abnormality related to neuronal connectivity and synaptogenesis, which, in turn, can lead to the dysfunction of neuronal pathways. These abnormal connections of functional brain regions may reflect

morphological abnormalities typically found in autistic children (Misic et al., 2014; Just et al., 2012), resulting in communication and learning impairments (Verly et al., 2013) (Schipul et al., 2012). Abnormalities regarding the size of the corpus callosum (He et al., 2010) are also described, as well as cortical thinning in the frontal, parietal, and occipital lobes (Zielinski et al., 2014) and a reduction in neural connectivity between these lobes (Tyszka et al., 2014). Irregular synaptic pruning mediated by microglia in autistic individuals is related to weak synaptic transmission and decreased functional brain connectivity, which in turn implies repetitive behavior and deficits in social interaction (Zhan et al., 2014). Beyond these factors, disturbances in the gut-brain communication axis (mainly promoted by the intestinal microbiota) (Sharon et al., 2016) may contribute to various aspects of the autistic brain.

Studies based on RNA sequencing indicate that a large portion of the cells found in organoids have a gene expression pattern corresponding to that of a human fetal brain (Ilieva et al., 2017). This gives a very promising character to research using organoid technology. A study conducted by Mariani et al. (2015) used brain organoids produced with iPSCs derived from patients with ASD, which, when compared with a control group, showed: less presence of neurites and synapses; differences related to cytoskeletal regulation; and deficiencies in potassium ion channel function. These organoids also showed an accelerated cell cycle and increased production of inhibitory GABAergic interneurons, characteristics that can be found in autistic patients. An analysis of the transcriptome showed an overexpression of the FOXP1 gene, which was positively correlated with excessive formation of inhibitory neurons. This result was validated by experiments that promoted the knockdown of the FOXP1 gene, which reduced GABA production to the level considered normal (Mariani et al., 2015).

Aberrations in the development in areas that concentrate a larger number of neural stem cells (NSCs) have a greater influence on the overall development process. This is the case for the subventricular zone (SVZ). Genes that regulate proliferation, migration, and cell differentiation in this area in question are found to be dysregulated in young autistic patients. Research also suggests that autistic patients have different DNA methylation profiles in genes related to these characteristics. Ilieva et al. (2017) observed an accumulation of methylation in the developing brain of autistic patients, suggesting abnormal epigenetic regulation (Ilieva et al., 2017). Studies of this type using organoids as a model can easily provide answers about epigenetic regulation since organoids recapitulate most of the epigenomic characteristics of fetal brain development.

With the aim of investigating the interaction between neurons and astrocytes and neuronal connectivity in individuals with autism, Russo et al. (2018) employed iPSC models



derived from non-syndromic ASD patients cultivated together with astrocytes in a 2D culture model (neuronal population grown on top of the astrocyte population). The results were intriguing as the ASD-derived cell culture exhibited disease characteristics, such as a decrease in glutamatergic neurotransmitter release, as well as alterations in the expression of genes related to synaptic formation. Consequently, these factors altered the spontaneous firing rate. Co-culturing healthy neurons with ASD-derived astrocytes revealed the glial cells' interference in neuronal development (synaptogenesis and neuronal morphology), resulting in neurons exhibiting ASD-related cellular characteristics. Conversely, when the co-culture combined healthy astrocytes with neurons derived from ASD, the "normal" phenotypes related to synaptogenesis and neuronal morphology were restored. IL-6 secretion by glial cells was identified as a possible cause of the phenotypes, confirmed by the cytokine's levels being blocked. This influence had been previously suggested in other research, and this study confirms the relationship (Russo et al., 2018). This work brings promising results to autism research using iPSC technology. Brain organoids can be used as models to further expand these findings and aid in the development of future therapeutic strategies, as 3D models allow for the recreation of a more complex cellular environment (Dezonne et al., 2017).

ORGANOIDS AS MODELS OF ALZHEIMER'S AND OTHER NEURODEGENERATIVE DISORDERS

Neurodegenerative diseases (NDs) are responsible for the progressive loss of cognitive and/or motor function in patients, with these symptoms often associated with the progressive and irreversible death of neurons leading to the loss of brain functions. Precursor mutations and common risk alleles associated with the development risk overlap in different neurodegenerative disorders. Additionally, some syndromes may have overlapping clinical manifestations. For example, common cognitive deficits in Alzheimer's disease (AD) are also present in vascular dementia and Lewy body dementia (LBD). Another example is motor system impairment, common to Parkinson's disease (PD), multiple sclerosis (MS), amyotrophic lateral sclerosis (ALS), Huntington's disease (HD), and spinocerebellar ataxias (SCAs). Moreover, aging is a common risk factor for some of these diseases. Hence, there is a direct relationship between increased life expectancy and the increased prevalence of these diseases that develop later in life (Prince et al., 2013). Despite the variety of clinical manifestations, neurodegenerative diseases share similar mechanisms. One characteristic is the regional aggregation of cytosolic or nuclear proteins, such as beta-amyloid plaques (A β) in AD, polyglutamine protein aggregates in HD (and

other similar diseases linked to CAG nucleotide repeat - glutamine codon), and alpha-synuclein aggregates in synucleinopathies such as PD (Taylor et al., 2002).

As discussed earlier regarding NDDs, complex genotype-phenotype relationships are also found in NDs. Multiple genes give rise to similar clinical entities in different diseases. When identified, these genes have helped elucidate the pathways of diseases such as AD and PD, suggesting new therapeutic approaches (Hardy & Orr, 2006). On the other hand, a neurodegenerative process evoked by a mutation can cause a spectrum of clinical signs (DeJesus-Hernandez et al., 2012; Renton et al., 2011; Schöls et al., 2015; Zimprich et al., 2004). Moreover, disorders with overlapping pathologies tend to share genetic risk loci (Zimprich et al., 2004; Scholz et al., 2009). An example is the shared genes between LBD and AD, among which is the apolipoprotein E (APOE) gene, considered the primary risk gene for AD (Huang & Mahley, 2014; Guerreiro et al., 2018). Carrying an APOE ϵ 4 polymorphic allele increases the patient's risk (3 to 4 times) of developing late-onset AD; possessing two alleles further raises this risk (9 to 15 times). Additionally, APOE ϵ 4 is associated with earlier onset of AD. Studies indicate that APOE4 is directly related to factors that impair normal brain function, such as beta-amyloid accumulation, and neurodegenerative processes mediated by tau and alpha-synuclein. Furthermore, this gene is linked to neuroinflammation (due to its significant role in regulating innate immune response), synaptic degeneration, glucose metabolism dysfunction, and cerebrovascular dysfunction. For a more in-depth study of the implications of the APOE gene in AD and other neurodegenerative diseases, see (Yamazaki et al., 2019).

Some tauopathies also share genetic risk (Höglinger et al., 2011). Tauopathies are a group of clinically heterogeneous NDs whose main pathological characteristic is the formation of aggregates of tau protein forming neurofibrillary tangles within the cell. Also known as "microtubule-associated tau protein," this protein is related to microtubule stability. Among the best-known tauopathies are AD, progressive supranuclear palsy, and corticobasal syndrome (Orr et al., 2017). Even in cases where clinically different syndromes are promoted by variants of the same gene, there can still be an overlap of genetic risks. As previously mentioned, many neurological diseases may share common mechanisms. However, generalization is not possible because there are still unique aspects of genetic risk that promote different mechanisms for some NDs.

Despite the extensive history, we still do not have complete clarification on the pathogenesis of AD, but known markers can aid in the understanding of its pathogenesis (Forestier et al., 2015; Liu et al., 2015). Macroscopically, it is possible to observe atrophy of the hippocampus and cerebral cortex, which in AD is related to increasing age (DeTure &

Dickson, 2019). Microscopically, the formation of amyloid plaques and neurofibrillary tangles can be observed. Both deposits lead to extensive neuronal loss, while they are essential markers for AD (Forestier et al., 2015; Liu et al., 2015; Stancu et al., 2014; Perl, 2010; DeTure & Dickson, 2019).

Specifically, AD is characterized by the deposition of beta-amyloid peptides (A β) in the extracellular environment of neurons and the formation of neurofibrillary tangles (NFTs) resulting from intracellular accumulation of hyperphosphorylated tau protein. The amyloid cascade hypothesis, formulated in 1992, postulates that these characteristics constitute the main pathological event linked to the clinical picture of the disease (Hardy & Higgins, 1992). The proteolytic cleavage of the beta-amyloid precursor protein (APP) by the action of two enzymes, beta-secretase 1 and gamma-secretase, is the event responsible for A β production (O'Brien & Wong, 2011). The accumulation of A β in the brain can lead, among other impairments, to the hyperphosphorylation of microtubule-associated tau protein and, consequently, the formation of neurofibrillary tangles (Niedowicz et al., 2011).

The cerebral organoid model is also promising in the field of ND modeling, being considered by many as an alternative to animal models. It is known that rodent models are not capable of reproducing the entirety of the pathophysiological processes of diseases such as PD and AD found in humans. We can take, for example, some points mentioned by Dawson et al. (2018), namely: inherent differences related to methods of generating animal models such as the artificial overexpression of proteins, which, when circumvented, generate models that demonstrate mild disease phenotypes; the reduced "lifespan" of rodents, which may ultimately contribute to the incomplete development of pathological neurodegeneration phenotypes; differences in the development and function of rodent and human brains, leading to errors when comparing or interpreting results of models and humans; the genetic differences between both (Dawson et al., 2018). However, respecting the limitations of organoids (mainly those related to in vitro neuronal immaturity), they have been pointed out as tools to investigate the early stages of diseases and their most common processes. For example, Raja et al. (2016) generated organoids from cells of AD patients, and the models presented the two biomarkers of the disease (A β deposition and tau protein hyperphosphorylation). These results were encouraging because 2D culture models were unable to mimic the extracellular environment and its necessary complexity to observe these biomarkers (Wang, 2018). In addition, a significant reduction of these biomarkers in organoids was demonstrated after treatment with β and γ secretase inhibitors (Raja et al., 2016).

Another group of researchers succeeded in developing organoids that showed progressive accumulation of A β , forming structures similar to plaques, preceding the appearance of phosphorylated Tau and neurofibrillary tangles (Gonzalez et al., 2018). Recently, aiming to confirm the hypothesis that anterior brain organoids formed by iPSCs from AD patients can accurately recapitulate the extracellular microenvironment present during neural degeneration, Yan et al. (2018b) generated prosencephalic cortical organoids with iPSCs with a mutation in the PSEN1 gene (responsible for the expression of presenilin-1, which plays an important role in A β generation). In the organoids, high levels of A β concentration, inflammatory phenotypes related to AD (elevated gene expression of IL-6 and TNF- α), increased expression of matrix remodeling protein (resulting in synaptic dysfunction and loss of neurons during pathology) were found. Treatment and responses to DAPT (a γ -secretase inhibitor), heparin, and heparinase were also evaluated. The results of drug treatment were encouraging, as they showed that treatment with DAPT inhibited endogenous A β aggregation, leading to a decrease in cytotoxicity, while heparin and heparinase III were able to reduce A β concentrations, probably by hindering the binding of A β peptides to neurons (Yan et al., 2018).

Examples of the use of organoids combined with genome editing by CRISPR/Cas9 can also be mentioned. Organoids with mutations in the APOE gene generated by genetic editing showed an increase in biomarkers for AD. Subsequently, the pathology was attenuated by further editing, converting APOE4 into APOE3 (Lin et al., 2018). As cerebral organoids can be exposed to drugs, there is hope that these models will be a promising platform for the discovery of drugs for the treatment of neurodegenerative diseases.

Despite the above, it is not yet clear how effective organoids can be for modeling neurodegenerative diseases. As we will see later, new techniques and improvements in the models promise to elevate cerebral organoids to a level of protagonist for modeling even late-onset diseases such as dementias, PD, and HD (Wang, 2018). The use of cells derived from PD patients is promising, as studies using specific mesencephalic type organoids derived from iPSCs to investigate the pathophysiology and genetic basis of the disease (Kim et al., 2019; Smits et al., 2019).

MODELING OF PRENATAL AND PERINATAL EXPOSURE TO DRUGS

Another applicability of cerebral organoids that may or may not be associated with the investigation of NDs is the prenatal exposure to drugs or substances, whether legal or illegal, to understand how and to what extent these substances can impact neurogenesis. Studies have exposed organoids to different types of substances (such as cocaine, ethanol,

nicotine, for example) to analyze the consequences of this interaction (Lee et al., 2016; Zhu et al., 2017; Wang et al., 2018). Another approach for organoids besides exposure to drugs of abuse is the investigation of neurotoxic effects of various substances such as valproic acid or other environmental chemicals as promoters of neural teratogenic effects (Schwartz et al., 2015; Belair et al., 2018). Regarding cocaine, Lee and colleagues (2016) demonstrated the inhibition of neocortical NPCs proliferation, premature neuronal differentiation, and consequently, disruption of neural tissue development after exposing neocortical organoids to the substance. The suggestion is that these effects are mediated by the production of reactive oxygen species, which could be a future therapeutic target.

MODELING OF BRAIN CANCER

The nature of the carcinogenic processes makes them difficult to cure, and an effective treatment could be based on a model system that incorporates the patient's genetic characteristics and reflects the complex 3D environment of tumor tissues. Cerebral organoids could represent this system in the investigation of the progressive nature of cancer as well as its resistances, serving as a good model for drug testing. Organoids derived from patients can bring more personalized approaches. Among several examples, glioblastoma (the most common and aggressive type of malignant brain tumor that affects humans) has been the most studied. This type of model, called brain tumor organoids or simply tumor organoids, was produced from patient tumor cells (obtained directly from neural tissue with this type of tumor) and grafted into previously prepared brain organoids from human embryonic stem cells (hESCs). The 3D model obtained is considered superior to the 2D environment (more commonly used) as it better mimics the microenvironment and progression of cancer, as well as presenting resistance to chemotherapeutic treatments similar to the live tumor in patients (Linkous et al., 2019). Chemotherapeutic effects are another focus of study, and the effects of "anticancer" drugs can be tested on organoids (Plummer et al., 2019). Another method of generating tumor organoids is through the use of CRISPR/Cas9 (Bian et al., 2018).

FUSION OF ORGANOID: APPROACHES TO MODELING COMPLEX FEATURES

Taking into account the barriers to be overcome by organoid technology, mainly its limitations in reproducing some complex characteristics of the human brain such as neuronal migration and synaptic connectivity, the organoid fusion technique brings new horizons and approaches to the model. As we have seen, self-organization occurs intrinsically in some protocols for generating cerebral organoids, but in many cases, this

self-organization does not lead to a great cerebral complexity, mainly due to interrupted neuronal migration and inter-regional connection deficiency. Models that mimic specific regions of the brain have greater reproducibility (Birey et al., 2017). However, separately created regional models do not provide the opportunity to recapitulate processes such as connectivity between regions and those related to cell migration (Lodato & Arlotta, 2015). These deficits lead to a gap in the study of cortical circuits. The fusion of organoids from pre-specified brain regions was presented as a solution (Birey et al., 2017). A study, previously presented in this review, conducted by Birey and colleagues (2017) is a good example of organoid fusion to identify deficits in interneuronal migration (GABAergic, in this case) in NDs (Timothy syndrome, in this case). The technique used is based on co-culture that promotes subsequent fusion of organoids from distinct brain structures, in this case, between the anterior (excitatory) and ventral (inhibitory) brain. The fusion occurs simply: when incorporated into matrigel, the organoids are placed as close as possible, and the fusion process takes place in approximately one week (Bagley et al., 2017). Thus, this technique represents a viable method for modeling phenotypic defects of disorders, such as migratory routes and cortical circuit formations.

NEUROVASCULAR MODELS

The process of vascularization of cerebral organoids is the next step in research aiming to reproduce (or part of it) the human brain in vitro. As we have seen, since the models do not have blood vessels, their growth and longevity are quite limited. Until 2018, it was not clear whether the co-culture of organoids with endothelial cells could lead to the formation of vessels, and even if the presence of these vessels would have any implication in the development (self-assembly process) of the model (Pham et al., 2018). To answer this question, a protocol for the vascularization of cerebral organoids derived from iPSCs with endothelial cells from the same patient was developed. Vascularization was verified, showing to be viable, as it did not interfere with the normal development of the in vitro organoid (self-assembly and cytoarchitecture). The authors then transplanted the vascularized organoids generated in vitro into rodents, as well as non-vascularized control organoids. As a result, the vascularized organoids had a longer survival compared to the controls. In this sense, the authors presented the viability of vascularization, especially temporally (Pham et al., 2018).

We have seen in this review that in vitro models of the BBB are indispensable tools for studying the development and drug transport to the CNS. The production of BBB organoids developed to date, largely through co-culture in low-adhesion environments of

organoids and endothelial cells, shows that generated pericytes and astrocytes mimic the main properties of the barrier, such as the presence of tight and adherent junctions, P-glycoprotein (P-gp), and active molecule transport (Bergmann et al., 2018; Oliveira et al., 2019). Bergmann and colleagues (2018) succeeded in creating BBB organoids as a reliable model for in vitro drug screening.

Nzou et al. (2018) generated an organoid model equipped with a neurovascular unit, which better mimics that found in humans, containing neurovascular cells, such as human brain microvascular endothelial cells, human pericytes, and neural cells, such as human astrocytes, human microglia, human oligodendrocytes, and human neurons, in a ratio of 30%, 15%, 15%, 5%, 15%, and 20%, respectively. In this model, Nzou and colleagues first produced a cerebral organoid containing human astrocytes, human microglia, human oligodendrocytes, and human neurons. Human brain microvascular endothelial cells and human pericytes were then added to coat the neuro-glial organoid, thus generating an organoid model with endothelial cells surrounding the brain parenchymal cells. Once formed, the resulting organoid was evaluated for BBB permeability properties, such as the expression of tight and adherent junction proteins and transporter proteins. Additionally, assays were conducted to investigate BBB permeability to IgG in untreated organoids and in others pretreated with histamine (a known agent for transiently opening the BBB). As a result, the analysis showed that the barrier organoids were more selective to antibodies compared to the non-barrier organoids, while histamine-treated barrier organoids showed increased permeability compared to untreated barrier organoids. Another finding was related to protection against neurotoxic components such as mercury, where the barrier organoids exhibited less cellular depletion compared to the non-barrier organoids.

Cakir and colleagues (2019) developed a fully in vitro vascularized cortical organoid model, one of the most recent works on the subject. The team produced cortical organoids from induced hESCs expressing an ectopically variant of human ETS transcription factor (ETV2). The expression of this transcription factor played an important role in reprogramming human fibroblasts into endothelial cells. The authors further demonstrated that overexpression of ETV2 induced VEGF-independent differentiation. Following this gene expression, some markers of vasculogenesis were observed, such as genes related to cell adhesion. Thus, vascularization of the organoid was achieved, and the presence of vascular structures led to improved functional maturation and survival (reducing apoptosis levels) of the organoid cells. The model also exhibited BBB-like features, including increased expression of tight junctions, transporters, such as the glucose transporter, and the presence of pericytes.

Despite these advances, vascularized organoid models still do not possess a fully functional vascular network in terms of oxygen and nutrient supply (Oliveira et al., 2019). As mentioned earlier, the *in vivo* grafting of human brain organoids into animals, especially in mice, has been developed as an alternative to achieve vascularized organoids for *in vitro* experiments. This approach (performed between 30 and 50 days after organoid creation) leads to the progressive vascularization of the model through the invasion of the host vasculature, providing blood flow; cell viability is higher compared to *in vitro* organoids, as well as showing greater maturation, progressive differentiation of neuronal and glial cells (including registered microglial interactions), and axonal growth, suggesting functional graft-host integration (as recorded by optogenetics) (Mansour et al., 2018).

FUTURE PERSPECTIVES

Based on all that has been discussed above regarding the evolution of organoid technology, it is remarkable how rapidly it has evolved in recent years, providing us with a wide variety of *in vitro* 3D models of the human brain for various applications, showing that the technology is a great ally in medicine. There is still much to be done when aiming for *in vitro* human neurodevelopmental modeling. Brain organoids still lack some developmental clues and standardization that would allow for an *in vivo*-like organization not present *in vitro*, such as the lack of supporting tissue (Lancaster et al., 2013; Lancaster et al., 2014b; Kelava & Lancaster, 2016a).

Variations within the same batch ("batch effect") are one of the first challenges to be overcome for the reproducibility of organoid experiments. Since the cells typically used for organoid generation (iPSCs) have a certain degree of variability among themselves, a possible solution would be the use of selected lineages and standardized iPSC generation methods in organoid generation protocols, which would benefit the entire scientific community in future research (Kelava and Lancaster, 2016a). Still within this theme, bioengineering techniques, such as the development of scaffolds and extracellular matrices, may be useful in prolonging the viability and development of organoids, providing tools that introduce complexity to the models, influence tissue architecture, and maintain organoid self-organization (Yin et al., 2016).

Another important point is the enhancement of protocols aiming at amplifying the cellular diversity in organoids, crucial for studying the complex interactions that occur in the brain, such as neuron-glia interactions. As seen in this review, the presence of glial cells within the organoids is essential, as they are constituents of the nervous system and play important roles: astrocytes, oligodendrocytes, and microglia act in synaptogenesis, circuit

maturation, myelination, and homeostasis, besides being involved in stages of neurological diseases. Difficulties still exist in the spontaneous generation of these glial cells, but the research conducted by Ormel et al. (2018), where microglia were generated within organoids, symbolizes the window of opportunity for advancement in this area. An alternative to modifying organoid generation protocols is the addition of previously differentiated glial cells from iPSCs to the model (Muffat et al., 2016).

However, we must remember that there are pros and cons regarding the degree of structural complexity of brain organoids, as the high degree of cell diversity, which on one hand can reproduce with some fidelity the complex networks of intercellular communication, can also add analytical difficulties when the research objective is to test hypotheses related to the contribution of specific cell types to specific intercellular processes. Supplementing results observed from a 3D model, combined with results obtained through 2D culture (which has a more homogeneous structure and environment) of specific cells related to specific processes will facilitate the initial understanding of the mechanisms associated with neurological disorders, allowing for the comparison of data regarding cellular interaction and intrinsic molecular mechanisms.

When combined with other approaches in cellular and molecular biology, such as whole-genome analysis using single-cell sequencing, organoid generation techniques can open doors for us to investigate the widespread cellular diversity in various stages of CNS development, including its later stages or even during aging, as well as to investigate the etiology of neurological diseases from their molecular mechanisms (Camp et al., 2015; Quadrato et al., 2017). The genetics related to the etiology of neurological diseases is quite heterogeneous, for this reason, techniques that define more efficiently the different impacts of genetic variants on neurodevelopment are indispensable. Current genetic editing technology is an ally since it has the ability to modify a variety of genes with some safety, allowing for gene silencing and induction of others, mainly in iPSCs (Ilieva et al., 2017). New genetic engineering techniques, such as the CRISPR/Cas9 system, have provided us with genome manipulation and expanded horizons in in vitro research (Waddington et al., 2016). These techniques have enabled mutations to be induced or corrected in wild-type or patient-derived cells (Trujillo & Muotri, 2018b; Adams et al., 2019), and organoids, in turn, have shown adaptability to these techniques (Yin et al., 2016). The process of human brain development can also be influenced by epigenetic mechanisms: a perspective not addressed in this review. In this sense, organoids can be used as a model for evaluating the epigenomic remodeling that occurs during in vivo neurodevelopment (Luo et al., 2016).



As we have seen in the previous sections, in addition to the supply of oxygen and other nutrients, vascularization is intimately related to brain maturation due to its role in the cellular differentiation of NPCs. Modifications in the methods of organoid production and culture using bioengineering approaches are essential tools in this regard. The examples mentioned above demonstrate that the combination of endothelial cells in the organoid culture to promote *in vivo* vascularization has been a significant advancement in protocols for generating brain organoids. Research on vascular phenotypes in neurodevelopmental and neurodegenerative disorders also represents an indispensable area for future studies, as cerebral vasculature is involved in multiple pathogenic processes that compromise cognition during these pathologies. Furthermore, by analyzing the techniques of organoid implantation in animal tissue, it is possible to investigate vascularization processes for tissue repair understanding, improvement of transplant techniques, understanding of carcinogenic mechanisms, among others. Future review research should focus on these topics and integrate the available data in the literature for better discussion.

Due to the fact that brain organoids maintain the main characteristics of a developing brain with genetic information identical to that of patients (Sachs et al., 2018; Yan et al., 2018), two other fields of great interest are personalized medicine and pharmacology. These fields can benefit from the production of personalized organoids, i.e., models derived from patients, which aim to faithfully reproduce an individual's cellular and molecular mechanisms associated with physiological processes, pathogenesis, and therapeutic responses. Such an approach is essential for investigating future prognostic methods as well as personalized treatments.

In general, future bioengineering approaches are still needed to favor more advanced methods for generating brain organoids. Due to the enormous potential of this technology, biobanks consisting of a collection of model organoids representing different CNS-related pathologies would greatly facilitate research and, consequently, a better understanding of brain disorders, as well as serving as a basis for therapeutic approaches, as mentioned earlier. We can draw a comparison with biobanks of tumor organoid types, which, with their established collections, demonstrate the benefits of implementing organoid biobanks; among these benefits, the development of therapeutic tests for precision therapies stands out. If we compare the difficulty of obtaining neural tissue as opposed to tumor tissue, brain organoid biobanks would prove to be a valuable resource (Sachs et al., 2018; Yan et al., 2018).

The recognized capacity for self-organization, differentiation, and generation of brain regions and structures with a certain degree of complexity makes organoids ideal *in vitro*



models and, to some extent, necessary for the study of CNS development. They have shown great promise for the field of modeling neurodevelopmental disorders. Once technical and ethical hurdles are overcome, future organoids will serve as reliable models because they possess a microenvironment and cellular diversity closer to what is observed in vivo, strongly impacting disease modeling and drug screening tests. In this review, we have provided a brief history of the technology and why it is revolutionizing the way we study the human brain. It is important to remember that it is still not a perfect model, as we still face some limitations and undoubtedly others will emerge in the future.

REFERENCES

1. Abbott, N. J., Rönnebeck, L., & Hansson, E. (2006). Astrocyte-endothelial interactions at the blood-brain barrier. *Nature Reviews Neuroscience*, 7*(1), 41–53. <http://dx.doi.org/10.1038/nrn1824>
2. Adams, J. W., Cugola, F. R., & Muotri, A. R. (2019). Brain organoids as tools for modeling human neurodevelopmental disorders. *Physiology*, 34*(5), 365-375.
3. Agostinho, P., Cunha, R. A., & Oliveira, C. (2010). Neuroinflammation, oxidative stress and the pathogenesis of Alzheimer's disease. *Current Pharmaceutical Design*, 16*(25), 2766–2778. <http://dx.doi.org/10.2174/138161210793176572>
4. Allende, M. L., Cook, E. K., Larman, B. C., Nugent, A., Brady, J. M., Golebiowski, D., Sena-Esteves, M., Tiff, C. J., & Proia, R. L. (2018). Cerebral organoids derived from Sandhoff disease-induced pluripotent stem cells exhibit impaired neurodifferentiation. *Journal of Lipid Research*, 59*(3), 550–563. <https://doi.org/10.1194/jlr.M081323>
5. Alstadhaug, K. B. (2014). Histamine in migraine and brain. *Headache*, 54*, 246–259.
6. Auger, F. A., Gibot, L., & Lacroix, D. (2013). The pivotal role of vascularization in tissue engineering. *Annual Review of Biomedical Engineering*, 15*, 177–200. <https://doi.org/10.1146/annurevbioeng-071812-152428>
7. Bagley, J. A., Reumann, D., Bian, S., Lévi-Strauss, J., & Knoblich, J. A. (2017). Fused cerebral organoids model interactions between brain regions. *Nature Methods*, 14*(7), 743–751. <https://doi.org/10.1038/nmeth.4304>
8. Barbierato, M., Facci, L., Argentini, C., Marinelli, C., Skaper, S. D., & Giusti, P. (2013). Astrocyte-microglia cooperation in the expression of a pro-inflammatory phenotype. *CNS Neurological Disorders – Drug Targets*, 12*(5), 608–618.
9. Belair, D. G., Wood, C., Wolf, C. J., Abbott, B. D., Becker, C., & Moorefield, S. D. (2018). A three-dimensional organoid culture model to assess the influence of chemicals on morphogenetic fusion. *Toxicological Sciences*, 166*, 394–408. <https://doi.org/10.1093/toxsci/kfy207>
10. Bell, R. D., Winkler, E. A., Singh, I., et al. (2012). Apolipoprotein E controls cerebrovascular integrity via cyclophilin A. *Nature*, 485*, 512–516.
11. Bennett, R. E., Robbins, A. B., Hu, M., Cao, X., Betensky, R. A., Clark, T., et al. (2018). Tau induces blood vessel abnormalities and angiogenesis-related gene expression in P301L transgenic mice and human Alzheimer's disease. *Proceedings of the National Academy of Sciences USA*, 115*(6), E1289–E1298.
12. Benzing, W. C., Wujek, J. R., Ward, E. K., Shaffer, D., Ashe, K. H., Younkin, S. G., & Brunden, K. R. (1999). Evidence for glial-mediated inflammation in aged APP(SW) transgenic mice. *Neurobiology of Aging*, 20*(6), 581–589. [http://dx.doi.org/10.1016/S0197-4580\(99\)00065-2](http://dx.doi.org/10.1016/S0197-4580(99)00065-2)
13. Bergmann, S., Lawler, S. E., Qu, Y., et al. (2018). Blood–brain-barrier organoids for investigating the permeability of CNS therapeutics. *Nature Protocols*, 13*, 2827–2843. <https://doi.org/10.1038/s41596-018-0066-x>

14. Bernier, R., Golzio, C., Xiong, B., Stressman, H. A., Coe, B. P., Osnat, P., Kali, W., Jennifer, G., Carl, B., Anneke, T. V., et al. (2014). Disruptive CHD8 mutations define a subtype of autism early in development. **Cell**. Available at: <http://www.sciencedaily.com/releases/2014/07/140703125851.htm>
15. Bershteyn, M., et al. (2017). Human iPSC-derived cerebral organoids model cellular features of lissencephaly and reveal prolonged mitosis of outer radial glia. **Cell Stem Cell, 20*(4), 435–449.e4.*
16. Bhat, S., Acharya, U. R., Adeli, H., Bairy, G. M., & Adeli, A. (2014). Autism: Cause factors, early diagnosis, and therapies. **Reviews in the Neurosciences, 25*(6), 841-850.*
17. Bian, S., Repic, M., Guo, Z., Kavirayani, A., Burkard, T., Bagley, J. A., Krauditsch, C., & Knoblich, J. A. (2018). Genetically engineered cerebral organoids model brain tumor formation. **Nature Methods, 15**, 631-639.
18. Birey, F., et al. (2017). Assembly of functionally integrated human forebrain spheroids. **Nature, 545**, 54–59.
19. Blazejewski, S. M., Bennison, S. A., Smith, T. H., & Toyo-Oka, K. (2018). Neurodevelopmental genetic diseases associated with microdeletions and microduplications of chromosome 17p13.3. **Frontiers in Genetics, 9**, 80. <https://doi.org/10.3389/fgene.2018.00080>
20. Blumberg, H. P., Wang, F., Chepenik, L. G., Kalmar, J. H., Edmiston, E., et al. (2008). Influence of vascular endothelial growth factor variation on human hippocampus morphology. **Biological Psychiatry, 64**, 901–903.
21. Braak, H., & Braak, E. (1991). Neuropathological staging of Alzheimer-related changes. **Acta Neuropathologica, 82*(4), 239–259.* <https://doi.org/10.1007/bf00308809>
22. Brammer, M. (2009). The role of neuroimaging in diagnosis and personalized medicine—current position and likely future directions. **Dialogues in Clinical Neuroscience, 11**, 389–396.
23. Bras, J., et al. (2014). Genetic analysis implicates APOE, SNCA and suggests lysosomal dysfunction in the etiology of dementia with Lewy bodies. **Human Molecular Genetics, 23**, 6139–6146.
24. Brennand, K. J., et al. (2011). Modelling schizophrenia using human induced pluripotent stem cells. **Nature, 473**, 221–225.
25. Buée, L., Hof, P. R., Bouras, C., Delacourte, A., Perl, D. P., Morrison, J. H., et al. (1994). Pathological alterations of the cerebral microvasculature in Alzheimer's disease and related dementing disorders. **Acta Neuropathologica, 87*(5), 469–480.*
26. Burrioni, L., Orsi, A., Monti, L., Hayek, Y., Rocchi, R., & Vattimo, A. G. (2008). Regional cerebral blood flow in childhood autism: A SPET study with SPM evaluation. **Nuclear Medicine Communications, 29**, 150–156.
27. Butler, M. G., Dasouki, M. J., Zhou, X. P., Talebizadeh, Z., Brown, M., Takahashi, T. N., Miles, J. H., Wang, C. H., Stratton, R., Pilarski, R., & Eng, C. (2005). Subset of

individuals with autism spectrum disorders and extreme macrocephaly associated with germline PTEN tumor suppressor gene mutations. **Journal of Medical Genetics, 42**, 318–321. <https://doi.org/10.1136/jmg.2004.024646>

28. Cabezas-Opazo, F. A., Vergara-Pulgar, K., Pérez, M. J., Jara, C., Osorio-Fuentealba, C., & Quintanilla, R. A. (2015). Mitochondrial dysfunction contributes to the pathogenesis of Alzheimer's Disease. **Oxidative Medicine and Cellular Longevity, 2015**, 509654.
29. Cahoy, J. D., Emery, B., Kaushal, A., Foo, L. C., Zamanian, J. L., Christopherson, K. S., et al. (2008). A transcriptome database for astrocytes, neurons, and oligodendrocytes: A new resource for understanding brain development and function. **Journal of Neuroscience, 28**, 264–278. <https://doi.org/10.1523/JNEUROSCI.4178-07.2008>
30. Cakir, B., Xiang, Y., Tanaka, Y., et al. (2019). Engineering of human brain organoids with a functional vascular-like system. **Nature Methods, 16**, 1169–1175. <https://doi.org/10.1038/s41592-019-0586-5>
31. Camp, J. G., Badsha, F., Florio, M., Kanton, S., Gerber, T., Wilsch-Bräuninger, M., Lewitus, E., Sykes, A., Hevers, W., Lancaster, M., et al. (2015). Human cerebral organoids recapitulate gene expression programs of fetal neocortex development. **Proceedings of the National Academy of Sciences U.S.A., 112**, 15672-15677.
32. Chailangkarn, T., Trujillo, C. A., Freitas, B. C., Hrvoj-Mihic, B., Herai, R. H., Yu, D. X., Brown, T. T., Marchetto, M. C., Bardy, C., McHenry, L., et al. (2016). A human neurodevelopmental model for Williams syndrome. **Nature, 536**, 338-343.
33. Chambers, S. M., Fasano, C. A., Papapetrou, E. P., Tomishima, M., Sadelain, M., & Studer, L. (2009). Highly efficient neural conversion of human ES and iPS cells by dual inhibition of SMAD signaling. **Nature Biotechnology, 27**, 275–280.
34. Chang, D., et al. (2017). A meta-analysis of genome-wide association studies identifies 17 new Parkinson's disease risk loci. **Nature Genetics, 49**, 1511–1516.
35. Chauhan, A., Chauhan, V., Brown, W. T., & Cohen, I. (2004). Oxidative stress in autism: Increased antioxidant proteins. **Life Sciences, 75*(a)*, 2539-2549.
36. Chen, S. W., Zhong, X. S., Jiang, L. N., et al. (2016). Maternal autoimmune diseases and the risk of autism spectrum disorders in offspring: A systematic review and meta-analysis. **Behavioral Brain Research, 296**, 61–69.
37. Chez, M. G., Dowling, T., Patel, P. B., Khanna, P., & Kominsky, M. (2007). Elevation of tumor necrosis factor-alpha in cerebrospinal fluid of autistic children. **Pediatric Neurology, 36**, 361–365.
38. Ching, M. S., Shen, Y., Tan, W. H., Jeste, S. S., Morrow, E. M., Chen, X., et al. (2010). Deletions of NRXN1 (neurexin-1) predispose to a wide spectrum of developmental disorders. **American Journal of Medical Genetics, 153B**, 937–947.
39. Cho, H., et al. (2015). Three-dimensional blood-brain barrier model for in vitro studies of neurovascular pathology. **Scientific Reports, 5**.

40. Cho, S. H., et al. (2015). SIRT1 deficiency in microglia contributes to cognitive decline in aging and neurodegeneration via epigenetic regulation of IL-1 β . **Journal of Neuroscience*, 35*, 807–818.
41. Chung, W., Choi, S. Y., Lee, E., Park, H., Kang, J., Choi, Y., et al. (2015). Social deficits in IRSp53 mutant mice improved by NMDAR and mGluR5 suppression. **Nature Neuroscience*, 18*, 435–443. <https://doi.org/10.1038/nn.3927>
42. Clarke, L. E., & Barres, B. A. (2013). Emerging roles of astrocytes in neural circuit development. **Nature Reviews Neuroscience*, 14*, 311–321. <https://doi.org/10.1038/nrn3484>
43. Cribbs, D. H., et al. (2012). Extensive innate immune gene activation accompanies brain aging, increasing vulnerability to cognitive decline and neurodegeneration: A microarray study. **Journal of Neuroinflammation*, 9*, 179.
44. Crotti, A., et al. (2014). Mutant Huntingtin promotes autonomous microglia activation via myeloid lineage-determining factors. **Nature Neuroscience*, 17*, 513–521.
45. Cruz, D. (2012). 2D and 3D QSAR studies for aminoimidazoles, aminohidantoinis and aminopyridines derivatives with inhibitory activity about human beta-secretase enzyme. Dissertation, State University of Feira de Santana: Bahia.
46. Cugola, F. R., et al. (2016). The Brazilian Zika virus strain causes birth defects in experimental models. **Nature*, 534*, 267–271.
47. Cunningham, C., Wilcockson, D. C., Champion, S., Lunnon, K., & Perry, V. H. (2005). Central and systemic endotoxin challenges exacerbate the local inflammatory response and increase neuronal death during chronic neurodegeneration. **Journal of Neuroscience*, 25*(40), 9275–9284. <http://dx.doi.org/10.1523/JNEUROSCI.2614-05.2005>
48. Dammann, O., & Leviton, A. (2004). Inflammatory brain damage in preterm newborns - dry numbers, wet lab, and causal inferences. **Early Human Development*, 79*, 1–15. <https://doi.org/10.1016/j.earlhumdev.2004.04.009>
49. Dawson, G. (2008). Early behavioral intervention, brain plasticity, and the prevention of autism spectrum disorder. **Development and Psychopathology*, 20*, 775–803.
50. Dawson, T. M., Golde, T. E., & Lagier-Tourenne, C. (2018). Animal models of neurodegenerative diseases. **Nature Neuroscience**. <https://doi.org/10.1038/s41593-018-0236-8>
51. De Falco, A., Cukierman, D. S., Hauser-Davis, R. A., & Rey, N. A. (2016). Alzheimer's disease: Etiological hypotheses and treatment perspectives. **Química Nova*, 39*, 63–80.
52. de la Torre-Ubieta, L., Won, H., Stein, J. L., & Geschwind, D. H. (2016). Advancing the understanding of autism disease mechanisms through genetics. **Nature Medicine*, 22*, 345–361.

53. DeFelipe, J., Alonso-Nanclares, L., & Arellano, J. I. (2002). Microstructure of the neocortex: Comparative aspects. **Journal of Neurocytology*, 31*, 299–316. <https://doi.org/10.1023/A:1024130211265>
54. DeJesus-Hernandez, M., et al. (2011). Expanded GGGGCC hexanucleotide repeat in noncoding region of C9ORF72 causes chromosome 9p-linked FTD and ALS. **Neuron*, 72*, 245–256.
55. Demaegd, K., Schymkowitz, J., & Rousseau, F. (2018). Transcellular spreading of tau in tauopathies. **ChemBioChem*, 19*(23), 2424-2432. <https://doi.org/10.1002/cbic.201800288>
56. den Abeelen, A. S. S. M., Lagro, J., van Beek, A. H. E. A., & Claassen, J. A. H. R. (2014). Impaired cerebral autoregulation and vasomotor reactivity in sporadic Alzheimer's disease. **Current Alzheimer Research*, 11*, 11–17.
57. Detoraki, A., Staiano, R. I., Granata, F., Giannattasio, G., Prevete, N., de Paulis, A., Ribatti, D., Genovese, A., Triggiani, M., & Marone, G. (2009). Vascular endothelial growth factors synthesized by human lung mast cells exert angiogenic effects. **Journal of Allergy and Clinical Immunology*, 123*(5), 1142-1149.e1-5. <https://doi.org/10.1016/j.jaci.2009.01.044>
58. DeTure, M. A., & Dickson, D. W. (2019). The neuropathological diagnosis of Alzheimer's disease. **Molecular Neurodegeneration*, 14*(1), 32. <https://doi.org/10.1186/s13024-019-0333-5>
59. Dezone, R. S., Sartore, R. C., Nascimento, J. M., Saia-Cereda, V. M., Romão, L. F., Alves-Leon, S. V., et al. (2017). Derivation of functional human astrocytes from cerebral organoids. **Scientific Reports*, 7*, 45091. <https://doi.org/10.1038/srep45091>
60. DiLullo, E., & Kriegstein, A. R. (2017). The use of brain organoids to investigate neural development and disease. **Nature Reviews Neuroscience*, 18*, 573–584. <https://doi.org/10.1038/nrn.2017.107>
61. dos Santos, P., Leide, C., Ozela, P. F., de Fátima de Brito Brito, M., Pinheiro, A. A., Padilha, E. C., ... & da Silva, H. M. (2018). Alzheimer's disease: A review from the pathophysiology to diagnosis, new perspectives for pharmacological treatment. **Current Medicinal Chemistry*, 25*(26), 3141-3159.
62. Duffy, A. M., Bouchier-Hayes, D. J., & Harmey, J. H. (2013). Vascular endothelial growth factor (VEGF) and its role in non-endothelial cells: Autocrine signaling by VEGF. In *Madame Curie Bioscience Database* [Internet]. Austin (TX): Landes Bioscience; 2000-2013. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK6482/>
63. Duncan, G. S., Andrew, D. P., Takimoto, H., Kaufman, S. A., Yoshida, H., Spellberg, J., de la Pompa, J. L., Elia, A., Wakeham, A., Karan-Tamir, B., Muller, W. A., Senaldi, G., Zukowski, M. M., & Mak, T. W. (1999). Genetic evidence for functional redundancy of Platelet/Endothelial cell adhesion molecule-1 (PECAM-1): CD31-deficient mice reveal PECAM-1-dependent and PECAM-1-independent functions. **Journal of Immunology*, 162*, 3022–3030.

64. Edmonson, C., Ziats, M. N., & Rennert, O. M. (2014). Altered glial marker expression in autistic post-mortem prefrontal cortex and cerebellum. **Molecular Autism, 5**, 9. <https://doi.org/10.1186/2040-2392-5-3>
65. Eiraku, M., Takata, N., Ishibashi, H., Kawada, M., Sakakura, E., Okuda, S., Sekiguchi, K., Adachi, T., & Sasai, Y. (2011). Self-organizing optic-cup morphogenesis in three-dimensional culture. **Nature, 472**, 51-56.
66. Eiraku, M., Watanabe, K., Matsuo-Takasaki, M., Kawada, M., Yonemura, S., Matsumura, M., Wataya, T., Nishiyama, A., Muguruma, K., & Sasai, Y. (2008). Self-organized formation of polarized cortical tissues from ESCs and its active manipulation by extrinsic signals. **Cell Stem Cell, 3**, 519-532.
67. Elston, G. N., Benavides-Piccione, R., & DeFelipe, J. (2001). The pyramidal cell in cognition: A comparative study in human and monkey. **Journal of Neuroscience, 21**, Rc163. <https://doi.org/10.1523/JNEUROSCI.21-17-j0002.2001>
68. Emanuele, E., Orsi, P., Barale, F., di Nemi, S. U., Bertona, M., & Politi, P. (2010). Serum levels of vascular endothelial growth factor and its receptors in patients with severe autism. **Clinical Biochemistry, 43**(3), 317–319. <https://doi.org/10.1016/j.clinbiochem.2009.10.005>
69. Estes, M. L., & McAllister, A. K. (2015). Immune mediators in the brain and peripheral tissues in autism spectrum disorder. **Nature Reviews Neuroscience, 16**(8), 469–486. <https://doi.org/10.1038/nrn3978>
70. Exalto, L. G., Biessels, G. J., Karter, A. J., et al. (2013). Risk score for prediction of 10-year dementia risk in individuals with type 2 diabetes: A cohort study. **Lancet Diabetes & Endocrinology, 1**, 183–190.
71. Eyal, G., Verhoog, M. B., Testa-Silva, G., Deitcher, Y., Lodder, J. C., Benavides-Piccione, R., et al. (2016). Unique membrane properties and enhanced signal processing in human neocortical neurons. **eLife, 5**, e16553. <https://doi.org/10.7554/eLife.16553>
72. Fakhoury, M. (2018). Microglia and astrocytes in Alzheimer's disease: Implications for therapy. **Current Neuropharmacology, 16**(5), 508-518. <https://doi.org/10.2174/1570159X15666170720095240>
73. Falco, M. (2014). Autism rates now in 1 in 68 U.S. children: CDC. Available at: <http://www.cnn.com/2014/03/27/health/cdcautism/index.html?iref=allsearch>. Accessed April 3, 2014.
74. Farrall, A. J., & Wardlaw, J. M. (2009). Blood-brain barrier: Ageing and microvascular disease—systematic review and meta-analysis. **Neurobiology of Aging, 30**(3), 337–352.
75. Fett-Conte, A. C., Bossolani-Martins, A. L., & Rosan, D. R. A. Etiology of autism: The complexity of risk factors in autism spectrum disorder. Available at: www.intechopen.com/books/autism-spectrum-disorder-recent-advances. Accessed April 2, 2016.
76. Fietz, S. A., et al. (2010). OSVZ progenitors of human and ferret neocortex are epithelial-like and expand by integrin signaling. **Nature Neuroscience, 13**, 690–699.

77. Forestier, A., Douki, T., De Rosa, V., Béal, D., & Rachidi, W. (2015). Combination of A β secretion and oxidative stress in an Alzheimer-like cell line leads to the over-expression of the nucleotide excision repair proteins DDB2 and XPC. **International Journal of Molecular Sciences*, 16*(8), 17422-17444.
78. Galli, S. J., et al. (2008). Immunomodulatory mast cells: Negative, as well as positive, regulators of immunity. **Nature Reviews Immunology*, 8*, 478–486.
79. Gan, L., Cookson, M. R., Petrucelli, L., et al. (2018). Converging pathways in neurodegeneration, from genetics to mechanisms. **Nature Neuroscience*, 21*, 1300–1309. <https://doi.org/10.1038/s41593-018-0237-7>
80. Garber, K. (2007). Neuroscience: Autism's cause may reside in abnormalities at the synapse. **Science*, 317*, 190-191.
81. Garcez, P. P., et al. (2016). Zika virus impairs growth in human neurospheres and brain organoids. **Science*, 352*, 816–818.
82. Gauthier, J., Siddiqui, T. J., Huashan, P., Yokomaku, D., Hamdan, F. F., Champagne, N., et al. (2011). Truncating mutations in NRXN2 and NRXN1 in autism spectrum disorders and schizophrenia. **Human Genetics*, 130*, 563–573.
83. Giandomenico, S. L., & Lancaster, M. A. (2017). Probing human brain evolution and development in organoids. **Current Opinion in Cell Biology*, 44*, 36–43. <https://doi.org/10.1016/j.ceb.2017.01.001>
84. Gonsette, R. E. (2008). Neurodegeneration in multiple sclerosis: The role of oxidative stress and excitotoxicity. **Journal of Neurological Sciences*, 274*(1-2), 48-53. <https://doi.org/10.1016/j.jns.2008.06.029>
85. Gonzalez, C., Armijo, E., Bravo-Alegria, J., Becerra-Calixto, A., Mays, C. E., & Soto, C. (2018). Modeling amyloid beta and tau pathology in human cerebral organoids. **Molecular Psychiatry**. <https://doi.org/10.1038/s41380-018-0229-8>
86. Gottesman, R. F., Schneider, A. L., Albert, M., et al. (2014). Midlife hypertension and 20-year cognitive change: The Atherosclerosis Risk in Communities Neurocognitive Study. **JAMA Neurology*, 71*, 1218–1227.
87. Grabrucker, A. M. (2013). Environmental factors in autism. **Frontiers in Psychiatry*, 2012*, 118.
88. Grammas, P., & Ovase, R. (2001). Inflammatory factors are elevated in brain microvessels in Alzheimer's disease. **Neurobiology of Aging*, 22*(6), 837–842.
89. Grebenyuk, S., & Ranga, A. (2019). Engineering organoid vascularization. **Frontiers in Bioengineering and Biotechnology*, 7*, 39.
90. Guerreiro, R., et al. (2018). Investigating the genetic architecture of dementia with Lewy bodies: A two-stage genome-wide association study. **Lancet Neurology*, 17*, 64–74.
91. Guerreiro, R., et al. (2013). TREM2 variants in Alzheimer's disease. **New England Journal of Medicine*, 368*, 117–127.

92. Gupta, S., Aggarwal, S., Rathanravan, B., & Lee, T. (1998). Th1- and Th2-like cytokines in CD4(+) and CD8(+) T cells in autism. **Journal of Neuroimmunology, 85**, 106–109. [https://doi.org/10.1016/S0165-5728\(98\)00021-6](https://doi.org/10.1016/S0165-5728(98)00021-6)
93. Hanamsagar, R., & Bilbo, S. D. (2017). Environment matters: Microglia function and dysfunction in a changing world. **Current Opinion in Neurobiology, 47**, 146-155. <https://doi.org/10.1016/j.conb.2017.10.007>
94. Hardy, J., & Orr, H. (2006). The genetics of neurodegenerative diseases. **Journal of Neurochemistry, 97**, 1690–1699.
95. Hardy, J. A., & Higgins, G. A. (1992). Alzheimer's disease: The amyloid cascade hypothesis. **Science, 256*(5054)*, 184-185. <http://dx.doi.org/10.1126/science.1566067>
96. Hattori, N. (2013). Cerebral organoids model human brain development and microcephaly. **Movement Disorders, 29*(2)*, 185. <https://doi.org/10.1002/mds.25740>
97. He, Q., Duan, Y., Karsch, K., & Miles, J. (2010). Detecting corpus callosum abnormalities in autism based on anatomical landmarks. **Psychiatry Research, 183**, 126–132.
98. Helms, H. C., et al. (2016). In vitro models of the blood–brain barrier: An overview of commonly used brain endothelial cell culture models and guidelines for their use. **Journal of Cerebral Blood Flow & Metabolism, 36**, 862–890.
99. Herculano-Houzel, S. (2009). The human brain in numbers: A linearly scaled-up primate brain. **Frontiers in Human Neuroscience, 3**, 31. <https://doi.org/10.3389/neuro.09.031.2009>
100. Heyer, D. B., & Meredith, R. M. (2017). Environmental toxicology: Sensitive periods of development and neurodevelopmental disorders. **NeuroToxicology, 58**, 23–41. <https://doi.org/10.1016/j.neuro.2016.10.017>
101. Heymann, D. L., Hodgson, A., Sall, A. A., Freedman, D. O., Staples, J. E., Althabe, F., Baruah, K., Mahmud, G., Kandun, N., Vasconcelos, P. F., et al. (2016). Zika virus and microcephaly: Why is this situation a PHEIC? **Lancet, 387**.
102. Hirsch, S., Reichold, J., Schneider, M., Székely, G., & Weber, B. (2012). Topology and hemodynamics of the cortical cerebrovascular system. **Journal of Cerebral Blood Flow & Metabolism, 32*(6)*, 952–967.
103. Hockemeyer, D., & Jaenisch, R. (2016). Induced pluripotent stem cells meet genome editing. **Cell Stem Cell, 18**, 573-586.
104. Höglinger, G. U., et al. (2011). Identification of common variants influencing risk of the tauopathy progressive supranuclear palsy. **Nature Genetics, 43**, 699–705.
105. Huang, Y., & Mahley, R. W. (2014). Apolipoprotein E: Structure and function in lipid metabolism, neurobiology, and Alzheimer's diseases. **Neurobiology of Disease, 72*(Pt A)*, 3–12.
106. Iadecola, C. (2017). The neurovascular unit coming of age: A journey through neurovascular coupling in health and disease. **Neuron, 96**, 17–42.

107. Iefremova, V., Manikakis, G., Krefft, O., Jabali, A., Weynans, K., Wilkens, R., Marsoner, F., Brändl, B., Müller, F. J., Koch, P., & Ladewig, J. (2017). An organoid-based model of cortical development identifies noncell-autonomous defects in Wnt signaling contributing to Miller-Dieker syndrome. *Cell Reports*, 19*, 50–59. <https://doi.org/10.1016/j.celrep.2017.03.047>
108. Ilieva, M., Fex Svenningsen, Å., Thorsen, M., & Michel, T. M. (2018). Psychiatry in a dish: Stem cells and brain organoids modeling autism spectrum disorders. *Biological Psychiatry*, 83*(7), 558–568. <https://doi.org/10.1016/j.biopsych.2017.11.011>
109. Inouye, K., Pedrazzani, E. S., & Pavarini, S. C. I. (2010). Alzheimer's disease influence on the perception of quality of life from elderly people. *Revista da Escola de Enfermagem da USP*, 44*(4), 1093-1099.
110. Iossifov, I., Ronemus, M., Levy, D., Wang, Z., Hakker, I., Rosenbaum, J., Yamrom, B., Lee, Y. H., Narzisi, G., Leotta, A., et al. (2012). De novo gene disruptions in children on the autistic spectrum. *Neuron*, 74*, 285–299.
111. Ip, J. P. K., Mellios, N., & Sur, M. (2018). Rett syndrome: Insights into genetic, molecular, and circuit mechanisms. *Nature Reviews Neuroscience*, 19*, 368–382. <https://doi.org/10.1038/s41583-018-0006-3>
112. Iturria-Medina, Y., et al. (2016). Early role of vascular dysregulation on late-onset Alzheimer's disease based on multifactorial data-driven analysis. *Nature Communications*, 7*, 11934.
113. Jay, G. W., Demattos, R. B., Weinstein, E. J., Philbert, M. A., Pardo, I. D., & Brown, T. P. (2011). Animal models for neural diseases. *Toxicologic Pathology*, 39*(1), 167–169. <https://doi.org/10.1177/0192623310389478>
114. Jucker, M., & Walker, L. C. (2011). Pathogenic protein seeding in Alzheimer disease and other neurodegenerative disorders. *Annals of Neurology*, 70*(4), 532-540. <https://doi.org/10.1002/ana.22615>
115. Jucker, M., & Walker, L. (2013). Self-propagation of pathogenic protein aggregates in neurodegenerative diseases. *Nature*, 501*, 45–51. <https://doi.org/10.1038/nature12481>
116. Just, M. A., Keller, T. A., Malave, V. L., Kana, R. K., & Varma, S. (2012). Autism as a neural systems disorder: A theory of frontal-posterior underconnectivity. *Neuroscience & Biobehavioral Reviews*, 36*, 1292–1313.
117. Kalesnikoff, J., & Galli, S. J. (2008). New developments in mast cell biology. *Nature Immunology*, 9*, 1215–1223.
118. Kameno, Y., Iwata, K., Matsuzaki, H., Miyachi, T., Tsuchiya, K. J., Matsumoto, K., & Mori, N. (2013). Serum levels of soluble platelet endothelial cell adhesion molecule-1 and vascular cell adhesion molecule-1 are decreased in subjects with autism spectrum disorder. *Molecular Autism*, 4*(1), 19. <https://doi.org/10.1186/2040-2392-4-19>

119. Karayiorgou, M., Simon, T. J., & Gogos, J. A. (2010). 22q11.2 microdeletions: Linking DNA structural variation to brain dysfunction and schizophrenia. *Nature Reviews Neuroscience*, 11*, 402–416.
120. Karch, C. M., & Goate, A. M. (2015). Alzheimer's disease risk genes and mechanisms of disease pathogenesis. *Biological Psychiatry*, 77*, 43–51.
121. Karpowicz, R. J., Trojanowski, J. Q., & Lee, V. M. (2019). Transmission of α -synuclein seeds in neurodegenerative disease: Recent developments. *Laboratory Investigation*, 99*, 971–981. <https://doi.org/10.1038/s41374-019-0195-z>
122. Kelava, I., & Lancaster, M. A. (2016a). Dishing out mini-brains: Current progress and future prospects in brain organoid research. *Developmental Biology*, 420*, 199–209. <https://doi.org/10.1016/j.ydbio.2016.06.037>
123. Kelava, I., & Lancaster, M. A. (2016b). Stem cell models of human brain development. *Cell Stem Cell*, 18*, 736–748. <https://doi.org/10.1016/j.stem.2016.05.022>
124. Kern, J. K., et al. (2015). Shared brain connectivity issues, symptoms, and comorbidities in autism spectrum disorder, attention deficit/hyperactivity disorder, and Tourette syndrome. *Brain Connectivity*, 5*(6), 321–335.
125. Kim, H., Park, H. J., Choi, H., et al. (2019). Modeling G2019S-LRRK2 sporadic Parkinson's disease in 3D midbrain organoids. *Stem Cell Reports*, 12*(3), 518–531. <https://doi.org/10.1016/j.stemcr.2019.01.020>
126. Kim, K. C., Gonzales, E. L., Lazaro, M. T., et al. (2016). Clinical and neurobiological relevance of current animal models of autism spectrum disorders. *Biomolecules & Therapeutics*, 24*(3), 207–243.
127. Kim, J., Koo, B. K., & Yoon, K. J. (2019). Modeling host-virus interactions in viral infectious diseases using stem-cell-derived systems and CRISPR/Cas9 technology. *Viruses*, 11*, E124.
128. King, B. H., & Lord, C. (2011). Is schizophrenia on the autism spectrum? *Brain Research*, 1380*, 34–41.
129. Klohs, J. (2019). An integrated view on vascular dysfunction in Alzheimer's disease. *Neurodegenerative Diseases*, 19*, 109–127. <https://doi.org/10.1159/000505625>
130. Komssi, S., & Kähkönen, S. (2006). The novelty value of the combined use of electroencephalography and transcranial magnetic stimulation for neuroscience research. *Brain Research Reviews*, 52*, 183–192. <https://doi.org/10.1016/j.brainresrev.2006.01.008>
131. Koo, B., Choi, B., Park, H., & Yoon, K. J. (2019). Past, present, and future of brain organoid technology. *Molecules and Cells*, 42*(9), 617.
132. Krabbe, G., Halle, A., Matyash, V., Rinnenthal, J. L., Eom, G. D., Bernhardt, U., Miller, K. R., Prokop, S., Kettenmann, H., & Heppner, F. L. (2013). Functional impairment of microglia coincides with beta-amyloid deposition in mice with Alzheimer-like pathology. *PLoS ONE*, 8*(4), e60921. <https://doi.org/10.1371/journal.pone.0060921>

133. Krabbe, G., et al. (2017). Microglial NFκB-TNFα hyperactivation induces obsessive-compulsive behavior in mouse models of progranulin-deficient frontotemporal dementia. **Proceedings of the National Academy of Sciences USA, 114**, 5029–5034.
134. Kriegstein, A. R., & Noctor, S. C. (2004). Patterns of neuronal migration in the embryonic cortex. **Trends in Neurosciences, 27**, 392-399.
135. Kushner, D. (2011). The autism defense. **IEEE Spectrum, 48**, 33–37.
136. Lai, G., Pantazatos, S. P., Schneider, H., & Hirsch, J. (2012). Neural systems for speech and song in autism. **Brain, 135**, 961–975.
137. Lancaster, M. A., & Knoblich, J. A. (2014b). Generation of cerebral organoids from human pluripotent stem cells. **Nature Protocols, 9**, 2329–2340.
138. Lancaster, M. A., Renner, M., Martin, C. A., Wenzel, D., Bicknell, L. S., Hurles, M. E., Homfray, T., Penninger, J. M., Jackson, A. P., & Knoblich, J. A. (2013). Cerebral organoids model human brain development and microcephaly. **Nature, 501*(7467), 373–379*. <https://doi.org/10.1038/nature12517>
139. Lancaster, M. A., & Knoblich, J. A. (2014a). Organogenesis in a dish: Modeling development and disease using organoid technologies. **Science, 345**, 1247125.
140. Lau, P., Bossers, K., Janky, R., et al. (2013). Alteration of the microRNA network during the progression of Alzheimer’s disease. **EMBO Molecular Medicine, 5**, 1613–1634.
141. Lavazza, A., & Massimini, M. (2018). Cerebral organoids: Ethical issues and consciousness assessment. **Journal of Medical Ethics, 44**, 606–610. <https://doi.org/10.1136/medethics-2017-104555>
142. Lee, C. Y., & Landreth, G. E. (2010). The role of microglia in amyloid clearance from the AD brain. **Journal of Neural Transmission (Vienna), 117*(8), 949–960*. <https://doi.org/10.1007/s00702-010-0433-4>
143. Lee, S. J. (1999). Adhesion molecule expression and regulation on cells of the central nervous system. **Journal of Neuroimmunology, 98**, 77–88.
144. Lee, C.-T., Chen, J., Kindberg, A. A., Bendriem, R. M., Spivak, C. E., Williams, M. P., et al. (2017). CYP3A5 mediates effects of cocaine on human neocortigenesis: Studies using an in vitro 3D self-organized hPSC model with a single cortex-like unit. **Neuropsychopharmacology, 42**, 774–784. <https://doi.org/10.1038/npp.2016.156>
145. Levitt, P., & Veenstra-VanderWeele, J. (2015). Neurodevelopment and the origins of brain disorders. **Neuropsychopharmacology, 40**, 1-3.
146. Li, X., Chauhan, A., Sheikh, A. M., Patil, S., Chauhan, V., & Li, X. M. (2009). Elevated immune response in the brain of autistic patients. **Journal of Neuroimmunology, 207**, 111–116.
147. Li, Y., Muffat, J., Omer, A., Bosch, I., Lancaster, M. A., Sur, M., Gehrke, L., Knoblich, J. A., & Jaenisch, R. (2017). Induction of expansion and folding in human cerebral organoids. **Cell Stem Cell, 20**, 385–396.e3. <https://doi.org/10.1016/j.stem.2016.11.017>

148. Lieberman, A. P., Shakkottai, V. G., & Albin, R. L. (2019). Polyglutamine repeats in neurodegenerative diseases. **Annual Review of Pathology: Mechanisms of Disease, 14**, 1-27. <https://doi.org/10.1146/annurev-pathmechdis-012418-012857>
149. Lim, E. T., et al. (2017). Rates, distribution and implications of postzygotic mosaic mutations in autism spectrum disorder. **Nature Neuroscience, 20**, 1217–1224.
150. Lin, Y. T., Seo, J., Gao, F., Feldman, H. M., Wen, H. L., Penney, J., Cam, H. P., Gjoneska, E., Raja, W. K., Cheng, J., et al. (2018). APOE4 causes widespread molecular and cellular alterations associated with Alzheimer's disease phenotypes in human iPSC-derived brain cell types. **Neuron, 98**, 1141–1154.e7.
151. Lindborg, B. A., et al. (2016). Rapid induction of cerebral organoids from human induced pluripotent stem cells using a chemically defined hydrogel and defined cell culture medium. **Stem Cells Translational Medicine, 5**, 970–979.
152. Linkous, A., Balamatsias, D., Snuderl, M., Pisapia, D., Liston, C., & Correspondence, H. A. F. (2019). Modeling patient-derived glioblastoma with cerebral organoids. **Cell Reports, 26**, 3203-3211.e5.
153. Lionel, A. C., Vaags, A. K., Sato, D., Gazzellone, M. J., Mitchell, E. B., Chen, H. Y., et al. (2013). Rare exonic deletions implicate the synaptic organizer Gephyrin (GPHN) in risk for autism, schizophrenia, and seizures. **Human Molecular Genetics, 22**, 2055–2066.
154. Liu, R. X., Huang, C., Bennett, D. A., Li, H., & Wang, R. (2016). The characteristics of astrocyte on A β clearance altered in Alzheimer's disease were reversed by anti-inflammatory agent (+)-2-(1-hydroxyl-4-oxocyclohexyl) ethyl caffeate. **American Journal of Translational Research, 8*(10)*, 4082–4094.
155. Liu, J., Liu, Z., Zhang, Y., & Yin, F. (2015). A novel antagonistic role of natural compound icariin on neurotoxicity of amyloid β peptide. **Indian Journal of Medical Research, 142*(2)*, 190-195.
156. Lodato, S., & Arlotta, P. (2015). Generating neuronal diversity in the mammalian cerebral cortex. **Annual Review of Cell and Developmental Biology, 31**, 699–720.
157. Luo, C., et al. (2016). Cerebral organoids recapitulate epigenomic signatures of the human fetal brain. **Cell Reports, 17**, 3369–3384.
158. Manning, M., Hudgins, L., Professional, P., & Guidelines, C. (2010). Array-based technology and recommendations for utilization in medical genetics practice for detection of chromosomal abnormalities. **Genetics in Medicine, 12**, 742–745.
159. Mansour, A. A., Gonçalves, J. T., Bloyd, C. W., Li, H., Fernandes, S., Quang, D., Johnston, S., Parylak, S. L., Jin, X., & Gage, F. H. (2018). An in vivo model of functional and vascularized human brain organoids. **Nature Biotechnology, 36**, 432–441. <https://doi.org/10.1038/nbt.4127>
160. Marchetto, M. C., Carromeu, C., Acab, A., Yu, D., Yeo, G. W., Mu, Y., Chen, G., Gage, F. H., & Muotri, A. R. (2010). A model for neural development and treatment of Rett syndrome using human induced pluripotent stem cells. **Cell, 143**, 527–539.

161. Mariani, J., Coppola, G., Zhang, P., Abyzov, A., Provini, L., Tomasini, L., et al. (2015). FOXG1-dependent dysregulation of GABA/glutamate neuron differentiation in autism spectrum disorders. **Cell*, 162*, 375–390. <https://doi.org/10.1016/j.cell.2015.06.034>
162. Marques, A. H., O'Connor, T. G., Roth, C., Susser, E., & Bjorke-Monsen, A. L. (2013). The influence of maternal prenatal and early childhood nutrition and maternal prenatal stress on offspring immune system development and neurodevelopmental disorders. **Frontiers in Neuroscience*, 7*, 120.
163. Martínez, T., Wright, N., López-Fraga, M., Jiménez, A. I., & Pañeda, C. (2013). Silencing human genetic diseases with oligonucleotide-based therapies. **Human Genetics*, 132*, 481–493.
164. McGann, J. C., Lioy, D. T., & Mandel, G. (2012). Astrocytes conspire with neurons during progression of neurological disease. **Current Opinion in Neurobiology*, 22*, 850–858. <https://doi.org/10.1016/j.conb.2012.03.009>
165. Mellios, N., Feldman, D. A., Sheridan, S. D., Ip, J. P. K., Kwok, S., Amoah, S. K., Rosen, B., Rodriguez, B. A., Crawford, B., Swaminathan, R., Chou, S., Li, Y., Ziats, M., Ernst, C., Jaenisch, R., Haggarty, S. J., & Sur, M. (2018). MeCP2-regulated miRNAs control early human neurogenesis through differential effects on ERK and AKT signaling. **Molecular Psychiatry*, 23*, 1051–1065. <https://doi.org/10.1038/mp.2017.86>
166. Merlini, M., Rafalski, V. A., Rios Coronado, P. E., Gill, T. M., Ellisman, M., Muthukumar, G., et al. (2019). Fibrinogen induces microglia-mediated spine elimination and cognitive impairment in an Alzheimer's disease model. **Neuron*, 101*(6), 1099–1108.e6.
167. Miller, A. J., Dye, B. R., Ferrer-Torres, D., et al. (2019). Generation of lung organoids from human pluripotent stem cells in vitro. **Nature Protocols*, 14*, 518–540. <https://doi.org/10.1038/s41596-018-0104-8>
168. Misic, B., Doesburg, S. M., Fatima, Z., Vidal, J., Vakorin, V. A., Taylor, M. J., & McIntosh, A. R. (2014). Coordinated information generation and mental flexibility: Large-scale network disruption in children with autism. **Cerebral Cortex**. <https://doi.org/10.1093/cercor/bhu082>
169. Mitchell, K. J. (2011). The genetics of neurodevelopmental disease. **Current Opinion in Neurobiology*, 21*, 197–203.
170. Miyake, K., Hirasawa, T., Koide, T., & Kubota, T. (2012). Epigenetics in autism and other neurodevelopmental diseases. **Advances in Experimental Medicine and Biology*, 724*, 91–98. https://doi.org/10.1007/978-1-4614-0653-2_7
171. Mohan, H., Verhoog, M. B., Doreswamy, K. K., Eyal, G., Aardse, R., Lodder, B. N., et al. (2015). Dendritic and axonal architecture of individual pyramidal neurons across layers of adult human neocortex. **Cerebral Cortex*, 25*, 4839–4853. <https://doi.org/10.1093/cercor/bhv188>
172. Montagne, A., Nation, D. A., Sagare, A. P., et al. (2020). APOE4 leads to blood-brain barrier dysfunction predicting cognitive decline. **Nature*, 581*(7806), 71–76. <https://doi.org/10.1038/s41586-020-2247-3>

173. Monzel, A. S., et al. (2017). Derivation of human midbrain-specific organoids from neuroepithelial stem cells. **Stem Cell Reports, 8**, 1144–1154.
174. Moon, K., Filis, A. K., & Cohen, A. R. (2010). The birth and evolution of neuroscience through cadaveric dissection. **Neurosurgery, 67**, 799–810. <https://doi.org/10.1227/01.neu.0000383135.92953.a3>
175. Moreno-De-Luca, A., Myers, S. M., Challman, T. D., Moreno-De-Luca, D., Evans, D. W., & Ledbetter, D. H. (2013). Developmental brain dysfunction: Revival and expansion of old concepts based on new genetic evidence. **The Lancet Neurology, 12**, 406–414.
176. Morimoto, K., Horio, J., Satoh, H., Sue, L., Beach, T., Arita, S., Tooyama, I., & Konishi, Y. (2011). Expression profiles of cytokines in the brains of Alzheimer's disease patients compared to the brains of non-demented patients with and without increasing Alzheimer pathology. **Journal of Alzheimer's Disease, 25*(1)*, 59–76.
177. Movsas, T. Z., Pinto-Martin, J. A., Whitaker, A. H., Feldman, J. F., Lorenz, J. M., Korzeniewski, S. J., Levy, S. E., & Paneth, N. (2013). Autism spectrum disorder is associated with ventricular enlargement in a low birth weight population. **The Journal of Pediatrics, 163*(1)*, 73–78. <https://doi.org/10.1016/j.jpeds.2012.12.084>
178. Muffat, J., et al. (2016). Efficient derivation of microglia-like cells from human pluripotent stem cells. **Nature Medicine, 22**, 1358–1367.
179. Muguruma, K., Nishiyama, A., Kawakami, H., Hashimoto, K., & Sasai, Y. (2015). Self-organization of polarized cerebellar tissue in 3D culture of human pluripotent stem cells. **Cell Reports, 10**, 537–550.
180. Mukherjee, S. B. (2017). Autism spectrum disorders—Diagnosis and management. **The Indian Journal of Pediatrics, 84*(4)*, 307–314.
181. Muller, W. A. (1995). The role of PECAM-1 (CD31) in leukocyte emigration: Studies in vitro and in vivo. **Journal of Leukocyte Biology, 57**, 523–528.
182. Mullin, A. P., et al. (2013). Neurodevelopmental disorders: Mechanisms and boundary definitions from genomes, interactomes, and proteomes. **Translational Psychiatry, 3*(12)*, e329. <https://doi.org/10.1038/tp.2013.89>
183. Muotri, A. R. (2016). The human model: Changing focus on autism research. **Biological Psychiatry, 79**, 642–649. <https://doi.org/10.1016/j.biopsych.2015.03.012>
184. Murray, M. E., Graff-Radford, N. R., Ross, O. A., Petersen, R. C., Duara, R., & Dickson, D. W. (2011). Neuropathologically defined subtypes of Alzheimer's disease with distinct clinical characteristics: A retrospective study. **The Lancet Neurology, 10**, 785–796.
185. Nagele, R. G., D'Andrea, M. R., Lee, H., Venkataraman, V., & Wang, H. Y. (2003). Astrocytes accumulate A β 42 and give rise to astrocytic amyloid plaques in Alzheimer disease brains. **Brain Research, 971*(2)*, 197–209. [https://doi.org/10.1016/S0006-8993\(03\)02361-8](https://doi.org/10.1016/S0006-8993(03)02361-8)
186. Neniskyte, U., & Gross, C. T. (2017). Errant gardeners: Glial-cell-dependent synaptic pruning and neurodevelopmental disorders. **Nature Reviews Neuroscience, 18*(11)*, 658–670.

187. Nicolson, R., DeVito, T. J., Vidal, C. N., Sui, Y., Hayashi, K. M., Drost, D. J., et al. (2006). Detection and mapping of hippocampal abnormalities in autism. **Psychiatry Research, 148**, 11–21.
188. Niedowicz, D. M., Nelson, P. T., & Murphy, M. P. (2011). Alzheimer's disease: Pathological mechanisms and recent insights. **Current Neuropharmacology, 9**(4), 674–684. <https://doi.org/10.2174/157015911798376181>
189. Noor, A., Whibley, A., Marshall, C. R., Gianakopoulos, P. J., Piton, A., Carson, A. R., Orlic-Milacic, M., Lionel, A. C., Sato, D., Pinto, D., et al. (2010). Disruption at the PTCHD1 locus on Xp22.11 in autism spectrum disorder and intellectual disability. **Science Translational Medicine, 2**, 1–9.
190. Norton, S., Matthews, F. E., Barnes, D. E., Yaffe, K., & Brayne, C. (2014). Potential for primary prevention of Alzheimer's disease: An analysis of population-based data. **Lancet Neurology, 13**, 788–794.
191. Nzou, G., Wicks, R. T., Wicks, E. E., Seale, S. A., Sane, C. H., Chen, A., et al. (2018). Human cortex spheroid with a functional blood-brain barrier for high-throughput neurotoxicity screening and disease modeling. **Scientific Reports, 8**, 7413. <https://doi.org/10.1038/s41598-018-25603-5>
192. O'Brien, R. J., & Wong, P. C. (2011). Amyloid precursor protein processing and Alzheimer's disease. **Annual Review of Neuroscience, 34**, 185–204. <https://doi.org/10.1146/annurev-neuro-061010-113613>
193. Oh, Y., & Jang, J. (2019). Directed differentiation of pluripotent stem cells by transcription factors. **Molecular Cells, 42**, 200–209.
194. Oliveira, B., Yahya, A. Ç., & Novarino, G. (2019). Modeling cell-cell interactions in the brain using cerebral organoids. **Brain Research, 1724**, 146458. <https://doi.org/10.1016/j.brainres.2019.146458>
195. Ormel, P. R., Vieira de Sá, R., van Bodegraven, E. J., Karst, H., Harschnitz, O., Sneeboer, M. A. M., Johansen, L. E., van Dijk, R. E., Scheefhals, N., Berdenis van Berlekom, A., Ribes Martínez, E., Kling, S., MacGillavry, H. D., van den Berg, L. H., Kahn, R. S., Hol, E. M., de Witte, L. D., & Pasterkamp, R. J. (2018). Microglia innately develop within cerebral organoids. **Nature Communications, 9**, 4167. <https://doi.org/10.1038/s41467-018-06684-2>
196. Ornoy, A., Weinstein-Fudim, L., & Ergaz, Z. (2015). Prenatal factors associated with autism spectrum disorder (ASD). **Reproductive Toxicology, 56**, 155–169.
197. Orr, M. E., Sullivan, A. C., & Frost, B. (2017). A brief overview of tauopathy: Causes, consequences, and therapeutic strategies. **Trends in Pharmacological Sciences, 38**(7), 637–648. <https://doi.org/10.1016/j.tips.2017.03.011>
198. Orta-Salazar, E., Cuellar-Lemus, C. A., Díaz-Cintra, S., & Feria-Velasco, A. I. (2014). Cholinergic markers in the cortex and hippocampus of some animal species and their correlation to Alzheimer's disease. **Neurología (English Edition), 29**(8), 497–503. <https://doi.org/10.1016/j.nrleng.2012.10.010>

199. Pacitti, D., Privolizzi, R., & Bax, B. E. (2019). Organs to cells and cells to organoids: The evolution of in vitro central nervous system modeling. **Frontiers in Cellular Neuroscience, 13**. <https://doi.org/10.3389/fncel.2019.00129>
200. Parikshak, N. N., Luo, R., Zhang, A., Won, H., Lowe, J. K., Chandran, V., Horvath, S., & Geschwind, D. H. (2013). Integrative functional genomic analyses implicate specific molecular pathways and circuits in autism. **Cell, 155**, 1008–1021.
201. Partridge, B., & Rossmeis, J. H. Jr. (2019). Companion animal models of neurological disease. **Journal of Neuroscience Methods**, 108484.
202. Pasca, A. M., Sloan, S. A., Clarke, L. E., Tian, Y., Makinson, C. D., Huber, N., Kim, C. H., Park, J. Y., O'Rourke, N. A., Nguyen, K. D., et al. (2015). Functional cortical neurons and astrocytes from human pluripotent stem cells in 3D culture. **Nature Methods, 12**, 671–678.
203. Pasca, S. P. (2018). The rise of three-dimensional human brain cultures. **Nature, 553**, 437. <https://doi.org/10.1038/nature25032>
204. Perl, D. P. (2010). Neuropathology of Alzheimer's disease. **Mount Sinai Journal of Medicine, 77*(1)*, 32–42.
205. Petrelli, F., & Bezzi, P. (2016). Novel insights into gliotransmitters. **Current Opinion in Pharmacology, 26**, 138–145. <https://doi.org/10.1016/j.coph.2015.11.010>
206. Pettinato, G., Wen, X., & Zhang, N. (2015). Engineering strategies for the formation of embryoid bodies from human pluripotent stem cells. **Stem Cells and Development, 24*(14)*, 1595–1609. <https://doi.org/10.1089/scd.2014.0427>
207. Pham, M. T., Pollock, K. M., Rose, M. D., Cary, W. A., Stewart, H. R., Zhou, P., Nolta, J. A., & Waldau, B. (2018). Generation of human vascularized brain organoids. **Neuroreport, 29**, 588–593. <https://doi.org/10.1097/WNR.0000000000001014>
208. Plummer, S., Wallace, S., Ball, G., Lloyd, R., Schiapparelli, P., Quiñones-Hinojosa, A., Hartung, T., & Pamies, D. (2019). A human iPSC-derived 3D platform using primary brain cancer cells to study drug development and personalized medicine. **Scientific Reports, 9**, 1407. <https://doi.org/10.1038/s41598-018-37481-6>
209. Prince, M., Bryce, R., Albanese, E., Wimo, A., Ribeiro, W., & Ferri, C. P. (2013). The global prevalence of dementia: A systematic review and meta-analysis. **Alzheimer's & Dementia, 9**, 63–75.
210. Prince, M., et al. (2013). The global prevalence of dementia: A systematic review and meta-analysis. **Alzheimer's & Dementia, 9**, 63–75.e2.
211. Qian, X., Nguyen, H. N., Song, M. M., Hadiono, C., Ogden, S. C., Hammack, C., Yao, B., Hamersky, G. R., Jacob, F., Zhong, C., et al. (2016). Brain-region-specific organoids using mini-bioreactors for modeling ZIKV exposure. **Cell, 165**, 1238–1254.
212. Qian, X., Song, H., & Ming, G. L. (2019). Brain organoids: Advances, applications, and challenges. **Development, 146**, dev166074. <https://doi.org/10.1242/dev.166074>

213. Quadrato, G., et al. (2017). Cell diversity and network dynamics in photosensitive human brain organoids. *Nature*, 545*, 48–53.
214. Raja, W. K., Mungenast, A. E., Lin, Y. T., Ko, T., Abdurrob, F., Seo, J., & Tsai, L. H. (2016). Self-organizing 3D human neural tissue derived from induced pluripotent stem cells recapitulate Alzheimer's disease phenotypes. *PLoS One*, 11*, 1–18.
215. Renner, M., Lancaster, M. A., Bian, S., Choi, H., Ku, T., Peer, A., Chung, K., & Knoblich, J. A. (2017). Self-organized developmental patterning and differentiation in cerebral organoids. *EMBO Journal*, 36*, 1316–1329.
216. Renton, A. E., et al. (2011). A hexanucleotide repeat expansion in C9ORF72 is the cause of chromosome 9p21-linked ALS-FTD. *Neuron*, 72*, 257–268.
217. Retallack, H., et al. (2016). Zika virus cell tropism in the developing human brain and inhibition by azithromycin. *Proceedings of the National Academy of Sciences USA*, 113*, 14408–14413.
218. Rodriguez, J. I., & Kern, J. K. (2011). Evidence of microglial activation in autism and its possible role in brain underconnectivity. *Neuron Glia Biology*, 7*, 205–213.
219. Roher, A. E., Debbins, J. P., Malek-Ahmadi, M., Chen, K., Pipe, J. G., Maze, S., et al. (2012). Cerebral blood flow in Alzheimer's disease. *Vascular Health and Risk Management*, 8*, 599–611.
220. Rossi, G., Manfrin, A., & Lutolf, M. P. (2018). Progress and potential in organoid research. *Nature Reviews Genetics*, 19*, 671–687. <https://doi.org/10.1038/s41576-018-0051-9>
221. Rossignol, D. A., & Frye, R. E. (2012). A review of research trends in physiological abnormalities in autism spectrum disorders: Immune dysregulation, inflammation, oxidative stress, mitochondrial dysfunction, and environmental toxicant exposures. *Molecular Psychiatry*, 17*, 389–401.
222. Roth, G., & Dicke, U. (2005). Evolution of the brain and intelligence. *Trends in Cognitive Sciences*, 9*, 250–257. <https://doi.org/10.1016/j.tics.2005.03.005>
223. Rozniecki, J. J., et al. (1999). Morphological and functional demonstration of rat dura mast cell-neuron interactions in vitro and in vivo. *Brain Research*, 849*, 1–15.
224. Russo, F. B., Freitas, B. C., Pignatari, G. C., Fernandes, I. R., Sebat, J., Muotri, A. R., & Beltrão-Braga, P. C. B. (2018). Modeling the interplay between neurons and astrocytes in autism using human induced pluripotent stem cells. *Biological Psychiatry*, 83*(7), 569–578.
225. Sachs, N., de Ligt, J., Kopper, O., Gogola, E., Bounova, G., Weeber, F., Balgobind, A. V., Wind, K., Gracanin, A., Begthel, H., et al. (2018). A living biobank of breast cancer organoids captures disease heterogeneity. *Cell*, 172*, 373–386.e10. <https://doi.org/10.1016/j.cell.2017.12.018>
226. Sajja, V. S., Hlavac, N., & VandeVord, P. J. (2016). Role of glia in memory deficits following traumatic brain injury: Biomarkers of glia dysfunction. *Frontiers in Integrative Neuroscience**, 10, 7. <https://doi.org/10.3389/fnint.2016.00007>

227. Sakaguchi, H., et al. (2015). Generation of functional hippocampal neurons from self-organizing human embryonic stem cell-derived dorsomedial telencephalic tissue. *Nature Communications*, 6, 8896. <https://doi.org/10.1038/ncomms9896>
228. Sanders, S. J., Murtha, M. T., Gupta, A. R., Murdoch, J. D., Raubeson, M. J., Willsey, A. J., Ercan-Sencicek, A. G., DiLullo, N. M., Parikshak, N. N., Stein, J. L., et al. (2012). De novo mutations revealed by whole-exome sequencing are strongly associated with autism. *Nature*, 485, 237–241. <https://doi.org/10.1038/nature10945>
229. Sandhoff, K., Harzer, K., Wässle, W., & Jatzkewitz, H. (1971). Enzyme alterations and lipid storage in three variants of Tay-Sachs disease. *Journal of Neurochemistry*, 18(12), 2469–2489. <https://doi.org/10.1111/j.1471-4159.1971.tb00204.x>
230. Savatt, J. M., & Myers, S. M. (2021). Genetic testing in neurodevelopmental disorders. *Frontiers in Pediatrics*, 9, 526779. <https://doi.org/10.3389/fped.2021.526779>
231. Scheltens, P., Blennow, K., Breteler, M. M. B., de Strooper, B., Frisoni, G. B., Salloway, S., & Van der Flier, W. M. (2016). Alzheimer's disease. *The Lancet*, 388(10043), 505–517. [https://doi.org/10.1016/s0140-6736\(15\)01124-1](https://doi.org/10.1016/s0140-6736(15)01124-1)
232. Schipul, S. E., Williams, D. L., Keller, T. A., Minshew, N. J., & Just, M. A. (2012). Distinctive neural processes during learning in autism. *Cerebral Cortex*, 22(4), 937–950. <https://doi.org/10.1093/cercor/bhr192>
233. Schöls, L., et al. (2015). No Parkinsonism in SCA2 and SCA3 despite severe neurodegeneration of the dopaminergic substantia nigra. *Brain*, 138(12), 3316–3326. <https://doi.org/10.1093/brain/awv209>
234. Scholz, S. W., et al. (2009). SNCA variants are associated with increased risk for multiple system atrophy. *Annals of Neurology*, 65(6), 610–614. <https://doi.org/10.1002/ana.21704>
235. Schwab, C., & McGeer, P. L. (2008). Inflammatory aspects of Alzheimer disease and other neurodegenerative disorders. *Journal of Alzheimer's Disease*, 13(4), 359–369. <https://doi.org/10.3233/JAD-2008-13405>
236. Schwank, G., Koo, B. K., Sasselli, V., Dekkers, J. F., Heo, I., Demircan, T., Sasaki, N., Boymans, S., Cuppen, E., van der Ent, C. K., Nieuwenhuis, E. E. S., Beekman, J. M., & Clevers, H. (2013). Functional repair of CFTR by CRISPR/Cas9 in intestinal stem cell organoids of cystic fibrosis patients. *Cell Stem Cell*, 13(6), 653–658. <https://doi.org/10.1016/j.stem.2013.11.002>
237. Schwartz, M. P., Hou, Z., Propson, N. E., Zhang, J., Engstrom, C. J., Santos Costa, V., et al. (2015). Human pluripotent stem cell-derived neural constructs for predicting neural toxicity. *Proceedings of the National Academy of Sciences of the United States of America*, 112(39), 12516–12521. <https://doi.org/10.1073/pnas.1516645112>
238. Seeman, P., & Madras, B. (Eds.). (2013). *Imaging of the Human Brain in Health and Disease*. Elsevier.
239. Sevigny, J., et al. (2016). The antibody aducanumab reduces A β plaques in Alzheimer's disease. *Nature*, 537, 50–56. <https://doi.org/10.1038/nature19323>

240. Sharon, G., Sampson, T. R., Geschwind, D. H., & Mazmanian, S. K. (2016). The central nervous system and the gut microbiome. **Cell**, 167(7), 915-932. <https://doi.org/10.1016/j.cell.2016.10.020>
241. Shashi, V., et al. (2014). The utility of the traditional medical genetics diagnostic evaluation in the context of next-generation sequencing for undiagnosed genetic disorders. **Genetics in Medicine**, 16(3), 176–182. <https://doi.org/10.1038/gim.2013.141>
242. Shepherd, J. (2018). Ethical (and epistemological) issues regarding consciousness in cerebral organoids. **Journal of Medical Ethics**, 44(9), 611–612. <https://doi.org/10.1136/medethics-2018-104778>
243. Shi, Y., Kirwan, P., Smith, J., Robinson, H. P. C., & Livesey, F. J. (2012). Human cerebral cortex development from pluripotent stem cells to functional excitatory synapses. **Nature Neuroscience**, 15(4), 477-486. <https://doi.org/10.1038/nn.3031>
244. Simcock, G., Kildea, S., Elgbeili, G., Laplante, D. P., Cobham, V., & King, S. (2017). Prenatal maternal stress shapes children’s theory of mind: The QF2011 Queensland Flood Study. **Journal of Developmental Origins of Health and Disease**, 8(4), 483–492. <https://doi.org/10.1017/s2040174417000186>
245. Sloan, S. A., Andersen, J., Pasca, A. M., Birey, F., & Pasca, S. P. (2018). Generation and assembly of human brain region-specific three-dimensional cultures. **Nature Protocols**, 13(11), 2062–2085. <https://doi.org/10.1038/s41596-018-0032-7>
246. Smits, L. M., Reinhardt, L., Reinhardt, P., et al. (2019). Modeling Parkinson's disease in midbrain-like organoids. **NPJ Parkinson's Disease**, 5, 5. <https://doi.org/10.1038/s41531-019-0078-4>
247. Smoller, J. W., Craddock, N., Kendler, K., Lee, P. H., Neale, B. M., Nurnberger, J. I., et al. (2013). Identification of risk loci with shared effects on five major psychiatric disorders: A genome-wide analysis. **The Lancet**, 381(9875), 1371–1379. [https://doi.org/10.1016/S0140-6736\(12\)62129-1](https://doi.org/10.1016/S0140-6736(12)62129-1)
248. Soden, S. E., et al. (2014). Effectiveness of exome and genome sequencing guided by acuity of illness for diagnosis of neurodevelopmental disorders. **Science Translational Medicine**, 6(265), 265ra168. <https://doi.org/10.1126/scitranslmed.3000775>
249. Sofroniew, M. V. (2015). Astrocyte barriers to neurotoxic inflammation. **Nature Reviews Neuroscience**, 16(4), 249–263. <https://doi.org/10.1038/nrn3898>
250. Sogut, S., Zoroglu, S. S., Ozyurt, H., et al. (2003). Changes in nitric oxide levels and antioxidant activities may have a role in the pathophysiological mechanisms involved in autism. **Clinical Chemistry and Laboratory Medicine**, 331(1), 111-117. <https://doi.org/10.1016/j.cca.2002.12.010>
251. Solito, E., & Sastre, M. (2012). Microglia function in Alzheimer’s disease. **Frontiers in Pharmacology**, 3, 14. <https://doi.org/10.3389/fphar.2012.00014>

252. Stan, A. D., Ghose, S., Gao, X.-M., Roberts, R. C., Lewis-Amezcu, K., Hatanpaa, K. J., et al. (2006). Human postmortem tissue: What quality markers matter? *Brain Research*, 1123, 1–11. <https://doi.org/10.1016/j.brainres.2006.09.025>
253. Stancu, I. C., Vasconcelos, B., Terwel, D., & Dewachter, I. (2014). Models of β -amyloid induced Tau-pathology: The long and “folded” road to understand the mechanism. *Molecular Neurodegeneration*, 9, 51. <https://doi.org/10.1186/1750-1326-9-51>
254. Sun, Y., & Ding, Q. (2017). Genome engineering of stem cell organoids for disease modeling. *Protein & Cell*, 8(5), 315–327. <https://doi.org/10.1007/s13238-017-0181-0>
255. Suzuki, K., Sugihara, G., Ouchi, Y., Nakamura, K., Futatsubashi, M., Takebayashi, K., et al. (2013). Microglial activation in young adults with autism spectrum disorder. *JAMA Psychiatry*, 70(1), 49–58. <https://doi.org/10.1001/jamapsychiatry.2013.272>
256. Sweeney, M., Sagare, A., & Zlokovic, B. V. (2018). Blood-brain barrier breakdown in Alzheimer’s disease and other neurodegenerative disorders. *Nature Reviews Neurology*, 14(2), 133–150. <https://doi.org/10.1038/nrneuro.2017.169>
257. Sweeney, M. D., Kisler, K., Montagne, A., Toga, A. W., & Zlokovic, B. V. (2018). The role of brain vasculature in neurodegenerative disorders. *Nature Neuroscience*, 21(10), 1318-1331. <https://doi.org/10.1038/s41593-018-0234-x>
258. Takahashi, H., & Shibuya, M. (2005). The vascular endothelial growth factor (VEGF)/VEGF receptor system and its role under physiological and pathological conditions. *Clinical Science*, 109(3), 227–241. <https://doi.org/10.1042/CS20050003>
259. Takahashi, K., Tanabe, K., Ohnuki, M., Narita, M., Ichisaka, T., Tomoda, K., & Yamanaka, S. (2007). Induction of pluripotent stem cells from adult human fibroblasts by defined factors. *Cell*, 131(5), 861–872. <https://doi.org/10.1016/j.cell.2007.11.019>
260. Tao, Y., & Zhang, S. C. (2016). Neural subtype specification from human pluripotent stem cells. *Cell Stem Cell*, 19(5), 573–586. <https://doi.org/10.1016/j.stem.2016.07.011>
261. Tărlungeanu, D. C., & Novarino, G. (2018). Genomics in neurodevelopmental disorders: An avenue to personalized medicine. *Experimental & Molecular Medicine*, 50(4), 1–7. <https://doi.org/10.1038/s12276-018-0129-7>
262. Taylor, J. P., Hardy, J., & Fischbeck, K. H. (2002). Toxic proteins in neurodegenerative disease. *Science*, 296(5575), 1991–1995. <https://doi.org/10.1126/science.1074999>
263. Theoharides, T. C., Kavalioti, M., & Tsilioni, I. (2019). Mast cells, stress, fear, and autism spectrum disorder. *International Journal of Molecular Sciences*, 20(15), 3611. <https://doi.org/10.3390/ijms20153611>
264. Theoharides, T. C., Stewart, J. M., Panagiotidou, S., & Melamed, I. (2016). Mast cells, brain inflammation, and autism. *European Journal of Pharmacology*, 778, 96–102. <https://doi.org/10.1016/j.ejphar.2015.03.086>
265. Theoharides, T. C., & Cochrane, D. E. (2004). Critical role of mast cells in inflammatory diseases and the effect of acute stress. *Journal of Neuroimmunology*, 146(1-2), 1–12. <https://doi.org/10.1016/j.jneuroim.2003.09.011>


266. Theoharides, T. C., et al. (2010). Mast cells and inflammation. **Biochimica et Biophysica Acta**, 1822(1), 21–33. <https://doi.org/10.1016/j.bbadis.2010.08.007>
267. Toledo, J. B., Arnold, S. E., Raible, K., Brettschneider, J., Xie, S. X., Grossman, M., et al. (2013). Contribution of cerebrovascular disease in autopsy-confirmed neurodegenerative disease cases in the National Alzheimer's Coordinating Centre. **Brain**, 136(9), 2697–2706. <https://doi.org/10.1093/brain/awt188>
268. Tran, N. Q. V., & Miyake, K. (2017). Neurodevelopmental disorders and environmental toxicants: Epigenetics as an underlying mechanism. **International Journal of Genomics**, 2017, 1–23. <https://doi.org/10.1155/2017/7526592>
269. Trujillo, C. A., Gao, R., Negraes, P. D., Chaim, I. A., Domissy, A., Vandenberghe, M., Devor, A., Yeo, G. W., Voytek, B., & Muotri, A. R. (2018a). Nested oscillatory dynamics in cortical organoids model early human brain network development. **bioRxiv**, 358622. <https://doi.org/10.1101/358622>
270. Trujillo, C. A., & Muotri, A. R. (2018b). Brain organoids and the study of neurodevelopment. **Trends in Molecular Medicine**, 24(11), 982–990. <https://doi.org/10.1016/j.molmed.2018.09.005>
271. Tyszka, J. M., Kennedy, D. P., Paul, L. K., & Adolphs, R. (2014). Largely typical patterns of resting-state functional connectivity in high-functioning adults with autism. **Cerebral Cortex**, 24(7), 1894–1905. <https://doi.org/10.1093/cercor/bht019>
272. Valiente, M., & Marín, O. (2010). Neuronal migration mechanisms in development and disease. **Current Opinion in Neurobiology**, 20(1), 68–78. <https://doi.org/10.1016/j.conb.2009.12.007>
273. van de Haar, H. J., Burgmans, S., Jansen, J. F. A., van Osch, M. J. P., van Buchem, M. A., Müller, M., et al. (2016). Blood-brain barrier leakage in patients with early Alzheimer disease. **Radiology**, 281(2), 527–535. <https://doi.org/10.1148/radiol.2016160126>
274. Van der Flier, W. M., Pijnenburg, Y. A. L., Fox, N. C., & Scheltens, P. (2011). Early-onset versus late-onset Alzheimer's disease: The case of the missing APOE ε4 allele. **Lancet Neurology**, 10(3), 280–288. [https://doi.org/10.1016/S1474-4422\(10\)70324-2](https://doi.org/10.1016/S1474-4422(10)70324-2)
275. Vargas, D. L., Nascimbene, C., Krishnan, C., Zimmerman, A. W., & Pardo, C. A. (2005). Neuroglial activation and neuroinflammation in the brain of patients with autism. **Annals of Neurology**, 57(3), 304. <https://doi.org/10.1002/ana.20321>
276. Verkhratsky, A., & Butt, A. M. (2013). **Glial physiology and pathophysiology** (1st ed.). Wiley-Blackwell.
277. Verly, M., Verhoeven, J., Zink, I., Mantini, D., Oudenhove, L. V., Lagae, L., Sunaert, S., & Romme, N. (2013). Structural and functional underconnectivity as a negative predictor for language in autism. **Human Brain Mapping**, 35(8), 3602–3615. <https://doi.org/10.1002/hbm.22246>
278. Villar-Piqué, A., Lopes da Fonseca, T., & Outeiro, T. F. (2016). Structure, function, and toxicity of alpha-synuclein: The Bermuda triangle in synucleinopathies. **Journal of Neurochemistry**, 139(Suppl 1), 240-255. <https://doi.org/10.1111/jnc.13249>

279. Voineagu, I., Wang, X. C., Johnston, P., Lowe, J. K., Tian, Y., Horvath, S., et al. (2011). Transcriptomic analysis of autistic brain reveals convergent molecular pathology. *Nature*, 474(7351), 380–384. <https://doi.org/10.1038/nature10110>
280. Waddington, S. N., Privolizzi, R., Karda, R., & O'Neill, H. C. (2016). A broad overview and review of CRISPR-Cas technology and stem cells. *Current Stem Cell Reports*, 2(1), 9–20. <https://doi.org/10.1007/s40778-016-0037-5>
281. Wallach, T. E., & Bayrer, J. R. (2017). Intestinal organoids: New frontiers in the study of intestinal disease and physiology. *Journal of Pediatric Gastroenterology and Nutrition*, 64(2), 180–185. <https://doi.org/10.1097/MPG.0000000000001411>
282. Wang, H. (2018). Modeling neurological diseases with human brain organoids. *Frontiers in Synaptic Neuroscience*, 10, 15. <https://doi.org/10.3389/fnsyn.2018.00015>
283. Wang, J. D., Khafagy, E.-S., Khanafer, K., Takayama, S., & ElSayed, M. E. (2016). Organization of endothelial cells, pericytes, and astrocytes into a 3D microfluidic in vitro model of the blood-brain barrier. *Molecular Pharmaceutics*, 13(3), 895–906. <https://doi.org/10.1021/acs.molpharmaceut.5b00829>
284. Wang, Y., Wang, L., Zhu, Y., & Qin, J. (2018). Human brain organoid-on-a-chip to model prenatal nicotine exposure. *Lab on a Chip*, 18(6), 851–860. <https://doi.org/10.1039/C7LC01084B>
285. Warren, Z., McPheeters, M. L., Sathe, N., Foss-Feig, J. H., Glasser, A., & Veenstra-Vanderweele, J. (2011). A systematic review of early intensive intervention for autism spectrum disorders. *Pediatrics*, 127(5), e1303–e1311. <https://doi.org/10.1542/peds.2011-0426>
286. Watanabe, K., et al. (2005). Directed differentiation of telencephalic precursors from embryonic stem cells. *Nature Neuroscience*, 8(3), 288–296. <https://doi.org/10.1038/nn1425>
287. Watanabe, M., Buth, J. E., Vishlaghi, N., de la Torre-Ubieta, L., Taxidis, J., Khakh, B. S., Coppola, G., Pearson, C. A., Yamauchi, K., Gong, D., et al. (2017). Self-organized cerebral organoids with human-specific features predict effective drugs to combat Zika virus infection. *Cell Reports*, 21(6), 517–532. <https://doi.org/10.1016/j.celrep.2017.10.001>
288. Wei, H. G., Zou, H., Sheikh, A. M., Malik, M., Dobkin, C., Brown, W. T., et al. (2011). IL-6 is increased in the cerebellum of autistic brain and alters neural cell adhesion, migration, and synaptic formation. *Journal of Neuroinflammation*, 8, 52. <https://doi.org/10.1186/1742-2094-8-52>
289. Werner, S., Vu, H. T., & Rink, J. C. (2017). Self-organization in development, regeneration, and organoids. *Current Opinion in Cell Biology*, 44, 102–109. <https://doi.org/10.1016/j.ceb.2016.12.008>
290. Willsey, A. J., Sanders, S. J., Li, M., Dong, S., Tebbenkamp, A. T., Muhle, R. A., Reilly, S. K., Lin, L., Fertuzinhos, S., Miller, J. A., et al. (2013). Coexpression networks implicate human midfetal deep cortical projection neurons in the pathogenesis of autism. *Cell*, 155(5), 997–1007. <https://doi.org/10.1016/j.cell.2013.10.018>

291. Wimmer, R. A., Leopoldi, A., Aichinger, M., Wick, N., Hantusch, B., Novatchkova, M., Taubenschmid, J., Hämmerle, M., Esk, C., Bagley, J. A., et al. (2019). Human blood vessel organoids as a model of diabetic vasculopathy. *Nature*, 565(7739), 505-510. <https://doi.org/10.1038/s41586-018-0806-8>
292. Wood, P. L. (2003). Roles of CNS macrophages in neurodegeneration. In P. L. Wood (Ed.), *Neuroinflammation: Mechanisms and management* (2nd ed., pp. 3–27). Humana Press.
293. Wright, A. V., Nuñez, J. K., & Doudna, J. A. (2016). Biology and applications of CRISPR systems: Harnessing nature’s toolbox for genome engineering. *Cell*, 164(1-2), 29–44. <https://doi.org/10.1016/j.cell.2016.12.010>
294. Wyss-Coray, T., & Rogers, J. (2012). Inflammation in Alzheimer disease—a brief review of the basic science and clinical literature. *Cold Spring Harbor Perspectives in Medicine*, 2(1), a006346. <https://doi.org/10.1101/cshperspect.a006346>
295. Yamazaki, Y., Zhao, N., Caulfield, T. R., Liu, C.-C., & Bu, G. (2019). Apolipoprotein E and Alzheimer disease: Pathobiology and targeting strategies. *Nature Reviews Neurology*. <https://doi.org/10.1038/s41582-019-0228-7>
296. Yan, Y., Song, L., Bejoy, J., Zhao, J., Kanekiyo, T., Bu, G., Zhou, Y., & Li, Y. (2018). Modeling neurodegenerative microenvironment using cortical organoids derived from human stem cells. *Tissue Engineering Part A*, 24(13-14), 1125-1137. <https://doi.org/10.1089/ten.TEA.2017.0423>
297. Yan, H. H. N., Siu, H. C., Law, S., Ho, S. L., Yue, S. S. K., Tsui, W. Y., Chan, D., Chan, A. S., Ma, S., Lam, K. O., et al. (2018). A comprehensive human gastric cancer organoid biobank captures tumor subtype heterogeneity and enables therapeutic screening. *Cell Stem Cell*, 23(6), 882-897.e11. <https://doi.org/10.1016/j.stem.2018.09.002>
298. Yao, Y., Walsh, W. J., McGinnis, W. R., & Praticò, D. (2006). Altered vascular phenotype in autism: Correlation with oxidative stress. *Archives of Neurology*, 63(8), 1161–1164. <https://doi.org/10.1001/archneur.63.8.1161>
299. Yasuhara, T., Shingo, T., & Date, I. (2004). The potential role of vascular endothelial growth factor in the central nervous system. *Reviews in Neuroscience*, 15(3), 293–307. <https://doi.org/10.1515/REVNEURO.2004.15.3.293>
300. Ye, F., Kang, E., Yu, C., Qian, X., Jacob, F., Yu, C., et al. (2017). DISC1 regulates neurogenesis via modulating kinetochore attachment of Ndel1/Nde1 during mitosis. *Neuron*, 96(5), 1041.e1045–1054.e1045. <https://doi.org/10.1016/j.neuron.2017.10.010>
301. Yin, X., Mead, B. E., Safaee, H., Langer, R., Karp, J. M., et al. (2016). Engineering stem cell organoids. *Cell Stem Cell*, 18(1), 25–38. <https://doi.org/10.1016/j.stem.2015.12.005>
302. Ying, Q.-L., Stavridis, M., Griffiths, D., Li, M., & Smith, A. (2003). Conversion of embryonic stem cells into neuroectodermal precursors in adherent monoculture. *Nature Biotechnology*, 21(2), 183–186. <https://doi.org/10.1038/nbt0203-183>

303. Yoon, S. J., Elahi, L. S., Pasca, A. M., Marton, R. M., Gordon, A., Revah, O., Miura, Y., Walczak, E. M., Holdgate, G. M., Fan, H. C., Huguenard, J. R., Geschwind, D. H., & Pasca, S. P. (2019). Reliability of human cortical organoid generation. **Nature Methods**, 16(1), 75–78. <https://doi.org/10.1038/s41592-018-0255-0>
304. Young, A. M., Chakrabarti, B., Roberts, D., Lai, M. C., Suckling, J., & Baron-Cohen, S. (2016). From molecules to neural morphology: Understanding neuroinflammation in autism spectrum condition. **Molecular Autism**, 7, 9. <https://doi.org/10.1186/s13229-016-0074-1>
305. Yu, J., Vodyanik, M. A., Smuga-Otto, K., Antosiewicz-Bourget, J., Frane, J. L., Tian, S., Nie, J., Jonsdottir, G. A., Ruotti, V., Stewart, R., et al. (2008). Induced pluripotent stem cell lines derived from human somatic cells. **Science**, 318(5858), 1917–1920. <https://doi.org/10.1126/science.1151526>
306. Yuen, R. K., et al. (2015). Whole-genome sequencing of quartet families with autism spectrum disorder. **Nature Medicine**, 21(2), 185–191. <https://doi.org/10.1038/nm.3804>
307. Zamolodchikov, D., Chen, Z. L., Conti, B. A., Renné, T., & Strickland, S. (2015). Activation of the factor XII-driven contact system in Alzheimer’s disease patient and mouse model plasma. **Proceedings of the National Academy of Sciences of the United States of America**, 112(13), 4068–4073. <https://doi.org/10.1073/pnas.1421648112>
308. Zhan, Y., Paolicelli, R. C., Sforazzini, F., Weinhard, L., & Bolasco, G. (2014). Deficient neuron-microglia signalling results in impaired functional brain connectivity and social behavior. **Nature Neuroscience**, 17(3), 400–406. <https://doi.org/10.1038/nn.3641>
309. Zhang, S.-C., Wernig, M., Duncan, I. D., Brüstle, O., & Thomson, J. A. (2001). In vitro differentiation of transplantable neural precursors from human embryonic stem cells. **Nature Biotechnology**, 19(12), 1129–1133. <https://doi.org/10.1038/nbt1201-1129>
310. Zhao, J., O’Connor, T., & Vassar, R. (2011). The contribution of activated astrocytes to A β production: Implications for Alzheimer’s disease pathogenesis. **Journal of Neuroinflammation**, 8, 150. <https://doi.org/10.1186/1742-2094-8-150>
311. Zhao, Z., Nelson, A. R., Betsholtz, C., & Zlokovic, B. V. (2015). Establishment and dysfunction of the blood-brain barrier. **Cell**, 163(5), 1064–1078. <https://doi.org/10.1016/j.cell.2015.10.018>
312. Zhu, Y., Wang, L., Yin, F., Yu, Y., Wang, Y., Shepard, M. J., et al. (2017). Probing impaired neurogenesis in human brain organoids exposed to alcohol. **Integrative Biology**, 9(10), 968–978. <https://doi.org/10.1039/c7ib00105c>
313. Zielinski, B. A., Prigge, M. B. D., Nielsen, J. A., Froehlich, A. L., Abildskov, T. J., Anderson, J. S., Fletcher, P. T., Zygmunt, K. M., Travers, B. G., Lange, N., et al. (2014). Longitudinal changes in cortical thickness in autism and typical development. **Brain**, 137(6), 1799–1812. <https://doi.org/10.1093/brain/awu061>
314. Zimprich, A., et al. (2004). Mutations in LRRK2 cause autosomal-dominant Parkinsonism with pleomorphic pathology. **Neuron**, 44(4), 601–607. <https://doi.org/10.1016/j.neuron.2004.10.021>

APPLIED DICTICS IN COMMUNICATION AND ORGANIZATIONAL BEHAVIOR

 <https://doi.org/10.56238/sevened2024.029-003>

Lelles de Paula Lemos¹

ABSTRACT

This article aims to highlight the importance of communication in the internal and external organizational environment, along with the technological applications that can help companies in this process. Therefore, it begins by presenting the importance of the organizational structure for the implementation of excellent communication, then two types of organizational communication are evidenced, institutional communication that deals with an aspect more related to internal processes and staff training for better behavior and communication, and marketing communication that has a greater focus on external communication in order to demonstrate a better image of organizations for the market in order to generate benefits. Then, the importance of the relationship between the company and the individuals that compose it is demonstrated and how this relationship can affect organizations and then the challenges to establish excellent organizational communication are listed, such as the establishment of good relationships and the way to disseminate information. At the end, it is presented how DICTs can impact this communication process in a broad way, and some types of technologies and their specific impacts on communication are highlighted, such as big data, cloud computing, virtual and augmented reality, and artificial intelligence. Where it is possible to conclude that communication of excellence in companies is essential and digital technologies are extremely important for the realization of this, as their applicability meets the needs of organizational communication. This article used bibliographic texts for its elaboration and is an exploratory research.

Keywords: Communication. Behaviour. Companies. TDICs. Technologies.

¹ Doctoral student in Business Administration at Must University. Master in Business Administration from Must University. Graduated in Business Administration. Graduated in Accounting Sciences. Graduated in Economic Sciences. Graduated in Financial Management. With an MBA in Digital Marketing. MBA in Economics, Market and Finance. MBA in International Trade. Specialist in Teaching in Administration. Specialist in Administrative Law. Specialist in Strategic Planning. Specialist in Quality Management. Specialist in Business and Strategic Accounting. Specialist in Blockchain, Cryptocurrencies and Finance in the Digital Age. Specialist in Training of New Managers. Specialist in Agribusiness. Specialist in Creative Economy and Business Management. E-mail: lelleslemosprofessional@gmail.com



INTRODUCTION

Communication is essential for better survival, both for people and business organizations, as the act of communicating enables better interaction between people, whether in companies or in other social environments where these social interactions can generate great impacts.

In a company, when people communicate in a calm and equal way with each other, the work environment can generate less stress, greater cordiality between the parties, and consequently a better performance in the work done, which will ultimately impact the results obtained by the organization.

Therefore, communication must be worked on by companies in order to engage their employees, both leaders and subordinates so that they feel part of something and that they also understand the paths taken by the organization, as it will be essential that employees understand everything that the company communicates correctly, as this can bring greater agility to operational processes, fewer errors at work and avoid misunderstandings, so employees feel aligned with the company and its goals.

In this context, there are several ways to improve communication between companies and employees and their other stakeholders, something that can be essential in this process are the *TDICs (Digital Information and Communication Technologies)*, because *technologies today are transforming all sectors and communication could not be left out, so it will be very important that organizations use technologies that provide the improvement of communication so that Keep up with the news and develop through these technologies.*

When a company does not have improved communication with its employees and its stakeholders, it will tend to errors, failures, interpersonal problems among employees, errors in supplier orders, as well as a not so good view of the market. Therefore, improving communication and using technologies that can help in this process can be the differential that will make the company achieve the desired success.

This article used the literature review as a research methodology that was carried out through an exploratory research and aims to highlight the types of communication in organizations, the organizational structure focused on communication, the individual-company relationship and the challenges to establish communication and behavior of excellence. As well as to highlight the importance of DICTs for organizational communication, list some of the technologies that make up DICTs and highlight their applications in communication, and finally identify the importance of these technologies for organizational development.



COMMUNICATION AND ORGANIZATIONAL BEHAVIOR

The organizational environment can be full of challenges to be overcome, given the dynamism and speed with which processes occur within companies, communication can be the pillar that will support and organize all this so that the company can achieve greater performance and productivity, as well as retain talented professionals within the organization.

When dealing with people, it is necessary to understand that each person is different and, therefore, may have different behaviors in the same situation, so understanding people and their behaviors in the professional environment will be extremely important so that the company's objectives are achieved while employees feel they belong to that environment.

ORGANIZATIONAL STRUCTURE

To understand the aspects of communication, behavior and its importance, it is first necessary to know the organizational structure of companies, because it is from this work structure that people will demonstrate their behavior and communicate, as they will also be communicated, and depending on the structure of the company, communications may or may not be flawed, as well as positively or not impact the behavior of employees.

But what is an organizational structure? According to the PMBOK (2013), organizational structure is an ecosystem agent of the organization that has the ability to impact the available resources and induce the way of conducting the projects that are being carried out by the company.

Therefore, the organizational structure can be understood as the structured environment of a company that, depending on its structuring conjunctures, may or may not facilitate the development of business in various areas.

In communication and behavior within companies, the organizational structure also plays a very important role, as it is nothing more than the environment where people work and produce, so environmental factors can influence organizational processes. In accordance with the above, the PMBOK (2013) states that the orientation and management of projects are influenced by the environmental factors of the organization.

These factors present in the environment may impact behavior and communication within the company, as it is something that is part of the daily life of all employees of the company. The PMBOK (2013) brings as an environmental factor of the organizational structure the management of people within companies, where the management performs performance analysis of professionals and records all training of people, among other functions.



In this way, the organizational structure of companies must be prepared to have excellent communication with employees to have as few problems as possible, as well as to influence people's good behavior, so that the company becomes more productive and is a place that people want to be not only to work, but to live together and perform a function in an excellent way.

INSTITUTIONAL COMMUNICATION

This type of communication consists of communication that aims at the dissemination and understanding of information with its stakeholders, which seeks to strengthen the characteristics of the institution so that it can generate greater reputation and consequently attract and retain a larger audience to acquire higher income.

According to Diniz (2019), communication for corporations is essential, as it is a differentiating aspect of strategic competitiveness. Therefore, it is essential that institutions behave correctly when communicating, especially with their target audience, as markets can be competitive and erroneous communication can induce customers to look for competition.

In this way, it is evident that institutional communication must be understood and applied correctly by organizations, so that it communicates correctly internally and externally. In the internal environment, it must communicate in such a way that employees at all operational levels are aware of notifications, memos, information and important changes, while also helping to avoid errors and rework arising from noise in communication, which in turn communication when not well executed can lead to internal conflicts and greater wear and tear for people that in the end can end up in unsuccessful jobs and health problems for employees.

In this context, Diniz (2019) states that in the environment of organizations, good communication is needed to improve relationships, so that all the information that is communicated becomes understood while meeting the needs of the company, thus avoiding the possible noises and bottlenecks arising from incoherent communication.

While Diniz, Botega & Marques (2022) express that communication when in the internal environment of organizations becomes a link that has the ability to ensure that professionals remain motivated in order to engage more with the company, making the production process of companies more efficient and with greater assertiveness in order to enable, therefore, that organizations achieve the established objectives.

On the other hand, the company in its external environment must communicate excellently with its stakeholders, as erroneous or misunderstood communication in an order



to a supplier may lead to lost time and higher operating expenses, while disclosing incomprehensible or doubtful information may cause investors and shareholders to end up not continuing to invest in the company. Therefore, the act of communicating must be at the heart of organizations, because without excellent communication, numerous adversities may arise in the pursuit of established objectives.

Diniz, Botega & Marques (2022) complement by stating that since external communication is focused on external customers, organizations may adopt communication strategies that are different from those used in the internal environment, depending only on the communication strategies used by the company. Therefore, external communication is about the dialogue between the company and the government, the community itself, and primarily its own customers, that is, its stakeholders. In this way, companies must understand that institutional communication needs to happen in a simplified, clear and direct way.

MARKETING COMMUNICATION

Communicating with audiences outside the organization is an important step to establish yourself as a successful company, as the way companies show themselves to the market can generate positive impacts or the opposite, depending only on their way of behaving in front of people. In this way, good communication will also be extremely important for the development of organizations.

Accordingly, Panzarini (2015) exemplifies that companies in order to be persuasive, given the number of competitors, need to go beyond the usual, that is, the products and services offered and other tangible aspects, it is necessary to look at the brands themselves to visualize and understand how they can attribute differentiating factors to please the target audience.

In this way, companies should look for intangible aspects that can impact people so that they become customers, and good communication can generate this competitive advantage in order to attract and retain customers, as good communication can have the power of persuasion and be the decision-making factor for people.

According to Panzarini (2015), this type of market-oriented communication can be strategically articulated for the positioning of companies and to sell their products and services to potential customers.

For this, what will be disseminated through this communication must impact people and for this companies must use tools to develop the message and make it reach the intended target audience in the way the message was thought and imagined, without noise



or misinterpretation. There are several strategies and tools that companies can use to achieve the desired result of communication.

Panzarini (2015) emphasizes that to build an impact communication with the market, companies use tools present in marketing communication, including advertising, public relations, advertisements and merchandising to establish a relationship with consumers so that they consume their products or services continuously.

Therefore, it is noticeable that marketing communication has a great impact on the results of organizations and comes in line with marketing, that is, companies can use marketing to assist in the development and propagation of their intentions through communication in order to boost the growth of consumption, where from the understanding of the message that the company disseminates to the market, This message can be the link that will connect people to a particular company and will make that company increase its sales, improve its image and increase its profitability and its positioning in the market compared to its competitors, something that should be highly valued, given the number of competitors present in the market and the possible difficulty of maintaining itself in a competitive market.

INDIVIDUAL-COMPANY RELATIONSHIP

Employees need to understand the company so that they can perform quality work and collaborate for the growth of the organization, but the company must also understand its employees and understand that each human being has individual characteristics that denote different needs, where certain actions may not be beneficial to employees and may cause discouragement, stress and consequently unproductivity, And to avoid these and other inconveniences, this individual-company relationship should be cultivated in a beneficial way, as happy people will tend to work happily and do jobs well done, thus positively impacting business.

Miranda, Borges & Moreira (2012) emphasize that because the business environment is complex with each passing day, it becomes more important to understand the functioning and construction of organizational relationships, as well as the connections developed in individual-company relationships.

Understanding this aspect of the organizational environment can bring some benefits to organizations, because when it knows its employees and provides a greater understanding of the workspace while demonstrating its satisfaction with the work done, it can generate greater motivation for individuals to continue dedicating themselves to the organization, this can bring greater freedom of expression and questioning to individuals,



where it can generate new work ideas or even important changes in the way the operational process is carried out.

According to Miranda, Borges & Moreira (2012) this factor is really important, because when a person who works in the organization becomes a subject and finds loopholes to ask questions and discuss something, this encourages their creativity, which can lead to benefits for this individual and for the company he works for.

In this way, it is possible to understand that when a company creates good relationships with individuals within its environment, this can generate a greater sense of importance for individuals in relation to the company by making them really care to the point of positioning themselves through questions aimed at improving the organization's processes, And he does it because he knows that the company will understand him and even if he does not apply his questions, he will know that this will not become a reprisal, and that his questions at some point may be understood by the organization as necessary and this, when true, can generate greater efficiency, speed, higher quality of production, a more harmonious work environment, greater creativity, quality of life at work, higher sales, and finally, greater profitability for companies. In this way, individuals become part of the company's own identity, as their actions and questions are relevant and can generate benefits for the organization.

In accordance with the above, Miranda, Borges & Moreira (2012) agree that in the organizational sense, the act of an individual questioning the practices carried out in the organization and ending their questioning through their own actions, to some degree, contributes to the company's identity.

By highlighting these factors, it is possible to understand that organizations must learn to cultivate the individual-company relationship, because this relationship, when well cultivated, can bring benefits to both sides and make individuals active thinking beings in the organization and capable of being problem solvers and being the pillars that will lead the organization towards the desired success.

CHALLENGES TO ESTABLISH EXCELLENT COMMUNICATION AND BEHAVIOR

To create a successful relationship both with employees and with the market itself, organizations will need to be able to communicate in a precise and easy-to-understand way, as this can be the determining factor for their actions, positioning in the face of problems, image in the market, market positioning, among others. Any inconsistencies, whether internal or external, can generate challenges to be overcome, which can lead to

higher operating and production costs, loss of market, and several other problems that can generate losses if not solved.

Junior (2006) complements by stating that the very act of communicating within organizations encounters challenges, given the conflicts that exist between work relationships and human relationships in this contemporary moment.

That said, the managers of organizations must turn their gaze to the creation of good internal and external relationships aimed at reducing or even excluding any risks that may cause challenges to be faced.

In this context, Oliveira, *et al* (2018) explain that when managers fail in internal and external communication, there may be several related risks that may be detrimental to the functioning of the organization, in any means of communication used.

Therefore, this factor brings the first challenge that organizations may face when trying to establish excellent communication and behavior, because the very act of establishing communication and good behavior must be carefully planned to prevent managers and organizational leaders themselves from implying unnecessary risks.

In addition to the above, Oliveira, *et al* (2018) point out some of the factors that must be carefully analyzed to avoid possible problems in communication, such as the language used to carry out the communication, the way of interacting with other employees and disseminating information that has not yet been confirmed. These precautions must be taken so that it does not cause inconsistencies for companies, as the information and the way of communicating must always be clarifying, enabling greater development for the organization.

Communication, as mentioned earlier, can be a trigger for organizational development, and learning how to use it correctly and efficiently can be a game-changer and a driving factor for business continuity, but the opposite is also true, because by using the tools to communicate incorrectly, you can incur unnecessary risks that can end in the company's setback, and this must be analyzed with extreme caution so as not to incur in these risks, especially at the beginning when companies may have other challenges to deal with, essentially in small companies that may be struggling day by day to survive and stand out in the market full of competition and constant changes.

Oliveira, *et al* (2018) confirms the above when they state that small businesses go bankrupt because they do not manage communications with due importance and because they do not care about the work environment, often having very small spaces for their employees to perform their functions, due to the accumulation of errors and absence of feedback, which ultimately convert into losses, causing the company to row towards



decline, going backwards and leaving its development potential towards becoming a successful company to return to the starting point and having to start practically from scratch again.

In this way, it is understandable that organizations must essentially be good at communication so that all their internal and external processes can flow towards their established objectives, and the correct use of this and other factors can contribute to this actually occurring, especially in this era of technologies, information and artificial intelligence, where these and other tools can be of great help for the development and differentiation of the market.

TDICS AND THEIR APPLICATIONS IN ORGANIZATIONAL COMMUNICATION

There are several technologies that can be understood as DICTs, where many, if not most, of them bring important characteristics to the development of organizations. Therefore, they have several applicabilities, including their usability in internal and external communication strategies and processes. In this way, it is highlighting some technologies that make up TDICs and how they can integrate and benefit communication and organizational behavior.

Virtual and Augmented Reality

According to Sebrae (2023), virtual reality (VR) enables the individual's immersion in the digital universe. Augmented reality (AR), on the other hand, combines the virtual world with reality, providing people, through electronic devices, with the visualization of virtual instruments in a real condition.

In this context, virtual and augmented reality can impact the communication processes of companies, because according to Castro Alves (2022) in her research, the author identified that this technology can be used as a tool to generate empathy in people, so that they understand the other side and see what it feels like to feel what another person in a given situation feels. Therefore, these technologies provide perspectives of another person or animals, with the vision turned to them in the context of the narrative, providing them with the opportunity to experience the realities of other beings.

It is possible to apply this concept in organizations, both in the internal and external environments. In the internal environment, it can be used for employee training, so that they can be more attentive in the way they treat people, so that they acquire better behavior and attentive communication with greater empathy among themselves, and especially in serving the public.



In the external environment, this technology can be used for marketing communication and advertising of promotions and launches of new products or campaigns. Because this technology can turn a simple image present in a package into something totally intuitive and creative that can be experienced by customers, as well as attract new consumers to the brand, because when applied in marketing campaigns to communicate a product to people, virtual and augmented reality can be a great differential for the product and attract people's attention.

Castro Alves (2022) brings some examples of how virtual and augmented reality can be applied in marketing communication by stating that these technologies have already been used by major brands in their marketing campaigns, such as the use of augmented reality by Burger King to burn McDonald's advertising, where when scanning the advertising poster with the smartphone, it burned and showed advertising for a new Burger King product, all through augmented reality elements.

Also according to Castro Alves (2022), AR technology can be used to disseminate exclusive content created by the brand itself, as well as highlight the brand through animations and movements in the brand, whether in the logo or in the product. Well, an action through a playful visualization in AR can attract people to experience the brand. This type of visual communication provides greater dynamism through readings of AR codes on packaging, prints, labels, even in prints on clothes, thus becoming a competitive differential.

The communication of companies in the external environment goes far beyond just writing and speaking, communication is present in the organization's own image, in its marketing, in the way it uses its image to attract and retain customers, in the packaging and labels of its products. And virtual and augmented reality has the ability to improve these aspects so that companies communicate their products through interactivity and actions that provide personalized experiences.

AI - Artificial Intelligence

According to Cruz (2023), the rapid development of artificial intelligence has brought about a transformation in the way companies communicate with their stakeholders, generating several advantages and challenges for themselves, in a disruptive moment.

In this way, companies will be able to use artificial intelligence tools to improve their communication, but they may have to overcome some challenges for this to occur in its fullness, in this way, when well used, it can provide organizations with some essential benefits for their continuous development.



According to Cruz (2023), artificial intelligence in companies has been used to improve applications in their communication, such as the automated sending of information to employees, scheduling meetings, and building documents. In addition, through this it is possible to perform data analysis to identify behavioral patterns and employee participation, enabling more efficient strategic planning so that the team feels motivated and increases production growth.

Artificial intelligence has the ability to generate more interactive and assertive communication so that all messages or conversations carried out have the expected impact on their recipients, it also brings greater speed to the dissemination of important information, impacting the strategies of organizations and perhaps their decision-making, helps in understanding the behaviors of individuals present in the environment and uses them to incorporate them into strategic plans in order to avoid actions and behaviors that do not agree with organizational development. Below in Chart 2 it is possible to highlight other applicabilities of artificial intelligence in organizational communication.

Table 2. Applicability of AI in organizational communication.

APPLICATIONS	DESCRIPTION
Application 1	Companies can perform analysis of social media users' data, understand their individual tastes, and suggest products, segmented emails, services, and personalized experiences.
Application 2	Improve machine translations, enabling companies to communicate with partner companies in different languages and regions.
Application 3	Condense content, being summarized news and the most important updates of goods and services.
Application 4	Perform insights and data analysis, identify patterns and trends to contextualize strategic communication plans and issues of relevance in the traditional press, written reflections and viewer engagement.
Application 5	Segmentation of viewers, scheduling publications on social networks, tracking the performance of publications made and making immediate corrections to improve the related effects.
Application 6	Monitor media and social networks to prevent imbalances in the organizational image.
Application 7	Provide quick service, through virtual assistants and <i>chatbots</i> , to offer an assistance service with accurate answers to questions, especially the most recurrent ones.

Source: Adapted from Cruz, 2023.

However, the use of artificial intelligence in organizations goes far beyond applicability and benefits, this technology also has its challenges and requires care in its use so that everything occurs correctly, as it has implications that can generate inconsistencies in communication and other areas of companies when not used correctly. Therefore, organizations must look not only at the benefits, but everything that includes the process of implementing and using this technology in the communication process

Cruz (2023) agrees with the above and shows that it is essential that companies turn their eyes beyond the benefits of artificial intelligence in communication and use it more carefully and strategically, in view of its limits and potential. Because, by understanding and knowing how to use the best of technology, such as automating activities that have continuous repetitions and the analysis of huge volumes of data, and at the same time focusing their attention on the limitations and challenges linked to artificial intelligence, such as the absence of an empathetic being and prejudiced tendencies, companies have the job of ensuring that everything related to this and other technologies is transparent, possessing ethics and equity.

Communication undoubtedly benefits from the use of artificial intelligence by organizations, as it helps in better service, in the behavioral management of individuals present in the company's internal environment, in the same way that it allows data analysis and external information in large volumes, enables market understanding, communication without borders and a better understanding of everything the company communicates to its stakeholders. This technology, when well applied in organizations, can play a guiding role in more assertive and improved communication in the face of organizational needs.

Big data

The evolution of companies and businesses, as well as society in general, brings significant changes to global development, where it is necessary to capture, analyze and generate a huge amount of data to obtain precious information for better business decision-making. In this process of analyzing and managing large volumes of data, communication may be inaccurate, as people may not understand the totality of the data or even analyze only superficially, in this way, when the analyzes obtained from these are passed on, it may generate inconsistencies in the decision making of companies, that is, the communication of the analyzed data will be passed on with noise or little precision, Therefore, it will be necessary to use digital tools that are capable of doing this entire process with the least amount of errors possible. And Big Data can assist in this process to improve data communication in the organizational environment.

Da Silva (2021) agrees with the above and states that understanding that Big Data is essential for improving the effectiveness of companies' communication, as it is essential for organizations to carry out good marketing using data, since through the analyses made by Big Data and the correct use of this data by the organizations that they currently make their strategic definitions.

In this way, Big Data helps in the elaboration of companies' strategic processes and has the ability to safeguard all organizational communication that is part of these strategic procedures. Therefore, having its characteristics allows for more assertive communication in the processes that involve decision-making for the continuous development of organizations.

This technology also has the ability to develop good relationships in the organizational environment, managing the behaviors of individuals and creating a more productive, organized and harmonious organizational climate, with only its correct and well-planned application being able to acquire these and other benefits.

According to Cabestré & dos Santos (2013), in order for companies to be able to share their goals and achieve them, the public relations professional must have a consistent performance, coming to meet the core of the companies, enabling the occurrence of harmonious interpersonal relationships and the use of new technologies such as Big Data. The quantitative factors obtained through this technology can be used by the public relations professional, both to enrich the collective learning of individuals in the internal organizational environment, and to corroborate the fulfillment of organizational goals and objectives.

Cloud Computing

According to Susnjara & Smalley (2024), *cloud computing* is an *on-demand* form of computing resources, such as storage resources, local or virtual server, tools and applications elevated through AI, among others. It also happens through the internet, where your payment is made as you use it.

In this way, cloud computing can be considered a digital technology that aggregates tools and functions in a virtual space, with greater speed and flexibility, greater security and lower costs compared to physical hardware and servers.

When it comes to organizational communication, this technology will be essential for organizations to maintain their operational agility, because through cloud computing data can be transacted from anywhere in the world securely and practically instantaneously. Therefore, companies that have their tools in the cloud are able to obtain data faster, hold meetings faster with all the necessary members, make assertive decisions faster, and finally launch innovative products and services faster and globally.

Cândido & Araújo Júnior (2022) corroborate the importance of cloud computing for communication and organizational development by stating that the act of sharing data and information and the way one interacts with stakeholders are priority actions in strategic



information management, knowledge management, communication itself, and company routines. Especially with the advent of alternative forms and places of work, which can be evidenced with the *home office* and the use of *coworking*.

That said, cloud computing has brought greater agility and flexibility to communication in companies, so much so that employees have the ability to work from their homes without having any loss of earnings, as all the necessary information is available, and communication between company members can be carried out immediately and without noise.

According to Cândido & Araújo Júnior (2022), the way man and machines interact has been providing new advances that provide greater specialization in production processes, because with the implementation of intelligence in machinery, it enables greater control of *inputs*, operations, where cloud computing is essential to bring new functions and approaches to the management of information itself within companies.

Efficient communication is to transmit information effectively and with the least amount of noise possible, so that the recipient understands the message that the sender sent and returns feedback with their considerations. In other words, when cloud computing provides better information management, it is corroborating better communication between the company and its stakeholders.

Finally, Cândido & Araújo Júnior (2022) conclude that *cloud computing* tends to be a very effective alternative in information management, as long as aspects such as the knowledge needed by individuals are taken into account, as it is a critical factor for the best use and consequently the success of the management of data and information managed and structured in the cloud.

TECHNOLOGIES IN BUSINESS DEVELOPMENT

As evidenced so far, it is possible to visualize the importance that technologies have in the context of communication and organizational behavior and in the way their benefits reflect on other areas of companies. That said, technologies have the ability to assist in the development and growth of businesses when applied correctly in the organizational environment, where it can bring several other benefits to the numerous departments.

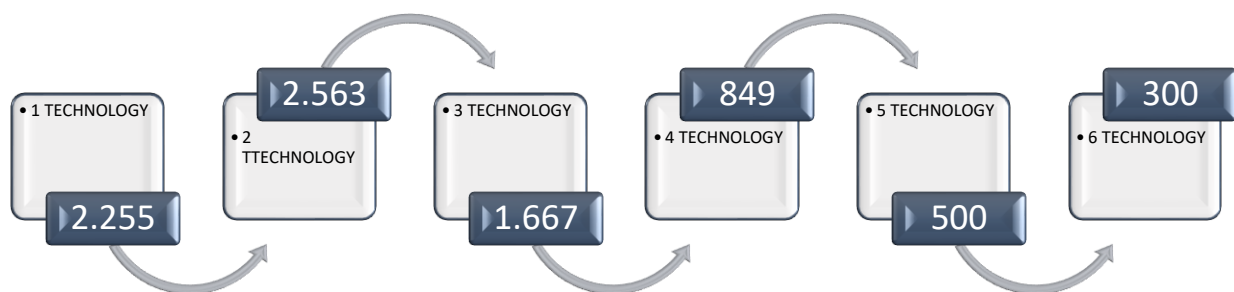
According to Sebrae (2023b), with the new technologies arising from the development of recent times, it brings the possibility for companies to plan, adapt or implement recent technologies and innovations in their business, so that in this way they have updated processes, products and services so that they can meet their demands in a personalized and differentiated way from other companies.

In this way, technologies today are essential for any type of companies, regardless of their nature, because technological advancement requires this update by companies so that they can continue to operate in the market in a competitive and attractive way for consumers, because companies that do not use new technologies may lag behind and lose market share to companies that are investing in the most diverse technologies that are emerging for improve your business as a whole.

A great proof of this evidence is pointed out by Gomes & Cabral (2023) through the IBGE evidenced by the Semiannual PINTEC survey carried out in 2022, where the results found indicate that of the 8,134 companies in the industry sector used at least one of the technologies, which are big data, cloud computing, artificial intelligence, internet of things, additive manufacturing, and robotics. Where most of these companies used at least two technologies, totaling 31.5%, companies that used only one totaled 27.7%. Where only 3.7% of companies used all technologies in their processes.

Through these data it is possible to show that technologies are of great importance for all companies, regardless of their field of activity, below in Figure 1 these results of the use of technologies by companies in a broader way for better understanding are evidenced.

Figure 1. Use of technologies by industrial companies.



Source: Adapted from Gomes and Cabral, 2023.

Through this data, it is possible to say that several companies already use one or more technologies in their processes for the best development of their operations, aiming to obtain benefits for their business. On the other hand, not all companies use technologies in their operations, this is due to several reasons, whether it is the need for major changes, training, lack of knowledge, or even the associated costs necessary for the implementation of new technologies in the organizational environment.

Gomes & Cabral (2023) state that of the results obtained in their surveys, where 9,586 companies with more than 100 people in the operation were surveyed, 15.1% did not implement any type of digital technology in 2022, and the main reason for them not to adopt

technologies was due to the high costs for implementing technology solutions, where this factor was pointed out by 70.3% of the companies that did not use any technology.

Therefore, it is necessary to disseminate even more knowledge about new technologies so that organizations understand their importance, in order to understand that the costs may indeed be high, but the future benefits may be immeasurable in the face of these initial implementation costs.

In this way, if most companies are already investing in new digital technologies for the development of their business, companies that do not invest will tend to fall into oblivion and end up incurring in a bankruptcy process, while companies that are investing in new technologies will be able to continue acquiring greater competitive advantages in order to become increasingly productive. profitable and perennial in an increasingly challenging and competitive world. In addition, Sebrae (2023b) says that for companies not to lag behind in the market and in a way ensure greater competitiveness, they need to innovate continuously.

METHODOLOGY

This article aims to highlight the importance of communication in the organizational context, and to demonstrate the potential of DICTs in the communication process, as well as in companies in general, so that organizations can develop continuously towards success.

To this end, it began with the evidence of the types of communication in companies, with the importance of the relationship between individuals and companies, after which the challenges to establish successful communication are demonstrated, and finally, the importance of digital technologies in this context is demonstrated, where their applicability was demonstrated and some of the technologies and their importance for communication were evidenced, demonstrating the impacts that these technologies can have on business.

To achieve these objectives, documentary and bibliographic texts are used to demonstrate the applicability and importance of the topics addressed, so that the evidence is accurate and clarifying, therefore, this article used an exploratory research for its elaboration.

Leão (2016) states that when research is carried out through the exploratory method, it aims to have greater knowledge about the researched theme, in order to make something familiar or acquire a new understanding about it, so that it is possible to elaborate a problem more accurately or develop new research hypotheses.



FINAL CONSIDERATIONS

In the end, after listing aspects that demonstrate the importance of communication for organizations and how technologies have the ability to assist in this process, it is possible to understand that organizations must establish a successful organizational structure so that communication can be carried out correctly aiming at improvements in internal and external processes.

Because, the structure is the basis for excellent communication, it is also understandable that business organizations must know and understand the individuals who work there so that they can communicate with them in an excellent way and with the least number of noises and inconsistencies possible, as this can be a factor that will provide greater performance of the processes, products and services.

In this research, two types of communication relevant to companies were evidenced, institutional communication that when applied and disseminated has the potential to attract and please stakeholders in order to develop and establish productive and transparent relationships, the second type exemplified was marketing communication that focuses on the foreign market and relates to marketing, where this is important so that companies can have a better positioning in the market and a better brand image, where both are important to acquire competitive advantage, attract and retain customers, overcome competitors and establish and consolidate a brand in the market.

Digital technologies, TDICs encompass organizational communication and bring new characteristics that benefit communication in companies, where through this research it is possible to understand that technologies today are essential to establish successful communication in companies, given that technologies are evolving by leaps and bounds and companies need to use them to keep up with the market and perhaps stand out in it, and as a consequence take advantage of its benefits for its own development.

There are several technologies that make up TDICS, big data is one of these technologies and it is of immense importance for companies, both in internal and external communication, because given its great capacity to capture, manage and analyze data, in a world that increasingly generates greater volumes of data, it becomes essential for communication in decision-making.

It was also evidenced virtual and augmented reality, *cloud computing* and artificial intelligence, where these also have a huge importance for organizational communication processes, virtual and augmented reality can be used for employee training in order to generate greater empathy and respect for others, it can be used in marketing campaigns and in personalization of labels and packaging.



Artificial intelligence meets the automation of repetitive tasks and processes, and has automated communication systems, such as *chatbots* for customer service, and in the internal environment it can be used to develop an intelligent and automated internal communication system for the better development of operational processes, as well as communication systems with simultaneous translation.

While cloud computing has remote, secure and low-cost communication, allowing professionals to access companies' resources and information anywhere, improving communication especially when some important members of the organization cannot attend important meetings.

Many companies already use TDICs in their processes due to these and other benefits, as these technologies have the ability to transform business and assist in the continuous evolution of processes in order to prevent companies from lagging behind, it also brings the possibility of gaining prominence in some way in its segment, as technologies can make companies transform into something totally new and improved in a way that is It is possible to establish an effective communication system, efficient processes, personalized service, products and processes that correctly meet demand and, finally, acquire a competitive advantage over other companies, so that it can generate greater profitability and succeed in an increasingly challenging and competitive world.

As limitations, it is possible to establish that this was done only by bibliographic research, and did not carry out an empirical research for the best evidence of data regarding communication and behavior linked to technologies in the organizational environment and, therefore, it is recommended to address these factors for future research.

REFERENCES

1. Castro Alves, D. (2022). ****Multissensorialidade e experiência: os usos da realidade virtual e aumentada na comunicação mercadológica****. UERJ. Disponível em: <https://www.bdtd.uerj.br:8443/handle/1/18112>. Acesso em: 27 jul. 24.
2. Cabestré, S. A., & dos Santos, V. M. ****Comunicação, informação e conhecimento nas organizações inovadoras: repensando o uso de big data****. Disponível em: https://repositorio.ufpb.br/jspui/bitstream/123456789/20581/1/TCC%20JANIELE_DIAS_DA_SILVA%20_21072021.pdf. Acesso em: 1 ago. 24.
3. Cândido, A. C., & Araújo Júnior, R. H. (2022). ****Potencialidades do desenvolvimento de cloud computing no âmbito da gestão da informação****. DOI: <https://doi.org/10.1590/1981-5344/25731>. Disponível em: <https://www.scielo.br/j/pci/a/rXjTqsQByRGZp6NQxSr8WYw/>. Acesso em: 06 ago. 24.
4. Cruz, A. C. S. (2023). ****Inteligência Artificial e a comunicação nas organizações****. **Revista Temática**, 19(10). DOI: <https://doi.org/10.22478/ufpb.1807-8931.2023v19n10.68280>. Disponível em: <https://periodicos.ufpb.br/ojs/index.php/tematica/article/view/68280>. Acesso em: 30 jul. 24.
5. Da Silva, J. D. (2021). ****Convertendo dados em conteúdo: big data e marketing orientado a dados como estratégia de comunicação para o instagram****. Disponível em: https://repositorio.ufpb.br/jspui/bitstream/123456789/20581/1/TCC%20JANIELE_DIAS_DA_SILVA%20_21072021.pdf. Acesso em: 1 ago. 24.
6. Diniz, E. S. (2019). ****COMUNICAÇÃO INSTITUCIONAL: A Comunicação e sua Contribuição para o Processo Educacional no Instituto de Ensino Superior Franciscano – IESF no município de Paço de Alumiar****. Disponível em: https://comum.rcaap.pt/bitstream/10400.26/29306/1/DISSERTA%C3%87%C3%83O%20DE%20MESTRADO_Edilson%20Diniz.pdf. Acesso em: 03 jul. 24.
7. Diniz, E. S., Botega, F. R., & Marquers, H. M. F. (2022). ****Comunicação institucional: a comunicação e sua contribuição para o processo de desenvolvimento organizacional****. Disponível em: https://www.excellenceeduc.com/revista_cientifica_excellence-V_13_mar_2022_artigo_09.pdf. Acesso em: 03 jul. 24.
8. Gomes, I., & Cabral, U. (2023). ****84,9% das indústrias de médio e grande porte utilizaram tecnologia digital avançada****. Disponível em: <https://agenciadenoticias.ibge.gov.br/agencia-noticias/2012-agencia-de-noticias/noticias/37973-84-9-das-industrias-de-medio-e-grande-porte-utilizaram-tecnologia-digital-avancada>. Acesso em: 10 ago. 24.
9. Junior, P. R. F. (2006). ****Os desafios da comunicação no contexto das relações de trabalho****. **Novos Olhares**, 17, 4-13. DOI: <https://doi.org/10.11606/issn.2238-7714.no.2006.51420>. Disponível em: <https://www.revistas.usp.br/novosolhares/article/view/51420>. Acesso em: 11 jul. 24.
10. Leão, L. M. (2016). ****Metodologia do estudo e pesquisa: facilitando a vida dos estudantes, professores e pesquisadores****. 1. ed. São Paulo: Vozes. E-book. ISBN: 9788532662255.

11. Miranda, A. R. A., Borges, C. L. P., & Moreira, L. B. (2012). ****Relação Indivíduo-Organização: Possibilidades de (Re)construção de Identidades****. *PERSPECTIVA, Erechim*, 36(134), 95-108. Disponível em: https://www.uricer.edu.br/site/pdfs/perspectiva/134_274.pdf. Acesso em: 10 jul. 24.
12. Oliveira, A. V., Dos Santos, E. R., Da Silva, K. C. F., Brito, L. S., Souza, M. C., & Pizzoni, T. G. P. (2018). ****Comunicação organizacional como estratégia de gestão****. *Revista AJES*, 7(14). Disponível em: <https://www.revista.ajes.edu.br/index.php/rca/article/view/143/0>. Acesso em: 11 jul. 24.
13. Panzarini, B. (2015). ****A comunicação mercadológica e a mundialização de um estilo de vida: estudo de caso da marca Harley Davidson no Brasil****. Disponível em: https://static.casperlibero.edu.br/uploads/2015/01/Bruna-Panzarini.UMESP_.pdf. Acesso em: 09 jun. 24.
14. PMBOK. (2013). ****Um Guia do Conhecimento em Gerenciamento de Projetos (Guia PMBOK®)****. 5ª ed. Newtown Square: Project Management Institute. ISBN: 9781628250077. Disponível em: https://www.facom.ufu.br/~william/Disciplinas%202019-1/BSI-GSI033-GerenciaProjetosTI/PMBOK_5aEdicao.pdf. Acesso em: 02 jul. 24.
15. Sebrae. (2023). ****O que é realidade aumentada e realidade virtual?***** Disponível em: <https://sebrae.com.br/sites/PortalSebrae/artigos/o-que-e-realidade-aumentada-e-realidade-virtual,9da08ec38f685810VgnVCM100000d701210aRCRD>. Acesso em: 27 jul. 24.
16. Sebrae. (2023b). ****Desenvolvimento Tecnológico****. Disponível em: <https://sebrae.com.br/sites/PortalSebrae/Programas/a-atuacao-do-sebraetec-em-inovacao,be71d53342603410VgnVCM100000b272010aRCRD>. Acesso em: 10 ago. 24.
17. Susnjara, S., & Smalley, I. (2024). ****O que é computação em nuvem?***** Disponível em: <https://www.ibm.com/br-pt/topics/cloud-computing>. Acesso em: 06 ago. 24.

MAJOR NEUROLOGICAL DISEASES IN SMALL ANIMALS

<https://doi.org/10.56238/sevened2024.029-004>

Lídia Ketry Moreira Chaves¹, Luiza Guarnieri Sabadin², Maria Clara Gomes Batista³, Livia Cortez Braga⁴, Danilo Lourenço de Albuquerque⁵, Maria Laura Alvares França Miranda⁶, Francisco Fábio Mesquita Oliveira⁷, Michelly Dias de Oliveira⁸, Wanessa Ferreira Boabaid⁹, Andreia Oliveira Santos¹⁰, Alexia Rayane Bento Ribeiro¹¹ and Mateus de Melo Lima Waterloo¹²

ABSTRACT

The incidence of neurological diseases in dogs and cats is high, leading to several complications that impair the quality of life of animals. Epilepsy, which is characterized by frequent seizures, herniated discs, which can result in spinal cord compression, and hepatic encephalopathy, commonly linked to severe liver problems, are the most common conditions. Managing these conditions requires early recognition of complications and transparent communication between the veterinarian and the owner, which is crucial to ensure appropriate care. Often, treatment of epilepsy includes the use of phenobarbital and potassium bromide. However, about 25% of patients may require additional therapies due to resistance. A herniated disc, on the other hand, needs a thorough diagnosis and can be treated through medications or surgical procedures, depending on their severity. In addition, the treatment of hepatic encephalopathy involves decreasing ammonia absorption and correcting metabolic disorders. In all situations, intensive care and meticulous management are essential for recovery, highlighting the relevance of prevention and appropriate treatment of neurological diseases in small animals

Keywords: Epilepsy. Herniated Disc. Hepatic encephalopathy. Veterinary neurology. Intensive treatment.

¹ Undergraduate student in Veterinary Medicine at the Federal Rural University of the Semi-arid (UFERSA)

² Undergraduate student in Veterinary Medicine at the Federal Rural University of the Semi-arid (UFERSA)

³ Undergraduate student in Veterinary Medicine at the Federal Rural University of the Semi-arid (UFERSA)

⁴ Undergraduate student in Veterinary Medicine at the Federal Rural University of the Semi-arid (UFERSA)

⁵ Veterinarian, professor at the Federal Institute of Paraíba (IFPB)

⁶ Undergraduate student in Veterinary Medicine at the Instituto Master de Ensino Presidente Antônio Carlos (IMEPAC)

⁷ Undergraduate student in Veterinary Medicine at the Federal Rural University of the Semi-arid (UFERSA)

⁸ Undergraduate student in Veterinary Medicine at the Instituto Master de Ensino Presidente Antônio Carlos (IMEPAC)

⁹ Undergraduate student in Veterinary Medicine at Centro Universitário Ingá (UNINGÁ)

¹⁰ Undergraduate student in Veterinary Medicine at Universidade Veiga de Almeida (UVA)

¹¹ Undergraduate student in Veterinary Medicine at the Federal Rural University of the Semi-arid (UFERSA)

¹² Master's student in the Graduate Program in Veterinary Medicine (Animal Clinic and Reproduction) at the Fluminense Federal University (UFF).



INTRODUCTION

In the routine of small animals, the prevalence of neurological diseases in dogs and cats is extremely high (SANTORO AND BAHR ARIAS, 2018; DE LAHUNTA & GLASS, 2015a). Given that most diseases cause motor, sensory and visceral changes, several complications can arise, especially decubitus ulcers, caused by loss of sensitivity, urinary retention or incontinence, urinary tract infection, diaper rash, muscle contractures, ankylosis, muscle atrophy and gastrointestinal and respiratory problems (SANTORO AND BAHR ARIAS, 2018).

The maintenance of the animal may be unfeasible due to present or future problems, and communication with the owner is crucial to minimize the chances of conflicts and improve the patient's quality of life. The veterinarian is responsible for identifying the possibility of complications, informing the owner about the clinical status and, above all, educating him about the relevance of preventing complications and actions to prevent or treat them (SANTORO AND BAHR ARIAS, 2018).

Most of the success in the treatment of neurological diseases is due to appropriate management, which requires special commitment and intensive care. This depends mainly on the commitment and availability of the tutor to ensure the necessary nursing care, such as keeping the animal in a dry and padded place, taking proper care of urination and defecation, changing the animal's position frequently and performing physiotherapy (SANTORO AND BAHR ARIAS, 2018).

Some of the main neurological diseases that affect dogs and cats are: epilepsy, a chronic condition characterized by recurrent seizures; herniated discs, which can cause spinal cord compression and result in pain, paralysis and loss of sensation; and hepatic encephalopathy, a brain dysfunction resulting from problems in liver metabolism, among others. Each of these diseases requires specialized management, aiming not only at controlling symptoms, but also at preventing complications that may impair the quality of life of patients (DE LAHUNTA & GLASS, 2015a).

LITERATURE REVIEW

EPILEPSIA

Epileptic seizures are the most frequent clinical neurological problems of small animals (CHANDLER, 2006). These are clinical signs resulting from abnormal and hypersynchronous neuronal discharges, which are manifested by stereotyped and paroxysmal behavioral changes, usually of an idiopathic nature (KNOWLES, 1998; FISHER ET AL 2005; LORENZ AND KORNEGAY, 2006). Epilepsy is a brain condition marked by



abnormal and unpredictable interruptions of brain function, which favor the appearance of recurrent epileptic seizures (FISHER et al, 2005; LORENZ AND KORNEGAY, 2006).

According to etiology, it can be categorized into idiopathic epilepsy, which has no known cause; symptomatic, which is secondary to an alteration in brain structure; and cryptogenic, which probably has symptoms but cannot establish a cause (CHANDLER, 2006). The classification of epileptic seizures can also be made based on the epileptiform focus (focal or generalized). Focal seizures are restricted to specific regions of the brain, while generalized seizures impact both hemispheres. It is crucial that the veterinarian receives a detailed description of the owner's seizures, as clinical observation can be restricted (CHANDLER, 2006; THOMAS, 2010).

Normal neural communication is mediated by synapses that predominantly use excitatory neurotransmitters, such as glutamate, and inhibitory neurotransmitters, such as gamma-aminobutyric acid (GABA). An imbalance in the activity of these neurotransmitters, either due to excessive excitation or insufficient inhibition, can lead to abnormal neuronal activity patterns, resulting in epileptic seizures (PLATT AND OLBY, 2004). Another type of existing pattern is "status epilepticus", which is an emergency condition characterized by continuous or repeated seizures that last more than 30 minutes, with the risk of irreversible brain damage and death. Treatment involves the immediate use of intravenous diazepam, followed by phenobarbital for long-term control (MARTINS, 2011).

The evaluation of epileptic seizures includes a thorough clinical history, in addition to additional tests such as blood count, biochemical profile and, in certain situations, electroencephalography. Cerebrospinal fluid analysis may be helpful in ruling out inflammation in the nervous system. With regard to treatment, phenobarbital is the preferred drug for the control of epileptic seizures, thanks to its effectiveness and affordable price. The suggested starting dose is 3-5 mg/kg every 12 hours, with modifications made after blood concentration measurement. The goal of antiepileptic treatment is to reduce the frequency and severity of seizures, minimizing adverse effects as much as possible. The use of potassium bromide as an alternative therapy in situations of phenobarbital resistance is possible (MARTINS, 2011).

Although many animals are able to control epileptic seizures with conventional therapies, approximately 25% do not respond adequately, which may require the addition of additional medications. There are few antiepileptics available for complementary use to phenobarbital and potassium bromide, mainly because of their short half-life, lack of knowledge about their effects on pets, and high costs (DEWEY, et al, 2004; ARIAS, 2009). Felbamate represents an option that enhances the inhibitory action of GABA and blocks



sodium channels. About 70% of the ingested dose is eliminated unchanged, while 30% is processed by the liver. The suggested dose for adult dogs is 20 mg/kg every eight hours, because of its short half-life. Although it rarely causes side effects, they can include liver disorders. The main advantage is that it does not cause sedation, but its high cost and the need for frequent administration are significant disadvantages (THOMAS, 2010).

Gabapentin, acting as an analogue of GABA, potentiates the release and effect of GABA in the brain, as well as blocking sodium channels. It is metabolized by the liver by 30-40%, but does not significantly stimulate liver enzymes, reducing the possibility of interactions with other medications. Gabapentin has a half-life of approximately 4 hours, requiring administration every 6-8 hours at a concentration of 25-60 mg/kg. Side effects that may occur include sedation and increased appetite, resulting in weight gain (DEWEY, 2006).

Levetiracetam is an antiepileptic drug whose effectiveness has not yet been fully elucidated. When taken orally, it has a bioavailability close to 100% and a half-life of approximately 3-4 hours. The suggested starting dose is 20 mg/kg every eight hours. Observations suggest that this medication is safe for continuous administration in dogs and may be a good alternative in complementary therapies, particularly for those suffering from liver problems. Levetiracetam has been shown to be effective in cats using phenobarbital, with few adverse effects (DEWEY, 2006). Zonisamide, on the other hand, is a drug processed in the liver and has good tolerability in dogs, even at high doses and for a prolonged period. The suggested dose is 5-10 mg/kg, administered every 12 hours, aiming to achieve therapeutic concentrations of 10-40 mcg/mL. With a half-life of about 15 hours, this medication is also linked to a higher cost than conventional treatments, however, few adverse effects have been reported (DEWEY, 2006).

Animals that remain seizure-free for one year or more may be considered for phasing out of antiepileptic medication. This reduction should occur every two weeks, decreasing from 10% to 25% of the dose, but if there are relapses, the previous therapy should be reinstated. For dogs with idiopathic epilepsy, it is recommended to continue treatment, even after long periods without seizures (MARTINS, 2011).

DISCO HERNIA

Herniated discs, also called Intervertebral Disc Disease, are the main cause of canine spinal cord injuries, usually linked to neurological changes (ALVES, 2018; SILVA, 2017). This condition occurs due to degradation or damage to the structures of the intervertebral disc, which encompass the nucleus pulposus and the annulus fibrosum, impacting both chondrodystrophic and non-chondrodystrophic breeds. In chondrodystrophic

breeds, such as Dachshund, Beagle and Poodle, it is possible to notice changes in the nucleus pulposus as early as three months of age (CECIM, 2019), which increases the danger of exteriorization after the fibrous ring breaks. On the other hand, non-chondrodystrophic breeds generally manifest this condition at older ages, usually presenting only disc protrusions (COELHO et al., 2016; Jones et al., 2000; MCGAVIN & ZACHAY, 2014).

Hansen Intervertebral Disc Disease (IVDD) type I is more common in chondrodystrophic breeds, but it can also manifest in animals without this tendency (THRALL, 2019; GUIDI et al., 2021). On the other hand, Hansen's IVDD type II arises from fiber degeneration and metaplasia. In addition, trauma can result in the appearance of type 3 hernias, particularly in dystrophic dogs of advanced age (NERONE & DIAMANTE, 2018). It can also happen that they manifest as annular or nuclear material in the spinal canal, which characterizes the sequestered hernia (VILANOVA JUNIOR et al., 2019).

IVDD is caused by a degenerative process that is accentuated with the aging of the animal, being influenced by genetic factors and can be accelerated by trauma and biomechanical failures (FENN et al., 2020). Intervertebral disc degeneration results from the loss of the nucleus pulposus (PN) ability to retain water, which leads to its degradation (DEWEY & DA COSTA, 2015; FOSSUM, 2021). In Hansen's hernia type I, the PN is extruded to both lateral and dorsal, thus compressing the spinal canal. The symptoms of IVDD vary depending on the location of the spinal cord injury, the amount of material in the spinal canal, and how quickly this material is expelled (LAHUNTA, GLASS, AND KENT, 2020). These signs can range from spinal cord hyperesthesia to paraplegia with profound pain loss (BRISSEON, 2010; FINGEROTH & THOMAS, 2015). Injuries to the thoracolumbar segment do not compromise the functionality of the forelimbs, but can affect the upper motor neurons and pelvic limbs (PM), resulting in spasticity and paralysis (SHARP & WHEELER, 2005). Pain often leads the animal to adopt a kyphotic posture, arching its back (SHARP & WHEELER, 2005).

The diagnosis is made through a detailed anamnesis and evaluation of the patient's history, considering the predisposition of the breed and species. A thorough neurological examination is also conducted to assess the integrity of the nervous systems and identify the existence, location, and severity of any disorder (SILVEIRA et al., 2020). When planning alternative diagnoses, it is essential to consider inflammatory diseases, such as meningitis or granulomatous meningoencephalitis, which justifies hematological tests and evaluation of cerebrospinal fluid (CESCA, 2018). Imaging tests, such as radiography, computed tomography, myelography, and magnetic resonance imaging, are crucial for an accurate

diagnosis (ALVES, 2018; CESCO, 2018). Among these options, magnetic resonance imaging is the most recommended, as it provides cross-sections that help in the identification and quantification of spinal cord compression, in addition to offering superior anatomical details compared to other methods (ALVES, 2018; CESCO, 2018). This examination also makes it possible to identify one or more herniated discs.

It is important to note that radiography is the most accessible imaging test in Brazil, both in terms of availability and cost, as few cities have MRI or CT scanners. However, myelography poses risks to patients, as it requires general anesthesia and the use of iodine-based contrast. In addition, myelography may not provide an accurate diagnosis, especially in cases of spinal cord edema, making it difficult to locate the affected area (CESCA, 2018). Thus, it is often not possible to access a complete diagnosis of IVDD, as the X-ray can only show a decrease in the intervertebral space, which does not necessarily indicate the presence of a hernia (ALVES, 2018; CESCO, 2018).

Regarding treatment, surgery is indicated when drug therapy does not present satisfactory results, especially when spinal cord compression compromises the animal's quality of life. The goal of surgery is to remove the damaged material and unclog the spinal canal. There are several surgical options available, including the ventral slit, which allows you to visualize the affected area, although it is not suitable for lateralized lesions; dorsal laminectomy, which involves removing structures from two vertebrae in sequence, but can lead to partial removal of herniated material; and hemilaminectomy, which excises one of the joint processes, resulting in less trauma and easier access to the spinal cord. Mini-hemilaminectomy, in turn, uses incisions in adjacent vertebrae, facilitating access to surgical material (GUIDI, 2021).

Physical therapy can play a key role in postoperative treatment, and should be started as early as possible to strengthen the muscles and improve the functionality of the limbs. In the first days after surgery, the focus is on preserving urinary and fecal functions, while after ten days, physical activities begin to be introduced to speed up recovery. Physical therapy can include stretching exercises, massages, and techniques such as electrical stimulation and laser therapy, which help reduce pain and facilitate the recovery process (GUIDI, 2021).

HEPATIC ENCEPHALOPATHY

Hepatic encephalopathy (HE) is a condition that can manifest in dogs with severe liver conditions, such as portosystemic shunts, acute liver failure, and cirrhosis. Although the pathophysiology of canine HS is not fully understood, it is known that it is the result of

several factors. HS is defined as a reversible change in neuronal activity, which arises when the central nervous system is exposed to neurotoxic substances. This exposure may occur as a result of severe primary liver disease or a deviation of the portal circulation of the liver, as occurs in cases of portosystemic shunts (DUARTE, 2005).

The most common neurological manifestations include a decrease in mental activity and receptivity, which can range from mild depression to coma. Other correlated signs may include dementia, seizures, lethargy, behavioral changes (such as aggressiveness or hysteria), difficulty walking, uncontrolled gait, anorexia, vomiting, diarrhea, and hypersalivation, the latter being more frequent in felines. Although the symptoms can be associated with diet, the severity of the symptoms is not always directly linked to the severity of the liver injury (DUARTE, 2005).

Several factors influence the pathophysiology of hepatic encephalopathy, many of them linked to the accumulation of substances that, after being absorbed in the intestine, are not properly metabolized by the liver. Compounds such as ammonia, substances that look like benzodiazepines, false neurotransmitters such as tyramine, tryptophan and octopamine, mercaptans (such as methanethiol) and short-chain fatty acids such as octanoic acid are included. In addition, other causes may include changes in the blood-brain barrier, neurotransmitter dysregulations and metabolic irregularities (BUNCH, 1991).

In addition to the direct consequences of these encephalopathic toxins, several metabolic changes can contribute to intensifying symptoms. These changes include azotemia, hypoxia, electrolyte imbalances, hypoglycemia, alkalosis, and hypovolemia. Patients with these irregularities are more likely to develop encephalopathy, and correction of these conditions may improve clinical status. For example, hypokalemia, commonly seen in situations of liver failure, is a frequent condition that favors depression and anorexia. Several elements can cause these metabolic changes and lead to encephalopathy, such as high protein consumption, gastrointestinal bleeding, use of diuretics, administration of sedatives or tranquilizers, hyperuricemia, infections, constipation and the administration of methionine (DUARTE, 2005).

The disease is often linked to portosystemic anastomoses, acute liver failure, or cirrhosis. The goal of treatment is to decrease the production and absorption of ammonia generated by the breakdown of proteins by bacteria in the colon. The usual treatments include lactulose, antibiotics such as metronidazole and the inclusion of fibre in the diet, often in conjunction with protein limitation. However, meals with a high fiber content can affect nutrient absorption (BRUNCH, 1991).



The composition of amino acids in the diet is equally relevant. Decreased branched-chain amino acids and increased aromatic amino acids may contribute to HS, although branched-chain amino acid supplementation has not been shown to benefit individuals with the condition (RIORDAN AND WILLIAMS, 1997). Because they are rich in branched-chain amino acids, protein sources such as cottage cheese and soy are recommended.

Patients who do not respond to treatment need to be re-examined for HS-related conditions such as dehydration and infections. Individuals with severe levels of the disease need intensive care and correction of electrolyte problems. Lactulose is the usual treatment, as it contributes to the reduction of intestinal pH, transforming ammonia into insoluble ions and accelerating the digestive process (RIORDAN AND WILLIAMS, 1997).

FINAL CONSIDERATIONS


Neurological diseases in dogs and cats, including epilepsy, herniated discs, and hepatic encephalopathy, present significant challenges for veterinarians and owners. The management of these problems requires not only an accurate diagnosis, but also intensive treatment and efficient communication between the veterinarian and the owner, to ensure the quality of life of the animals. Early detection of complications and the application of appropriate therapeutic tactics are essential to reduce the effect of neurological diseases. In epilepsy, the selection of antiepileptic drugs must be individualized, taking into account the animal's reaction to conventional treatments and the need to include additional medications. Herniated discs, in turn, require a rigorous diagnostic approach and treatment that can range from drug to surgical, depending on the severity of the condition. Hepatic encephalopathy, finally, highlights the importance of monitoring metabolic factors and adjusting diet to reduce the production of neurotoxic substances.



REFERENCES

1. Alves, L. S. (2018). Diagnóstico por imagem de hérnia discal Hansen tipo I, II e III em cães. **Veterinaria e Zootecnia**, 25(1), 10–21.
2. Arias, M. V. B. (2009). Dicas essenciais para o controle da epilepsia em cães e gatos. **Clin. Vet.**, XIV(81), 26-35.
3. Bunch, S. E. (1991). Hepatic encephalopathy. **Progress in Veterinary Neurology**, 2(4), 287-296.
4. Brisson, B. A. (2010). Intervertebral disc disease in dogs. **Veterinary Clinics of North America: Small Animal Practice**, 40(5), 829-858. Disponível em: [https://www.vetsmall.theclinics.com/article/S0195-5616\(10\)00080-X/fulltext](https://www.vetsmall.theclinics.com/article/S0195-5616(10)00080-X/fulltext). Acesso em: 28 set. 2024.
5. Cecim, B. F. (2019). Doença do disco intervertebral em cães da raça Dachshund: Uma revisão de literatura. **Iniciação Científica Cesumar**, 21(2), 189–201.
6. Cesca, P. H. (2018). **Doença do disco intervertebral cervical em cães** (Tese de doutorado, Universidade Federal do Rio Grande do Sul).
7. Coelho, H. E., Santos, R. L., & Alessi, A. C. (2016). **Patologia veterinária**. Coelho.
8. De Lahunta, A., & Glass, E. (2009). **Veterinary Neuroanatomy and Clinical Neurology** (3rd ed.). Saunders Elsevier.
9. Dewey, C. W., & Da Costa, R. C. (2015). **Practical guide to canine and feline neurology** (2nd ed.). John Wiley & Sons. ISBN 978-11-199-4611-3.
10. De Lahunta, A., & Glass, E. (2015a). **Veterinary Neuroanatomy and Clinical Neurology** (4th ed.). Saunders Elsevier.
11. Dewey, C. W., Guiliano, R., Boothe, D. M., et al. (2004). Zonisamide therapy for refractory idiopathic epilepsy in dogs. **J Am Anim Hosp Assoc.**, 40, 285–291.
12. Duarte, R., & Ushikoshi, W. (2005). Encefalopatia hepática em cães. [s.l.: s.n.]. Disponível em: <https://consultadogvet.wordpress.com/wp-content/uploads/2017/03/bmv-2005-6.pdf>. Acesso em: 28 set. 2024.
13. Fenn, J., & Olby, N. J. (2020). Classification of intervertebral disc disease. **Frontiers in Veterinary Science**, 7(1), 1-17.
14. Fischer, R. S., et al. (2005). Epileptic seizures and epilepsy: Definitions proposed by the International League Against Epilepsy (ILAE) and the International Bureau for Epilepsy (IBE). **Epilepsia**, 46(4), 470-472.
15. Fingerhuth, M., & Thomas, W. B. (2015). **Advances in Intervertebral Disc Disease in Dogs and Cats** (1st ed.). Wiley-Blackwell. ISBN 978-0 4-709-5959-6.
16. Fossum, T. W. (2021). **Cirurgia de pequenos animais** (5th ed.). Guanabara Koogan. ISBN 978-85-951-5011-9.

17. Guidi, A. R., Castedo, J. P., Santos, L. C. P., et al. (2021). Diagnósticos e tratamentos empregados em casos de hérnias de disco em cães: Revisão. **Pubvet**, 15(10), 1–7.
18. Jones, T. C., Herr, R. D., & King, N. W. (2000). **Patologia veterinária**. Manole.
19. Knowles, K. (1998). Idiopathic epilepsy. **Clin Tech Small Anim Pract.**, 13(3), 144-151.
20. Lorenz, M. D., & Kornegay, J. N. (2006). **Neurologia Veterinária** (4th ed.). Manole.
21. Martins, G. C. (2011). Epilepsia em cães: revisão de literatura. Monografia apresentada na Escola de Veterinária da Universidade Federal de Minas Gerais. Disponível em: <https://repositorio.ufmg.br/handle/1843/BUBD-9C5HRE>. Acesso em: 28 set. 2024.
22. McGavin, D., & Zachay, J. F. (2013). **Bases da patologia em veterinária**. Elsevier Brasil.
23. Nerone, M. C., & Diamante, G. A. C. (2018). Hérnia de disco tipo III em um cão. **Acta Scientiae Veterinariae**, 46(1), 350.
24. Platt, S. R., & Olby, N. J. (Eds.). (n.d.). Neurology. In **Veterinary Clinics of North America: Small Animal Practice**.
25. Pontikaki, A. E., Pavlidou, K., Polizopoulou, Z., Savvas, I., & Kazakos, G. (2022). Prophylactic effect of fenestration on the recurrence of thoracolumbar intervertebral disc disease in dogs. **Animals**, 12(19), 1-18. Disponível em: <https://www.mdpi.com/2076-2615/12/19/2601>. Acesso em: 28 set. 2024.
26. Riordan, S. M., & Williams, R. (1997). Treatment of hepatic encephalopathy. **The New England Journal of Medicine**, 337(7), 473-479.
27. Santoro, M. B., & Bahr Arias, M. V. (2018). Complicações observadas em cães e gatos com doenças neurológicas. **Pesquisa Veterinária Brasileira**, 38(6), 1159–1171. Disponível em: <https://www.scielo.br/j/pvb/a/HhJDktSVZFLRcL9pMVSkRbJ/?format=pdf&lang=pt>. Acesso em: 28 set. 2024.
28. Silva, V. F. N. (2017). **Fisioterapia como tratamento pós-cirúrgico de cães com hérnia de disco Hansen tipo I** (Dissertação de mestrado, Universidade Federal do Rio Grande do Sul).
29. Sharp, N. J. H., & Wheeler, S. J. (2004). **Small Animal Spinal Disorders: Diagnosis and Surgery** (2nd ed.). Elsevier Mosby. ISBN 978-07-234-3209-8.
30. Thomas, W. B. (2010). Idiopathic epilepsy in dogs and cats. **Vet Clin North Am Small Anim Pract.**, 40(1), 161-179.
31. Thrall, D. E. (2019). **Diagnóstico de radiologia veterinária** (7th ed.). Elsevier. ISBN 978-85-352-9196-4.
32. Vilanova Junior, J. A., Dipp, G., Silva Neto, B. P., Balardini, J. L. M., Isaka, L. J. E., Jair, M. S. O. R., & Engracia Filho, R. (2019). Hérnia de disco sequestrada em cão. **Acta Scientiae Veterinariae**, 47(1), 456.

CHRONIC OROFACIAL PAIN AND ENDODONTICS: DIAGNOSTIC AND THERAPEUTIC CHALLENGES <https://doi.org/10.56238/sevened2024.029-005>**Nara Sarmiento Macedo Signorelli¹, Hassan Ali Srour² and Camilla Christian Gomes Moura^{3,4}****ABSTRACT**

Orofacial pain encompasses conditions of dental, musculoskeletal, and neuropathic origins, demanding accurate differential diagnosis to prevent mistreatment. Acute pain typically stems from pulpitis and periapical infections, whereas chronic pain arises from neuroplastic alterations and central sensitization. Neuropathic pain, such as trigeminal neuralgia, is characterized by its intensity and resistance to standard analgesics. Musculoskeletal pain, often linked to temporomandibular disorders, manifests diffusely, intensifying under emotional stress. Effective chronic orofacial pain management requires a multidisciplinary approach, combining pharmacological and non-pharmacological strategies, including physiotherapy and cognitive-behavioral therapy. Emerging interventions, such as ion channel modulators and transcranial stimulation, showcase advances in neuroscience, offering potential for improved outcomes. Recognizing phenotypic variations in orofacial pain is key to accurate diagnosis and optimal care.

Keywords: Orofacial Pain. Endodontics. Trigeminal neuralgia. Central Awareness. Multidisciplinary Therapy. Trilad Theory. Human reasoning.

¹ Msc

School of Dentistry, Federal University of Uberlândia, Uberlândia, Brazil

² PhD

Uberlândia School of Medicine (FAMEU-FATRA), Uberlândia, Brazil

³ PhD

School of Dentistry, Federal University of Uberlândia, Uberlândia, Brazil

⁴ Undergraduate Student

Uberlândia School of Medicine (FAMEU-FATRA), Uberlândia, Brazil

Email: camillamoura@ufu.br



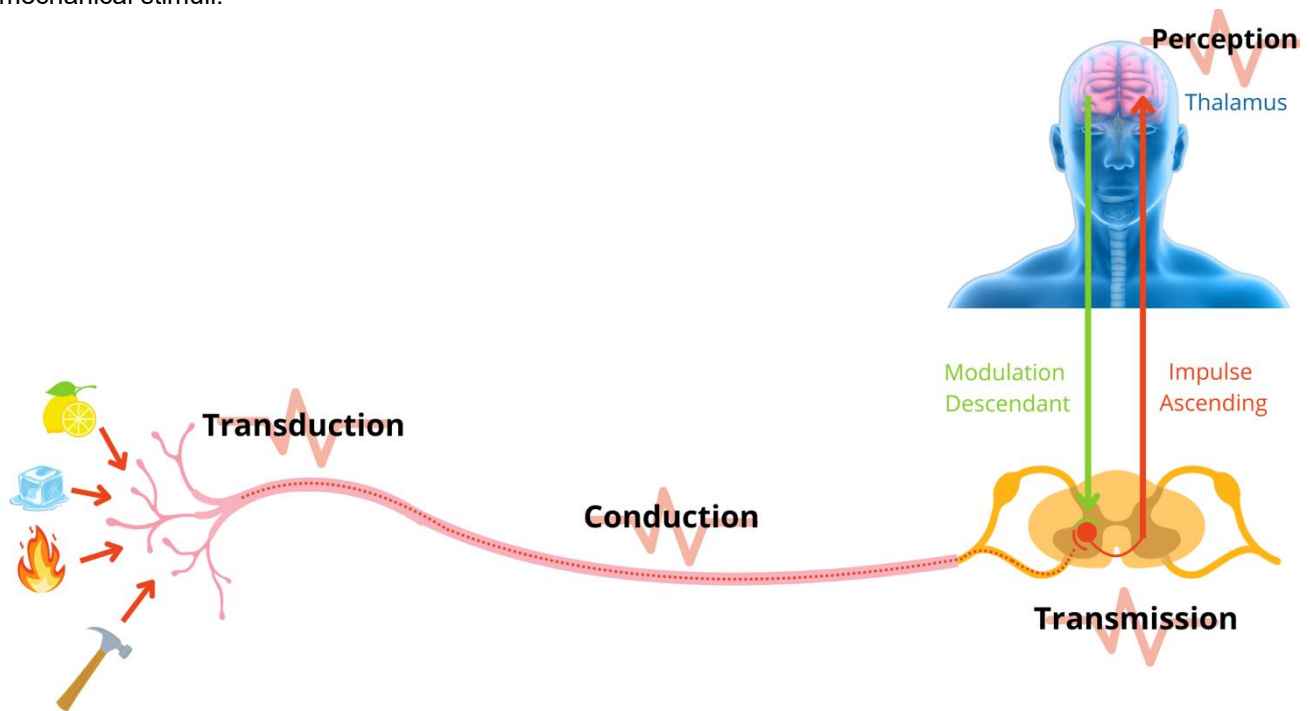
INTRODUCTION

With the increasing complexity of diagnosing and treating chronic orofacial pain, the application of the Trilad Theory offers healthcare professionals a new approach that goes beyond traditional therapeutic responses (SROUR 2022 and 2023). This theory allows that, instead of choosing between physical or psychological treatments in a binary way, multiple alternatives can be considered, promoting a broader management adapted to the needs of each patient (SROUR & MACHADO 2024; SROUR *et al.* 2024). This approach allows for a more holistic and individualized treatment, reflecting the sensory and emotional complexity of pain described by the International Association for the Study of Pain (IASP).

Pain is defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage. As the IASP clarifies, pain encompasses both physical and psychological dimensions, being a multifaceted experience influenced by sensory-discriminative, affective-motivational and cognitive-evaluative aspects. From an evolutionary perspective, pain plays a critical biological function, alerting the body to threats and promoting behaviors that protect against injury (RAJA, *et al.*; 2020).

At the cellular level, pain is initiated by nociceptors, specialized nerve endings that respond to harmful stimuli such as mechanical pressure, temperature extremes, or chemical signals. Nociceptors transduce these stimuli into electrical signals through the activation of ion channels, such as TRPV1 and sodium channels (NaV1.7). These signals are transmitted through peripheral nerves to the dorsal horn of the spinal cord, where they can undergo modulation before ascending to higher brain centers such as the thalamus and cortex. In chronic pain, these signaling pathways can become sensitized, resulting in hyperalgesia (increased sensitivity to painful stimuli) or allodynia (pain caused by normally non-painful stimuli) (ROTPENPIAN & YAKKAPHAN, 2021). Behaviorally, pain elicits a wide range of responses, from withdrawal and avoidance behaviors to psychological reactions such as anxiety and depression (TANNER, *et al.*, 2022).

Figure 1: Transmission scheme, through peripheral nociceptors, of pain caused by chemical, physical or mechanical stimuli.



Pain is much more than a symptom, it is a subjective experience and a major clinical challenge, as quantifying a qualitative report through traditional intensity scales does not capture the full complexity and depth of this phenomenon (SROUR & MACHADO, 2024). What is pain to you? What do you call pain? What was the worst painful experience you felt? It is possible to name pain the most diverse sensations such as tightness, discomfort, burning, itching, twisting, among an infinity of possibilities that the patient will simply name as "pain".

Pain is broadly categorized as acute or chronic, with duration being the determining factor for this classification. Acute pain is typically short-lived (less than three months) and serves as a protective mechanism in response to injury or inflammation. It is usually localized, and the clinician can easily attribute cause and effect, that is, the tissue injury that was able to activate nociceptors and cause this pain is visible and easily identified. In contrast, chronic pain persists beyond the normal healing period, often lasting more than three months, and may continue even after the original lesion has resolved. Chronic pain is more complex, often involving central sensitization and neuroplastic changes in the central nervous system (CNS), and it is not possible to identify the cause and the pain reported by the patient in such a simple way. The prolonged nature of chronic pain is often associated with psychological responses such as depression, anxiety, and stress, which further complicates its management (RAJA, *et al.*; 2020).

According to Srour *et al.* (2024), the Trilad Theory proposes a third response in addition to the traditional fight-or-flight mechanism, "freezing", which expands the possibilities of reaction in stressful situations, allowing a more integrative and adaptive approach to human behavior, which can be extrapolated to the analysis of orofacial pain.

Acute pain has a protective action and is directly related to an activation of peripheral nociceptors. It takes a painful stimulus, be it physical, chemical or mechanical, for the trigger to be triggered. Generally, with the healing of this affected tissue, the pain will also cease to exist. Chronic pain, on the other hand, is not protective in nature, that is, it is not necessarily linked to an identifiable tissue injury. It lasts longer than 3 months and is often associated with psychological factors such as irritability, sadness, social distancing, difficulty sleeping and daily activities. This pain occurs mainly through central pain mechanisms, and neuroplastic changes in the central nervous system (RAJA, *et al.*; 2020).

However, classifying pain in a binary way, as acute or chronic, may represent a simplistic view of the complex's mechanisms involved in the painful sensation. For Srour (2023), human thinking tends to follow this binary pattern, limiting decision options to extremes such as yes/no or positive/negative. The Trilad Theory (SROUR, 2022, 2023, and 2024), expands this reasoning by allowing the consideration of multiple alternatives, offering a more complex and flexible approach to problem solving, including for issues related to pain diagnosis.

There is no doubt that orofacial pain represents a complex and multifaceted challenge for health professionals, covering a wide range of conditions with diverse etiologies. These conditions can be broadly categorized into dental, musculoskeletal, neuropathic, and idiopathic origins. Understanding the full range of diagnoses and their associated phenotypes is crucial to providing effective treatment and avoiding misdiagnosis or overtreatment. The Trilad Theory offers a way to integrate the various dimensions involved in pain (SROUR, 2022), recognizing that orofacial pain is a multifaceted experience. According to this theory, we must overcome dualistic thinking, allowing a more comprehensive view of situations and offering multiple alternatives for decision-making, which can be applied in diagnosis and treatment planning in various areas, such as medicine and dentistry.

The application of the Trilad Theory, by promoting a broader approach to human reasoning (SROUR, 2023), is essential to avoid inadequate pain management, which can have not only physical, but also psychological and social consequences (WU *et al.*, 2020). By recognizing the complexity of orofacial pain, we must seek a more accurate diagnosis and a more comprehensive treatment plan, reducing the risk of overtreatment and, consequently, the economic and social impacts that chronic pain imposes. Effectively addressing pain goes

beyond clinical concerns – it is a critical societal responsibility that encompasses medicine, dentistry, and the national health system (HONDA *et al.*, 2018).

Chronic orofacial pain, including dentoalveolar pain, presents substantial challenges for dental practice, especially due to its multifactorial nature and coexistence with other painful conditions. Chronic pain in this region can be particularly difficult to diagnose, as many of its symptoms overlap with those of other diseases, such as temporomandibular disorders (TMDs) and trigeminal neuropathic pain. Due to this overlap, many patients undergo inadequate treatments, such as endodontic treatments and tooth extractions, without their complaints being resolved (PIGG, *et al.*, 2021).



Studies show that between 5% and 24% of patients report persistent pain after endodontic treatments. Odontogenic pain, by itself, is already one of the most prevalent in cases of orofacial pain, but it is often confused with pain of other origins, such as muscle or neuropathic pain, requiring a detailed and careful diagnostic evaluation (NIXDORF, *et al.*, 2015). In some cases, the pain may be related to TMD or other myofascial conditions, which requires the practitioner to accurately differentiate the source of the discomfort to avoid unnecessary procedures (WRIGHT; 2000). In addition, the increased sensitization of the trigeminal and facial nerves, observed in chronic orofacial pain, contributes to the complexity of the diagnosis.

Chronic orofacial pain is a condition that, if poorly managed, can result in treatments that not only fail to resolve the pain but can also exacerbate the condition. This phenomenon of "therapeutic failure" points to the importance of understanding not only odontogenic pain, but also neuropathic and muscular pain that can mimic or coexist with it (SCHOLZ & WOOLF, 2007). This chapter explores in detail the challenges of diagnosing and treating chronic orofacial pain, with an emphasis on the difficulties faced by endodontics professionals when trying to differentiate odontogenic pain from other forms of orofacial pain. Pathophysiological mechanisms, etiological factors, and comorbidities associated with pain will be discussed, as well as the multidisciplinary therapeutic approaches recommended for its effective management.

Pain Quality Descriptors	
Acute Pain	Chronic Pain
<ol style="list-style-type: none"> 1. Stabbing (severe, sharp pain, like a stab) 2. Throbbing (pulsating, often associated with inflammation) 3. Burning (burning sensation, common in burns) 4. Cutting (as if being cut) 5. Pungent (a piercing, sharp pain) 6. Piercing (as if something is piercing the skin) 7. Sharp (clear and distinct pain) 8. Spasmodic (intermittent pain that suddenly arises) 	<ol style="list-style-type: none"> 1. Deaf (constant and not very intense, but persistent pain) 2. Diffuse (scattered pain, difficult to locate) 3. Dull (persistent and dull pain, but not sharp) 4. Deep (pain that appears to be localized to internal tissues or organs) 5. Burning (continuous burning sensation, common in chronic neuropathies) 6. Heavy (feeling of heaviness or constant pressure) 7. Persistent (pain that does not cease over time) 8. Pulsatile (appears to pulsate rhythmically, but continuously over time)

TYPICAL PHENOTYPES OF OROFACIAL PAIN AND PATHOPHYSIOLOGY

Facial pain conditions manifest through different phenotypes, each influenced by distinct underlying pathophysiological mechanisms (TANNER *et al.*, 2022). These conditions can be classified according to their nociceptive, neuropathic, musculoskeletal, vascular, or idiopathic origins, which helps in the definition of appropriate diagnostic and treatment strategies (ROMERO-REYES *et al.*, 2023).

Odontogenic pain arises due to damage to dental tissues, mainly involving inflammation or infection, such as in dental caries, pulpitis or periapical abscesses (MACAULEY, O'DONNELL & DUNCAN, 2013). These conditions are considered nociceptive, as they activate normal pain pathways in response to tissue damage. Patients with odontogenic pain often describe it as intense and localized, and the symptoms are aggravated by external stimuli, such as cold or heat (BENKO, 2012; SPLIETH & TACHOU, 2013). The pain can be quite acute, reflecting the acute inflammatory nature of dental tissues (ROMERO-REYES, *et al.*, 2023).

Neuropathic pain, on the other hand, is associated with nerve damage or dysfunction, as seen in conditions such as trigeminal neuralgia, postherpetic neuralgia, and glossopharyngeal neuralgia. These conditions result from injuries or diseases that affect the nerves responsible for transmitting pain signals. Trigeminal neuralgia, for example, is characterized by sudden episodes of severe, stabbing pain, often triggered by stimuli that would not normally cause pain, such as light touch, chewing, or speech (SPENCER & GREMILLION, 2007; TANNER *et al.*, 2022). The pain is usually described as similar to an electric shock, reflecting the anomalous activation of nerve fibers (TANNER *et al.*, 2022). Neuropathic pain is notoriously difficult to treat with conventional painkillers, often requiring medications that act specifically on nerve pain, such as anticonvulsants or antidepressants (SPENCER & GREMILLION 2007).

Musculoskeletal pain in the orofacial region usually originates from conditions such as temporomandibular disorders (TMD) or bruxism, which involve the muscles and joints of the jaw. This type of pain is described as dull and diffuse, often radiating to adjacent areas such as the temples or ears (LABANCA *et al.*, 2023). TMD, for example, may present with additional symptoms, such as jaw stiffness or popping, especially during movements such as chewing or talking. Bruxism, which involves grinding or clenching of the teeth, can exacerbate this pain, particularly in patients under stress (FERRILLO *et al.*, 2022). In these situations, pain is more associated with the musculoskeletal system than nerve injury, and treatments often focus on reducing muscle tension or correcting joint dysfunctions (BUSSE *et al.*, 2023).

Vascular pain, as occurs in migraines or cluster headaches, is characterized by throbbing or pulsating sensations, often accompanied by autonomic symptoms such as tearing or nasal congestion (CHOI, LEE & PARK, 2023). Cluster headaches, for example, are marked by excruciating pain located around one eye, often described as burns or stab wounds. The episodic nature of these headaches, along with their association with vascular changes, points to a dysregulation of blood flow in the cranial vessels (KAWAGUCHI & ICHINOHE, 2024). These pains are often triggered by environmental factors or stress, and treatment may include medications that target vascular tone, such as triptans, or preventive therapies, such as calcium channel blockers (JALALI *et al.*, 2014).

Idiopathic pain, including persistent idiopathic facial pain (PID) and atypical odontalgia (OA), is poorly understood in origin and has no clear physical cause. These conditions are thought to be related to central sensitization mechanisms or nociplastic pain, in which the central nervous system becomes hypersensitive to painful stimuli (LABANCA *et al.*, 2023; MAY *et al.*, 2023). Patients with idiopathic pain often experience chronic pain, which is imprecisely located and difficult to describe, which can lead to frustration and lead to misdiagnosis (SPENCER & GREMILLION, 2007). In the case of PID, pain can be constant, without any clear association with identifiable triggers or injuries, making its management challenging. Treatments often focus on addressing the central sensitization component, utilizing medications such as antidepressants or anticonvulsants (GERWIN, 2020).

In summary, each facial pain condition has distinct phenotypic characteristics and requires specific diagnostic and therapeutic approaches. Understanding the underlying pathophysiology is essential for effective treatment, as management strategies vary significantly across nociceptive, neuropathic, musculoskeletal, vascular, and idiopathic pain conditions (TANNER *et al.*, 2022; ROMERO-REYES *et al.*, 2023).

Type of Pain	Definition	Key features
Neuropathic	Neuropathic pain occurs due to injury or dysfunction in the nervous system, whether peripheral or central, resulting in an anomalous transmission of pain signals.	<p>Sensation of electric shock: Neuropathic pain is often described as a sharp, intense pain, similar to electric shocks, burns, or twinges.</p> <p>Allodynia: The presence of pain resulting from normally non-painful stimuli, such as a light touch to the skin, is common in patients with neuropathic pain.</p>
Nociceptive	Nociceptive pain results from the activation of nociceptors, which are receptors specialized in detecting actual or potential tissue lesions. It is the most common form of pain associated with inflammation or physical damage.	<p>Precise location: Nociceptive pain is usually well localized and is directly related to the injured area, as occurs in burns, trauma, or inflammation.</p> <p>Response to common painkillers: This type of pain responds well to treatment with traditional painkillers, such as anti-inflammatories and opioids, which work to control inflammation and pain.</p>
Nociplastic	Nociplastic pain occurs in the absence of tissue injury or overt nerve damage. It is related to central sensitization, in which the central nervous system amplifies pain signals, even in the absence of a clear nociceptive or neuropathic source.	<p>Generalized tenderness: Patients with nociplastic pain, such as in fibromyalgia, may report pain that is diffuse, difficult to locate, and disproportionate to the injury or external stimulus.</p> <p>Resistance to conventional analgesics: Nociplastic pain does not respond well to traditional analgesic and anti-inflammatory treatments, requiring therapeutic strategies that involve central nervous system modulators, such as antidepressants and anticonvulsants.</p>

THE CHALLENGE OF DIFFERENTIAL DIAGNOSIS

The differential diagnosis between odontogenic pain and non-odontogenic pain is a complex task that requires a deep understanding of the clinical characteristics of each type of pain. Odontogenic pain, commonly related to pulp and periapical inflammation, is one of the most frequent complaints in endodontic practice. However, other forms of pain, such as those of muscular and neuropathic origin, can simulate odontogenic pain, complicating the diagnosis (PIGG, *et al.*, 2021).

ENDODONTIC PAIN

Dental pulp is a specialized connective tissue that is found in the central portion of the teeth. This tissue is highly innervated and vascularized, being responsible for maintaining the

vitality of the tooth (RONAN *et al.*, 2024). The pulp is composed of four main zones: the odontoblastic layer, the cell-free zone (Weil's layer), the cell-rich zone, and the pulp nucleus (BENDER, 2000).

Odontoblasts, located at the interface between the pulp and dentin, are specialized cells that produce dentin, a mineralized tissue that protects the pulp. In addition, these cells play an important role in the transmission of painful stimuli, as their prolongations extend to the dentin tubules, allowing the conduction of nociceptive signals (RONAN *et al.*, 2024).

The innervation of the pulp is mostly sensory, composed of nerve fibers from the trigeminal ganglion, responsible for the perception of painful stimuli. Nerve fibers are divided into two main types: A-delta fibers and C fibers. A-delta fibers, which are myelinated, quickly transmit the sensation of acute and localized pain, while C fibers, which are unmyelinated, lead to slower and more diffuse pain, often associated with inflammatory processes (BENDER, 2000; RONAN *et al.*, 2024).

The mechanisms of pain of pulp origin are complex and involve both mechanical and thermal and chemical stimuli. The hydrodynamic effect, which results from the movement of fluid within the dentin tubules, is one of the main mechanisms responsible for dental pain. When there is a rapid variation in temperature, such as the application of cold or heat, the fluid in the tubules moves, deforming the nerve endings and triggering a painful response. This movement is mainly detected by A-delta fibers, which are responsible for the sensation of sharp and short pain (BENDER, 2000; ABD-ELMEGUID & YU, 2009).

Another important factor in pulp pain is inflammation, especially in cases of pulpitis, which can be reversible or irreversible. In reversible pulpitis, the inflammation is mild and usually results from stimuli such as superficial cavities. Irreversible pulpitis, on the other hand, occurs when the inflammation is intense and extensive, leading to pulp necrosis. In these cases, the C fibers are the main ones involved, transmitting a dull, persistent and frequently referred pain (BENDER, 2000; ABD-ELMEGUID & YU, 2009).

During the inflammatory process, the release of inflammatory mediators, such as substance P and calcitonin gene-related peptide (CGRP), sensitizes nerve endings, lowering the threshold for the generation of action potentials. In addition, inflammation increases vascular permeability, leading to increased intrapulp pressure, which further intensifies the sensation of pain (ABD ELMEGUID & YU, 2009; RONAN *et al.*, 2024). In chronic conditions, the pulp may undergo neuroplastic changes, resulting in hyperalgesia (increased sensitivity to painful stimuli) or allodynia (pain caused by normally non-painful stimuli). These changes are often observed in patients with chronic pulpitis or pulp necrosis, in whom pain may persist even after removal of the initial stimulus (BENDER, 2000; RONAN *et al.*, 2024).

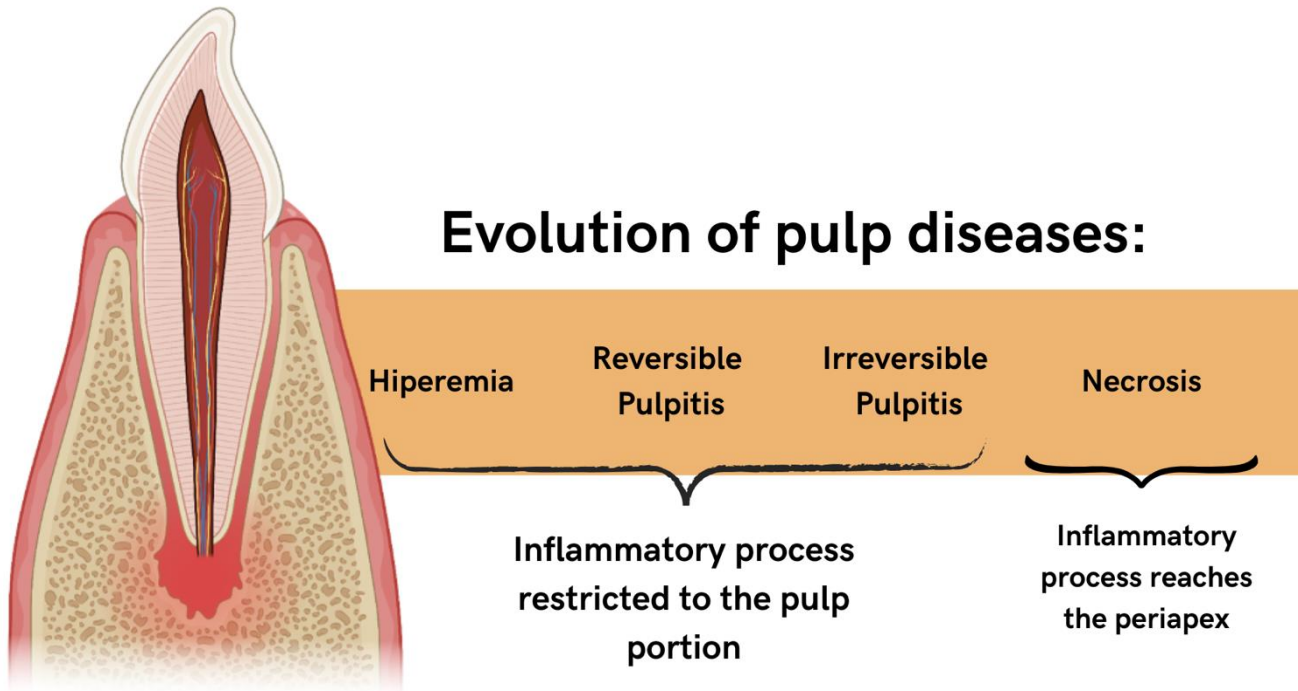


Apical periodontitis is an inflammatory condition that arises as a result of pulp necrosis, usually caused by bacterial infections that penetrate the dental pulp through deep cavities, fractures, or trauma. Pulp death creates an environment conducive to the proliferation of anaerobic microorganisms that invade the root canals and establish themselves in the periapical region (LILIS *et al.*, 2024).

As bacteria and their byproducts, such as toxins and endotoxins, spread through the necrotic root canals, they reach the periodontal ligament and alveolar bone around the root apex, triggering an acute inflammatory response. The immune system reacts to the bacterial influx by releasing inflammatory cells, such as neutrophils, macrophages, and lymphocytes, which accumulate in the periapical area and attempt to fight infection (WOLF *et al.*, 2019). This periapical inflammation is characterized by the activation of osteoclasts, cells responsible for bone resorption, which leads to the destruction of the alveolar bone around the apex of the root. This process of periapical bone loss is mediated by several inflammatory cytokines, including IL-1, TNF- α , and RANKL, which stimulate osteoclastogenesis. The release of inflammatory mediators not only causes bone destruction but also sensitizes nerve fibers in the region (LILIS, *et al.*, 2024).

In the context of pain, nociceptors, which are nerve endings specialized in detecting painful stimuli, are activated by the products of inflammation and increased pressure in the periapical space caused by edema and the exudation of inflammatory fluids. The activation of these nociceptors results in the transmission of painful signals to the central nervous system, creating a sensation of intense and localized pain, which is characteristic of apical periodontitis. This pain is usually exacerbated by mechanical stimuli, such as chewing or percussion, due to pressure on the inflamed tissue around the apex of the tooth. Thus, understanding pulp neurophysiology and the mechanisms involved in pulp pain is critical for the proper diagnosis and treatment of pulp pathologies, allowing dental professionals to effectively manage painful conditions that affect patients.

Figure 2: Evolution of pulp disease. In all phases, the patient may present pain, in different ways and qualities.



Diagnosis	Quality of pain	Peripheral Mechanism	Central Mechanism	Clinical Signs
Pulpitis	Sharp stabbing, throbbing	Inflammation of the dental pulp leading to sensitization of nociceptors	Peripheral sensitization can lead to prolonged signs of pain.	Severe and prolonged pain, especially at night, sensitivity to heat and cold, and may progress to spontaneous pain without any stimulus.
Periapical Abscess	Acute stabbing, localized	Inflammatory response to infections causing pressure on periapical tissues	Central sensitization possible in cases of prolonged infection.	Swelling, redness, pus drainage, tooth sensitivity to pressure, and possible systemic signs such as fever.
Pain after endodontic treatment	Acute to chronic, with varying pain intensity	Post-treatment trauma or infection affecting surrounding tissues	Central sensitization in chronic cases.	Pain following endodontic treatment, swelling, and tenderness that may persist or recur.
Trinca Radicular	Acute stabbing type	Microfractures cause stimulation of the nociceptors of the dental pulp.	Central sensitization in chronic cases.	Sharp pain when biting or chewing, sensitivity to cold, and discomfort that may come and go.
Dentin Hypersensitivity	Acute short-term stabbing type	Exposure of dentin tubules leading to fluid	It is not typically involved.	Sensitivity to hot, cold, or sweet stimuli, with no

		movement that stimulates nociceptors		visible signs of tooth decay.
--	--	--------------------------------------	--	-------------------------------

MYOFASCIAL PAIN AND TEMPOROMANDIBULAR DISORDERS (TMD)

The temporomandibular joint (TMJ) is one of the most complex joints in the human body, being responsible for the opening, closing, and sliding movements of the jaw. It is composed of bone, ligament and muscle structures that allow a wide range of movements necessary for functions such as chewing, speaking and swallowing. Anatomically, the TMJ involves the head of the mandible (mandibular condyle), the glenoid cavity of the temporal bone, and the articular disc, a fibrocartilaginous structure that acts as a shock absorber, preventing direct contact between bones during movement (SESSLE, 2014; TANNER *et al.*, 2022).

Temporomandibular disorder (TMD) is a condition that affects the TMJ and masticatory muscles, and is one of the main causes of orofacial pain. Pain in TMD can be divided into three main categories: muscular, joint, and mixed, depending on the structures involved.

Muscle Pain

Muscle pain in TMD is usually related to dysfunctions in the muscles of mastication, such as the masseter, temporalis, and pterygoid. Conditions such as bruxism, characterized by clenching or grinding of the teeth, can lead to muscle fatigue and pain. This type of pain is usually described as dull and diffuse, radiating to adjacent areas such as the temples and ears. Pain can be exacerbated by jaw movements or even at rest, depending on the severity of muscle inflammation (FERRILLO *et al.*, 2022).

In addition, emotional stress has often been associated with muscle pain in TMD, since patients with high levels of anxiety or depression tend to have greater tension in the masticatory muscles. The pathophysiology involves both activation of muscle nociceptors and central sensitization, resulting in hyperalgesia (FERRILLO *et al.*, 2022; ROMERO-REYES *et al.*, 2023).

Joint Pain

Joint pain in TMD is related to alterations within the temporomandibular joint itself. The main cause of joint pain is joint disc displacement, a condition in which the disc moves from its normal position, causing friction between the mandibular condyle and the glenoid cavity. This displacement can result in sharp pain, often associated with joint noises, such as clicking

or crackling during the opening and closing of the jaw (SESSLE, 2014; ROMERO-REYES *et al.*, 2023).

In more advanced cases, joint degeneration can occur, leading to osteoarthritis, a degenerative condition that affects the underlying cartilage and bones. Joint pain is typically described as deep, localized pain, with worsening during jaw movement or pressure on the joint (TANNER *et al.*, 2022). Joint inflammation can also lead to increased sensitivity and restriction of jaw movements.

Mixed Pain

Mixed pain in TMD involves both muscle and joint components and is the most common type of temporomandibular pain. Patients with mixed pain often report a combination of symptoms, such as diffuse, dull pain in the masticatory muscles, associated with joint clicking and restriction of movement. Mechanical overload on the jaw muscles and joints can lead to chronic inflammation, further exacerbating pain (TANNER *et al.*, 2022). This combination of muscle and joint factors makes the management of mixed pain more challenging, requires a multidisciplinary approach to treatment, which may include physical therapy, stress management, and the use of occlusal devices (FERRILLO *et al.*, 2022; ROMERO-REYES *et al.*, 2023).

Understanding the mechanisms of pain in TMD, differentiating its muscular, joint, and mixed causes, is crucial for effective diagnosis and treatment. Targeted treatments that address both inflammatory components and biomechanical and psychological factors are essential for the proper management of this complex condition.

Diagnosis	Quality of pain	Peripheral Mechanism	Central Mechanism	Clinical Signs
Temporomandibular Disorder (TMD)	Chronic, massive and profound	Muscle or joint dysfunction, inflammation	Central sensitization, possibly leading to chronic pain syndromes	Jaw pain, limited range of motion, clicking or popping sounds, headaches, and muscle tenderness.
Referred pain	Opaque, diffuse, variable intensity	It originates from other structures such as the ear, muscles or sinuses and is referred to the teeth	Central processing of referred pain may involve sensitization	Non-localized pain in one tooth, no apparent dental pathology, possible pain in nearby structures.

NEUROPATHIC PAIN

Neuropathic pain, defined by the International Association for the Study of Pain (IASP) as that resulting from injury or dysfunction of the somatosensory nervous system, is another condition that can mimic odontogenic pain. In the orofacial setting, neuropathic pain can be caused by lesions in the trigeminal, facial, or peripheral nerves that innervate the oral cavity and adjacent structures. Trigeminal neuralgia is a classic example of neuropathic pain that can be confused with odontogenic pain due to its location and the paroxysmal nature of the painful episodes (SPENCER, *et al.*, 2007)

Studies indicate that about 3% to 5% of patients with persistent orofacial pain have neuropathic pain, and many of them have undergone invasive dental treatments without the actual cause of the pain being treated. Orofacial neuropathic pain is often accompanied by abnormal sensations such as allodynia (pain caused by stimuli that are not normally painful) and hyperalgesia (increased sensitivity to painful stimuli) (SCHOLZ, *et al.*, 2007).

The differentiation between orofacial pain and headache is related to the trigeminal nerve dermatomes that are involved. Headache affects the ophthalmic branch (V1) of the trigeminal nerve, as well as the dermatomes of the greater and lesser occipital nerves. On the other hand, facial pain, according to the most recent International Classification of Headache Disorders (ICHD-3), is defined as pain located below the infraorbitomeatal line, in front of the pinna and above the neck – a region innervated by the maxillary (V2) and mandibular (V3) branches of the trigeminal nerve. Unlike headaches, which are usually primary, facial pain is more often attributed to secondary causes. Inflammatory or infectious processes in craniofacial structures, such as sinusitis and dentoalveolar diseases, are common causes of facial pain (GAUL, *et al.*, 2007; GAUL, *et al.*, 2008; ZIEGELER, *et al.*, 2019). In some cases, diagnostic tests do not identify organic lesions, and facial pain is considered the disease itself – in these cases, the patient is diagnosed with idiopathic (primary) orofacial pain (MAARBJERG, *et al.*, 2017).

Diagnosis	Quality of pain	Peripheral Mechanism	Central Mechanism	Clinical Signs
Neuralgia Trigeminal	Chronic, similar to electric shock	Compression or irritation of the trigeminal nerve	Central sensitization leading to hypersensitivity	Sudden, severe facial pain triggered by touching, chewing, or speaking, usually on one side of the face.
Atypical facial pain/ Idiopathic persistent facial pain	Chronic, deep, constant	No identifiable peripheral cause	Central sensitization leading to	Diffuse, poorly localized facial pain with no



			persistent and unexplained pain	obvious dental or sinus problems.
Postherpetic Neuralgia	Chronic, burning, stabbing-like	Peripheral nerve damage after herpes zoster infection	Central sensitization involving abnormal CNS pain processing	Persistent pain after the rash has healed, usually associated with skin tenderness and burning sensations.
Glossopharyngeal neuralgia	Severe, like an electric shock, radiating	Glossopharyngeal nerve compression or irritation	Central sensitization due to prolonged nerve irritation	Sudden pain in the throat, ear, or base of the tongue, triggered when swallowing or speaking.
Neuropatia Periférica	Chronic, burning, tingling	Peripheral nerve damage	Central sensitization in cases of chronic nerve injury	Numbness, tingling, or burning pain in the affected area, usually in glove or sock distribution.
Cluster Headache	Serious, stabbing, unilateral	Neurovascular inflammation affecting the autonomic pathways of the trigeminal	Central mechanisms include hypothalamic involvement	Severe pain around one eye, tearing, nasal congestion, and restlessness during an attack.
Migraine	Throbbing, pulsatile, unilateral	Neurovascular dysfunction involving the trigeminal system	Central sensitization and cortical spreading depression	Moderate to severe throbbing headache, nausea, photophobia, and aura in some cases.
Giant Cell Arteritis	Muffled, throbbing, grave	Inflammation of the arteries, particularly the temporal artery	Central sensitization can occur if left untreated	Scalp tenderness, jaw lameness, vision problems, and systemic symptoms like fever or weight loss.
Bell's palsy	No pain or mild pain in some cases	Inflammation or compression of the facial nerve	Not normally involved	Sudden weakness or paralysis on one side of the face, drooping mouth or eyelid, and difficulty closing the eyes.

OTHER FACIAL PAIN

Associated with dental problems



Diagnosis	Quality of pain	Peripheral Mechanism	Central Mechanism	Clinical Signs
Dental Cavities	Sharp twinge type	Activation of nociceptors in response to bacterial invasion and decomposition	Not normally involved	Visible cavities, tooth sensitivity to sweets, hot or cold stimuli, and dark spots on the tooth surface.
Gingivitis	On the left, dolorido.	Inflammation of the gum tissues due to plaque buildup	Not normally involved	Red, swollen gums that may bleed while brushing or flossing, but no bone or insertion loss.
Periodontitis	Surda, persistent, painful	Inflammation and destruction of periodontal ligaments	Central sensitization in chronic cases	Gum recession, deep pockets, loose teeth, bleeding gums, and bad breath.
Periodontal Abscess	Acute, localized, throbbing	Infection leading to abscess formation and pressure on periodontal tissues	Not normally involved	Sore and swollen gums, pus discharge, tooth mobility and localized swelling.
Tooth fracture/ dislocation/avulsion	Sharp, Amateur, Intermittent	Trauma to the tooth causing direct stimulation of the nociceptors	Not normally involved	Visible dental involvement, sharp pain when chewing or biting, and sensitivity to temperature changes.
Root cyst	Surda, persistent	The formation of cysts causes pressure and inflammation in the surrounding tissues	Not normally involved	Painless swelling from slow growth, tooth displacement, or tooth mobility, often visible on x-rays.
Dry socket	High-pitched, twinge-like, throbbing	Loss of blood clot and bone exposure leading to activation of nociceptors	Not normally involved	Severe pain 2 to 3 days after tooth extraction, exposed bone in the socket, bad taste, and bad breath.
Impacted Tooth	Deaf, throbbing, localized	Pressure and inflammation in surrounding tissues due to impaction	Not normally involved	Swollen and tender gums, difficulty opening the mouth, and recurrent infections (pericoronitis).



Burning Mouth Syndrome	Chronic burning-type	Peripheral nerve damage or dysfunction	Central sensitization possibly involving changes in pain pathways	Persistent burning sensation on the tongue or other oral tissues, often with no visible abnormalities.
Sialadenitis	Deaf, painful, associated with swelling	Inflammation of the salivary glands causing activation of the nociceptor	Not normally involved	Swelling of the affected salivary gland, pain, dry mouth, and possibly fever.
Parotitis	Deaf, sore, localized	Inflammation or infection of the parotid gland	Not normally involved	Pain and swelling in the cheek region near the parotid gland, fever, and pus discharge in bacterial cases.
Osteomyelitis	Severe, latejante, persistent	Infection of the bone causing inflammation and necrosis	Usually not involved unless it becomes chronic	Swelling, pain, pus discharge, fever, and sometimes bone exposure.
Eagle Syndrome	Sharp, penetrating, radiating down the throat	Elongation of the styloid process by irritating the surrounding tissues	Not normally involved	Pain when turning the head, swallowing, or speaking, often radiating to the ear or throat.

Associated with infections of the sinuses and respiratory areas

Diagnosis	Quality of pain	Peripheral Mechanism	Central Mechanism	Clinical Signs
Sinusitis	Dude, pressure-like, often associated with nasal congestion	Inflammation of the sinus mucosa	Pain can be reported, but the central mechanisms are not primarily involved	Facial pressure, congestion, postnasal drip, and tenderness in the maxillary sinus area.
Nasal Polyp	Lightweight, pressure-like	Polyps causing obstruction and inflammation of the nasal tissues	Not normally involved	Nasal congestion, reduced sense of smell, and recurrent sinus infections.
Sinusite Maxilar	Deaf, pressure-like, often associated with nasal symptoms	Inflammation of the maxillary sinus mucosa	Pain can be reported, but the central mechanisms are not primarily involved	Facial pain, pressure and swelling, often with nasal and postnasal congestion.

--	--	--	--	--

Associated with cardio-vascular problems

Diagnosis	Quality of pain	Peripheral Mechanism	Central Mechanism	Clinical Signs
Carotidinia	Throbbing, high-pitched, localized	Inflammation of the carotid artery or surrounding tissues	Not normally involved	Carotid artery tenderness and pain, often associated with swelling or a palpable mass.

COMORBIDITIES AND RISK FACTORS

Patients with chronic orofacial pain often have comorbidities that further complicate diagnosis and treatment. Patients with TMD are almost three times more likely to develop migraines, in addition to being associated with other chronic pain conditions (AARON, BURKE & BUCHWALD, 2000; YAKKAPHAN, *et al.*, 2024), such as fibromyalgia, chronic fatigue syndrome, arthritis (MESIC, *et al.*, 2023), irritable bowel syndrome (COSTA, *et al.*, 2017; SLADE *et al.*, 2020) and chronic back pain. In addition, TMD can also be related to non-painful diseases, such as obstructive sleep apnea (MACHADO, *et al.*, 2024).

In addition to physical conditions, studies have revealed a strong relationship between chronic facial pain and psychological factors (MELEK, DEVINE, & RENTON, 2018). These factors significantly influence TMD, with up to 75% of TMD patients having psychological issues. These patients are more likely to develop anxiety, somatization, and depression, and emotional stress has a considerable impact on the condition (SÓJKA *et al.*, 2019). There is a significant correlation between stress and a higher rate of chronic TMDs. This reinforces the need for a multidisciplinary approach, involving not only dental professionals, but also physicians, psychologists, and physiotherapists (STANISZEWSKI *et al.*, 2018).

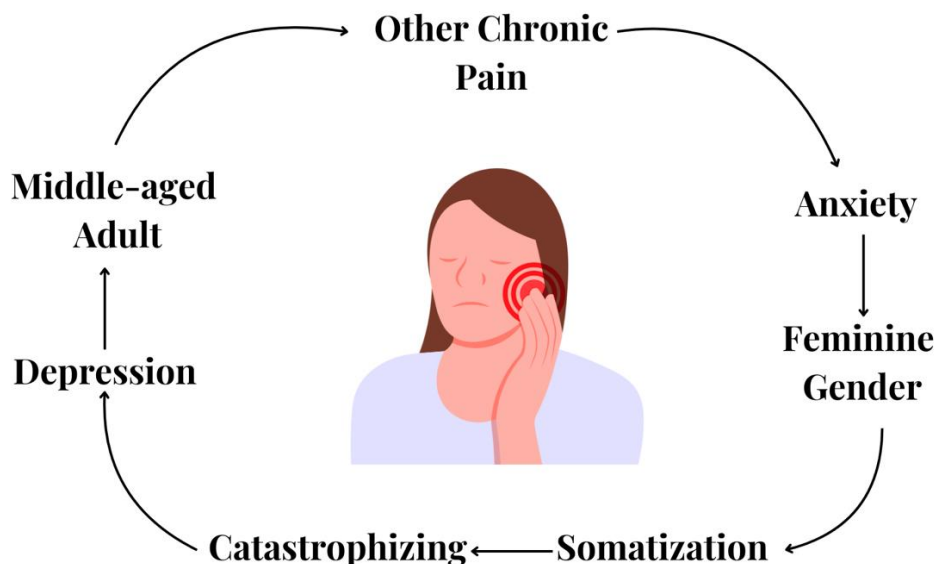
Data also indicate that TMD is more prevalent, long-lasting, intense, and frequent in women (KHAN, LIU, & TAO, 2024). Hormonal factors (PATIL, *et al.*, 2015; JEDYNAK, *et al.*, 2021), craniofacial anatomy (ALARCÓN, BASTIR & ROSAS, 2015; SHE, *et al.*, 2021), TRP channel engagement (WU, *et al.*, 2015; GONZÁLEZ-RAMÍREZ *et al.*, 2017; WANG, *et al.*, 2023), the opioid system (LIU, *et al.*, 2021), and the endocannabinoid system (NIU, *et al.*, 2012; WEERATHATHAPHAN *et al.*, 2021), as well as psychosocial aspects (MEINTS &

EDWARDS, 2018; DEMIRCIOĞLU, ÖZKAL & DAĞ, 2022), have been suggested as possible contributors to this gender disparity (SORGE & TOTSCH, 2017).

In endodontics, studies have shown that women have a higher prevalence of apical periodontitis compared to men (BERLINCK *et al.*, 2015). In addition, women report greater pain intensity, higher consumption of analgesics, and less pain relief with the use of these medications compared to men (POLYCARPOU *et al.*, 2005; ESTRELA *et al.*, 2011; Nusstein and Beck, 2003). In a recent animal study, Lilis *et al.*, 2024 demonstrated that female mice exhibit unique gene expression patterns during apical infections compared to males, with nociceptors regulating the expression of these genes. The predominance of women in the study highlights the need for gender-specific diagnostic and treatment approaches, especially to understand how endodontic treatments can interfere with the emergence or exacerbation of TMD-related pain in women (CASALE, *et al.*, 2021).

The average age reported by patients with TMD is 40 years (MAIXNER, *et al.*, 2016; FERREIRA, SILVA & FELÍCIO, 2016; VALESAN, *et al.*, 2021). This age group is more susceptible to dental problems and temporomandibular joint (TMJ) dysfunctions due to cumulative wear and tear (BUSBY, *et al.*, 2014), suggesting the need for integrated dental and TMD management strategies.

Figure 3: Risk factors associated with chronic orofacial pain.



THERAPEUTIC APPROACHES

The treatment of chronic orofacial pain should be personalized and multidisciplinary, considering the peripheral, central, and psychological factors that contribute to the

perpetuation of pain (BENICZKY *et al.*, 2005). Next, we discuss the main therapeutic approaches for chronic orofacial pain.

PHARMACOLOGICAL THERAPIES

Pharmacologic therapies for chronic orofacial pain include the use of anticonvulsants, such as gabapentin and pregabalin, which have been effective in treating neuropathic pain, and tricyclic antidepressants, such as amitriptyline, which are also used to reduce central sensitization. Nonsteroidal anti-inflammatory drugs (NSAIDs) and common pain relievers may be helpful in early stages of pain, but they are often insufficient to control long-term chronic pain (KIM, *et al.*, 2021).

NON-PHARMACOLOGICAL THERAPIES

Non-pharmacological therapies, such as physical therapy, acupuncture, and cognitive-behavioral therapy, have been shown to be effective in the management of chronic orofacial pain. These approaches aim not only to reduce pain but also to improve the functionality and quality of life of patients by addressing the biopsychosocial aspects of pain.

Recently, interventions such as transcranial magnetic stimulation (TMS) and transcutaneous electrical stimulation (TENS) have been explored as therapeutic options for orofacial neuropathic pain, with promising results in some studies (KIM, *et al.*, 2021).

The application of the Trilad Theory in dental practice allows the practitioner to explore a combination of disciplines in addition to traditional options (Srouf 2022, 2023, 2024, Srouf & Machado 2024, Srouf *et al.* 2024). For example, when dealing with chronic orofacial pain, the dentist can integrate psychological approaches, muscle therapies, treatments that aim at the patient's emotional control, such as relaxation or mindfulness techniques, all within the same treatment plan.

EMERGING APPROACHES

Advances in neuroscience have opened new possibilities for the treatment of chronic orofacial pain. Among the emerging approaches are the use of ion channel modulators, gene therapies, and the use of stem cells to regenerate damaged nerve tissues. These therapies may provide new options for patients who do not respond to conventional approaches.

In addition, a better understanding of the genetic and epigenetic factors that influence orofacial pain may allow for the development of more personalized treatments, adjusted to the individual needs of each patient (KIM, *et al.*, 2021).



FINAL CONSIDERATIONS

Chronic orofacial pain represents a major challenge for healthcare professionals, especially in endodontics, where confusion between odontogenic pain and other forms of pain can lead to unnecessary and ineffective treatments. Careful differential diagnosis, coupled with a deep understanding of the mechanisms underlying pain and associated comorbidities, is essential to ensure that patients receive the most appropriate treatment.

With the advancement of neuroscience research and the development of new therapeutic approaches, there is hope that professionals can, soon, offer more effective solutions for patients with chronic orofacial pain, significantly improving their quality of life.

Finally, the Trilad Theory and human reasoning does not see the neural system as an isolated structure, or a single way of stimulating and perceiving pain, and faces these mechanisms in a comprehensive way, where other aspects must be considered. Considering that this powerful system works together and not in isolation.

ACKNOWLEDGMENTS

This book chapter was developed with the support of research funding, provided in part by the Coordination for the Improvement of Higher Education Personnel – Brazil (CAPES) – Funding Code 001; by the National Council for Scientific and Technological Development – CNPq (INCT Oral Health and Dentistry) 406840/2022-9; 406261/2023-7; and by the Research Support Foundation of the State of Minas Gerais – FAPEMIG, grant numbers APQ-02105-18 and APQ-00927-23.

REFERENCES

1. ABD-ELMEGUID, A., & YU, D. C. (2009). Dental pulp neurophysiology: Part 1. Clinical and diagnostic implications. *Journal of the Canadian Dental Association*, *75*(1), 55-63. Disponível em: <https://www.cda-adc.ca/jcda/vol-75/issue-1/55.html>. Acesso em: 20 set. 2024.
2. BENDER, I. B. (2000). Pulpal pain diagnosis: A review. *Journal of Endodontics*, *26*(3), 175-179. <https://doi.org/10.1097/00004770-200003000-00012>.
3. BENICZKY, S., TAJTI, J., VARGA, E. T., & VÉCSEI, L. (2005). Evidence-based pharmacological treatment of neuropathic pain syndromes. *Journal of Neural Transmission*, *112*, 735-749. <https://doi.org/10.1007/s00702-005-0297-x>.
4. Benko, K. (2012). Dental pain. In S. Mahadevan & G. Garmel (Eds.), *An introduction to clinical emergency medicine* (pp. 255-270). Cambridge University Press.
5. Busse, J. W., Casassus, R., Carrasco-Labra, A., Durham, J., Mock, D., Zakrzewska, J. M., Palmer, C., Samer, C. F., Coen, M., Guevremont, B., Hoppe, T., Guyatt, G. H., Crandon, H. N., Yao, L., Sadeghirad, B., Vandvik, P. O., Siemieniuk, R. A. C., Lytvyn, L., Hunskar, B. S., & Agoritsas, T. (2023). Management of chronic pain associated with temporomandibular disorders: A clinical practice guideline. *BMJ*, *383*, e076227. <https://doi.org/10.1136/bmj-2023-076227>.
6. CABRAL, M., & BRAUN, A. (2021). Gender and pain sensitivity in orofacial disorders. *Journal of Oral Pain*, *65*(1), 162-168.
7. Canfora, F., Ottaviani, G., Calabria, E., Pecoraro, G., Leuci, S., Coppola, N., Sansone, M., Rupel, K., Biasotto, M., Di Lenarda, R., Mignogna, M. D., & Adamo, D. (2023). Advancements in understanding and classifying chronic orofacial pain: Key insights from biopsychosocial models and international classifications (ICHD-3, ICD-11, ICOP). *Biomedicines*, *11*(12), 3266. <https://doi.org/10.3390/biomedicines11123266>.
8. CASALE, R., JEDYNAK, E., & MAIER, C. (2022). Sex differences in trigeminal neuralgia: Clinical insights and new therapeutic approaches. *Journal of Neurological Research*, *11*, 331-343. <https://doi.org/10.1093/neurology/cre242>.
9. Chapman, C. R., & Vierck, C. J. (2017). The transition of acute postoperative pain to chronic pain: An integrative overview of research on mechanisms. *The Journal of Pain*, *18*, 359.e1–359.e38.
10. Choi, E., Lee, Y. H., & Park, H. K. (2023). Orofacial pain with cardiac origin of coronary artery disease: A case report and literature review. *Case Reports in Dentistry*, *2023*, 6304637. <https://doi.org/10.1155/2023/6304637>.
11. CRID. (2023). Vasovagal syncope and hypertensive crisis in dental practice. *Case Reports in Dentistry*, *2023*. <https://doi.org/10.1155/2023/6304637>.
12. Croskerry, P., Campbell, S. G., & Petrie, D. A. (2023). The challenge of cognitive science for medical diagnosis. *Cognitive Research: Principles and Implications*, *8*(1), 13. <https://doi.org/10.1186/s41235-022-00460-z>.


13. Dalband, M., Mortazavi, H., & Hashem-Zehi, H. (2011). Bilateral temporomandibular joint pain as the first and only symptom of ischemic cardiac disease: A case report. **Chang Gung Medical Journal**, **34**(6 Suppl), 1-3. PMID: 22490449.
14. DIOGENES, A. (2024). Trigeminal neuron modulation of osteoimmune response. **Frontiers in Molecular Biosciences**, **11**. <https://doi.org/10.3389/fmolb.2024.1338511>.
15. Ferrillo, M., Giudice, A., Marotta, N., Fortunato, F., Di Venere, D., Ammendolia, A., Fiore, P., & de Sire, A. (2022). Pain management and rehabilitation for central sensitization in temporomandibular disorders: A comprehensive review. **International Journal of Molecular Sciences**, **23**(20), 12164. <https://doi.org/10.3390/ijms232012164>.
16. Gaul, C., Gantenbein, A., Buettner, U., et al. (2008). Orofacial cluster headache. **Cephalalgia**, **28**, 903–905.
17. Gaul, C., Sándor, P., Galli, U., et al. (2007). Orofacial migraine. **Cephalalgia**, **27**, 950–952.
18. Gerwin, R. (2020). Chronic facial pain: Trigeminal neuralgia, persistent idiopathic facial pain, and myofascial pain syndrome—An evidence-based narrative review and etiological hypothesis. **International Journal of Environmental Research and Public Health**, **17**(19), 7012. <https://doi.org/10.3390/ijerph17197012>.
19. Glare, P., Aubrey, K. R., & Myles, P. S. (2019). Transition from acute to chronic pain after surgery. **Lancet**, **393**, 1537–1546.
20. Haviv, Y. (2022). Orofacial pain, diagnosis, and treatment. **Applied Sciences**, **12**, 11026. <https://doi.org/10.3390/app122111026>.
21. Headache Classification Committee of the International Headache Society (IHS). (2013). The International Classification of Headache Disorders, 3rd edition (beta version). **Cephalalgia**, **33**(9), 629-808. <https://doi.org/10.1177/0333102413485658>.
22. Heath, L., & Philip, A. (2020). Chronic pain care: Time for excellence. **Family Medicine and Community Health**, **8**, e000285.
23. Honda, Y., Handa, T., Fukuda, K. I., Koukita, Y., & Ichinohe, T. (2018). Comparison of risk factors in patients with acute and chronic orofacial pain. **Anesthesia Progress**, **65**(3), 162-167. <https://doi.org/10.2344/anpr-65-02-05>.
24. HUSSEIN, H., & KISHEN, A. (2022). Local immunomodulatory effects of intracanal medications in apical periodontitis. **Journal of Endodontics**, **48**, 430–456. <https://doi.org/10.1016/j.joen.2021.11.012>.
25. Indelicato, E., & Boesch, S. (2021). From genotype to phenotype: Expanding the clinical spectrum of CACNA1A variants in the era of next generation sequencing. **Frontiers in Neurology**, **12**, 639994. <https://doi.org/10.3389/fneur.2021.639994>.
26. Institute of Medicine (US) Committee on Advancing Pain Research, Care, and Education. (2011). **Relieving pain in America: A blueprint for transforming prevention, care, education, and research**. National Academies Press. Disponível em: <https://www.ncbi.nlm.nih.gov/books/NBK91497/> <https://doi.org/10.17226/13172>.

27. International Classification of Orofacial Pain, 1st Edition (ICOP). (2020). *Cephalalgia*, *40*, 129–221.
28. Jalali, N., Vilke, G. M., Korenevsky, M., Castillo, E. M., & Wilson, M. P. (2014). The tooth, the whole tooth, and nothing but the tooth: Can dental pain ever be the sole presenting symptom of a myocardial infarction? A systematic review. *Journal of Emergency Medicine*, *46*(6), 865-872. <https://doi.org/10.1016/j.jemermed.2013.11.071>.
29. Ji, R. R., Nackley, A., Huh, Y., Terrando, N., & Maixner, W. (2018). Neuroinflammation and central sensitization in chronic and widespread pain. *Anesthesiology*, *129*(2), 343-366. <https://doi.org/10.1097/ALN.0000000000002130>.
30. Kawaguchi, J., & Ichinohe, T. (2024). A case report on unstable angina pectoris manifesting as orofacial pain. *Bulletin of Tokyo Dental College*, *65*(2-3), 41-46. <https://doi.org/10.2209/tdcpublication.2024-0005>.
31. Kim, E. S., & Fung, S. (2024). Management of orofacial pain starts with careful differentiation of odontogenic and non-odontogenic pain. *Drugs & Therapy Perspectives*, *40*, 256–263. <https://doi.org/10.1007/s40267-024-01087-4>.
32. KORONA-GLOWNIAK, I., PIATEK, D., FORMAL, E., LUKOWIAK, A., GERASYMCHUK, Y., KEDZIORA, A., BUGLA-PLÓSKONSKA, G., GRYWALSKA, E., BACHANEK, T., & MALM, A. (2021). Patterns of oral microbiota in patients with apical periodontitis. *Journal of Clinical Medicine*, *10*, 2707. <https://doi.org/10.3390/jcm10122707>.
33. Labanca, M., Gianò, M., Franco, C., & Rezzani, R. (2023). Orofacial pain and dentistry management: Guidelines for a more comprehensive evidence-based approach. *Diagnostics (Basel)*, *13*(17), 2854. <https://doi.org/10.3390/diagnostics13172854>.
34. Leżnicka, K., Pawlak, M., Sawczuk, M., Gasiórowska, A., & Leońska-Duniec, A. (2023). SCN9A rs6746030 polymorphism and pain perception in combat athletes and non-athletes. *Genes (Basel)*, *14*(3), 733. <https://doi.org/10.3390/genes14030733>.
35. Lillis, K. V., Grinceviciute, R., & Diogenes, A. (2024). Sex-specific nociceptor modulation of the apical periodontitis transcriptome. *Frontiers in Molecular Biosciences*, *11*, 1338511. <https://doi.org/10.3389/fmolb.2024.1338511>.
36. Maarbjerg, S., Wolfram, F., Heinskou, T. B., et al. (2017). Persistent idiopathic facial pain – A prospective systematic study of clinical characteristics and neuroanatomical findings at 3.0 Tesla MRI. *Cephalalgia*, *37*, 1231–1240.
37. Macauley, Y., O'Donnell, P., & Duncan, H. F. (2013). Dental pain. *BMJ*, *347*, f6539. <https://doi.org/10.1136/bmj.f6539>.
38. Macfarlane, T., & Del Mastro, A. (2021). New international classification of orofacial pain: What is in it for endodontists? *Journal of Endodontics*, *47*(3), 345-357. <https://doi.org/10.1016/j.joen.2020.12.002>.
39. Maixner, W., Fillingim, R. B., Williams, D. A., Smith, S. B., & Slade, G. D. (2016). Overlapping chronic pain conditions: Implications for diagnosis and classification. *The Journal of Pain*, *17*(9 Suppl), T93-107. <https://doi.org/10.1016/j.jpain.2016.06.002>.

40. May, A., Benoliel, R., Imamura, Y., Pigg, M., Baad-Hansen, L., Svensson, P., & Hoffmann, J. (2023). Orofacial pain for clinicians: A review of constant and attack-like facial pain syndromes. **Cephalalgia**, **43**(8), 3331024231187160. <https://doi.org/10.1177/03331024231187160>.
41. Mox, T., et al. (2020). The role of neuropathic pain in trigeminal neuralgia. **Journal of Headache and Pain**, **16**, 84, 128-135. <https://doi.org/10.1016/j.jhp.2020.10.002>.
42. NIHMS. (2020). Gender differences in orofacial pain: An in-depth review. **Journal of Pain Research**, **13**, 193-199. <https://doi.org/10.1016/j.jhp.2020.10.002>.
43. Nixdorf, D. R., Law, A. S., John, M. T., et al. (2015). Differential diagnoses for persistent pain after root canal treatment: A study in the national dental practice-based research network. **Journal of Endodontics**, **41**, 457–463. <https://doi.org/10.1016/j.joen.2014.11.009>.
44. Pigg, M., Nixdorf, D. R., Law, A. S., Renton, T., Sharav, Y., Baad-Hansen, L., & List, T. (2021). New international classification of orofacial pain: What is in it for endodontists? **Journal of Endodontics**, **47**, 345-357. <https://doi.org/10.1016/j.joen.2020.12.002>.
45. Raja, S. N., Carr, D. B., Cohen, M., Finnerup, N. B., Flor, H., Gibson, S., et al. (2020). The revised International Association for the Study of Pain definition of pain: Concepts, challenges, and compromises. **Pain**, **23**. <https://doi.org/10.1097/j.pain.0000000000001939>.
46. Rayner, L., Hotopf, M., Petkova, H., Matcham, F., Simpson, A., & McCracken, L. M. (2016). Depression in patients with chronic pain attending a specialised pain treatment centre: Prevalence and impact on health care costs. **Pain**, **157**, 1472–1479. <https://doi.org/10.1097/j.pain.0000000000000509>.
47. Romero-Reyes, M., Arman, S., Teruel, A., et al. (2023). Pharmacological management of orofacial pain. **Drugs**, **83**(14), 1269–1292. <https://doi.org/10.1007/s40265-023-01882-9>.
48. Rotpenpian, N., & Yakkaphan, P. (2021). Review of literatures: Physiology of orofacial pain in dentistry. **Eneuro**, **8**, 1-7. <https://doi.org/10.1523/ENEURO.0154-21.2021>.
49. Scholz, J., & Woolf, C. J. (2007). The neuropathic pain triad: Neurons, immune cells, and glia. **Nature Neuroscience**, **10**, 1361-1368. <https://doi.org/10.1038/nn1992>.
50. Schug, S. A., Lavand'homme, P., Barke, A., Korwisi, B., Rief, W., Treede, R. D., et al. (2019). The IASP classification of chronic pain for ICD-11. **Pain**, **160**, 45–52. <https://doi.org/10.1097/j.pain.0000000000000361>.
51. Slade, G. D., Ohrbach, R., Greenspan, J. D., Fillingim, R. B., Bair, E., Sanders, A. E., Dubner, R., Diatchenko, L., Meloto, C. B., Smith, S., & Maixner, W. (2016). Painful temporomandibular disorder: Decade of discovery from OPPERA studies. **Journal of Dental Research**, **95**(10), 1084-1092. <https://doi.org/10.1177/0022034516653743>.
52. Small, C., & Laycock, H. (2020). Acute postoperative pain management. **British Journal of Surgery**, **107**(2), e70-e80. <https://doi.org/10.1002/bjs.11477>.

53. Spencer, C. J., & Gremillion, H. A. (2007). Neuropathic orofacial pain: Proposed mechanisms, diagnosis, and treatment considerations. **Dental Clinics of North America**, **51**, 209-224. <https://doi.org/10.1016/j.cden.2006.09.006>.
54. Splieth, C. H., & Tachou, A. (2013). Epidemiology of dentin hypersensitivity. **Clinical Oral Investigations**, **17**, 3–8. <https://doi.org/10.1007/s00784-012-0678-0>.
55. Srour, H. A. (2022). Teoria da Trilidade e o raciocínio humano (Tese de doutorado, Absolute Christian University, Flórida, EUA). 99 f.
56. Srour, H. A. (2024). Explorando a Teoria da Trilidade e o raciocínio humano: Aplicações do Diagrama de Hassan em neurociências. **Ciências da Saúde**, **28**(137), 15. <https://doi.org/10.69849/revistaft/ni10202408150722>.
57. Srour, H. A. (2023). Teoria da Trilidade e o raciocínio humano. **Absolute Review**, **15**(1), 8-20. <https://review.acu.education/edicao-v-15-n-01-maio-2023/>.
58. Srour, H. A., & Machado, F. S. (2024). Superando o dualismo: A aplicação da Teoria da Trilidade e o raciocínio humano nas respostas ao estresse. In W. G. Almeida (Org.), **Trajectories in Health: Experiences, Challenges and Innovations in the Scenario** (1st ed., pp. 201-224). Editora Contemporânea. <https://doi.org/10.56083/edcont.978.65-982396-5-7>.
59. Srour, H. A., Viana, A. B., Almeida, A. C. S., Pereira, A. L. da S., Lemos, L. M. G., Lima, W. L. da C., & Ferreira, Y. T. (2024). A Trilidade neurobiológica do mecanismo de luta ou fuga: Uma nova perspectiva. **Revista Contemporânea**, **4**(5). Retrieved from file:///C:/Users/anato/Downloads/Contempor%C3%A2nea%20022%20(5).pdf.
60. Sun, X., Yang, Z., Nie, Y., & Hou, B. (2022). Microbial communities in the extraradicular and intraradicular infections associated with persistent apical periodontitis. **Frontiers in Cellular and Infection Microbiology**, **11**, 798367. <https://doi.org/10.3389/fcimb.2021.798367>.
61. Tanner, J., Teerijoki-Oksa, T., Kautiainen, H., Vartiainen, P., Kalso, E., & Forssell, H. (2022). Health-related quality of life in patients with chronic orofacial pain compared with other chronic pain patients. **Clinical and Experimental Dental Research**, **8**(3), 742-749. <https://doi.org/10.1002/cre2.560>.
62. The Lancet. (2019). ICD-11. **Lancet**, **393**, 2275.
63. Treede, R. D., Rief, W., Barke, A., Aziz, Q., Bennett, M. I., Benoliel, R., Cohen, M., Evers, S., Finnerup, N. B., First, M. B., Giamberardino, M. A., Kaasa, S., Korwisi, B., Kosek, E., Lavand'homme, P., Nicholas, M., Perrot, S., Scholz, J., Schug, S., Smith, B. H., Svensson, P., Vlaeyen, J. W. S., & Wang, S. J. (2019). Chronic pain as a symptom or a disease: The IASP classification of chronic pain for the International Classification of Diseases (ICD-11). **Pain**, **160**(1), 19-27. <https://doi.org/10.1097/j.pain.0000000000001384>.
64. Trentini, C., Moreno, C., & Souza, R. (2023). Expression of chronic pain genes in apical periodontitis tissues. **International Endodontic Journal**, **56**, 183-197. <https://doi.org/10.1111/iej.13548>.

65. Vlaeyen, J. W. S., Kole-Snijders, A. M. J., Boeren, R. G. B., & van Eek, H. (1995). Fear of movement/(re) injury in chronic low back pain and its relation to behavioral performance. **Pain**, **62**, 363-372. [https://doi.org/10.1016/0304-3959\(95\)00042-W](https://doi.org/10.1016/0304-3959(95)00042-W).
66. Wolf, E., Dragicevic, M., & Fuhrmann, M. (2019). Alleviation of acute dental pain from localized apical periodontitis: A prospective randomized study comparing two emergency treatment procedures. **Journal of Oral Rehabilitation**, **46*(2)*, 120-126. <https://doi.org/10.1111/joor.12730>.
67. Wu, G., et al. (2021). The role of ion channels in neuropathic orofacial pain. **Journal of Clinical Medicine**, **10**, 5345-5353. <https://doi.org/10.3390/jcm10122707>.
68. Wu, G., Ringkamp, M., Murinson, B. B., Pogatzki, E. M., Hartke, T. V., Weerahandi, H. M., Campbell, J. N., Griffin, J. W., & Meyer, R. A. (2002). Degeneration of myelinated efferent fibers induces spontaneous activity in uninjured C-fiber afferents. **Journal of Neuroscience**, **22**, 7746-7753. <https://doi.org/10.1523/JNEUROSCI.22-17-07746.2002>.
69. Wu, Y., et al. (2020). Mechanisms of orofacial pain: A review. **Journal of Neurological Research**, **24*(4)*, 56-64. <https://doi.org/10.1155/2023/6304637>.
70. Yakkaphan, P., et al. (2023). Burnout syndrome and orofacial pain: A comparative study. **Journal of Orofacial Pain**, **25*(1)*, 1285-1290. <https://doi.org/10.1016/j.oooo.2023.10.002>.
71. Ye, Y., Salvo, E., Romero-Reyes, M., Akerman, S., Shimizu, E., Kobayashi, Y., Michot, B., & Gibbs, J. (2021). Glia and orofacial pain: Progress and future directions. **International Journal of Molecular Sciences**, **22*(5345)*, 1-21. <https://doi.org/10.3390/ijms22105345>.
72. Ziegeler, C., & May, A. (2019). Facial presentations of migraine, TACs, and other paroxysmal facial pain syndromes. **Neurology**, **93**, e1138–e1147. <https://doi.org/10.1212/WNL.0000000000000630>.

**THE PHILOSOPHY OF ALL OF US: THE MEANING OF LIFE ACCORDING TO
AYN RAND** <https://doi.org/10.56238/sevened2024.029-006>**Milton Leonardo Espíndola Kasprike¹****ABSTRACT**

Ayn Rand states that everyone has a philosophy called the sense of life that acts as an automatic evaluator of all thoughts, emotions and actions of individuals. The objective of the article is to present this concept, demonstrate its practical application and expose what are the philosophical issues involved. Methodologically, the article performs a theoretical analysis of the works of Rand and her main collaborators. The article explores how the sense of life is formed subconsciously and how it influences the subject's perception of reality and self-esteem. Knowing about the meaning of life is fundamental to all men, as ignorance can lead to an existence guided by unexamined and contradictory ideas, which leads to negative emotions and the passivity of actions. The conscious confrontation of the philosophical questions that Rand presents is the process that all men must go through in order to achieve a more harmonious, self-confident, and fulfilled life. Finally, the article emphasizes that it is only through philosophy that man can develop a benevolent sense of life, which recognizes reason as an absolute, reality as knowable, the human being as good, and happiness as a goal.

Keywords: Philosophy. Ayn Rand. Objectivism. Sense of Life. Self-esteem.

¹ Psychologist, graduated from the UniDomBosco University Center, Curitiba-PR, and is currently a master's student in the Graduate Program in Philosophy at the Pontifical Catholic University of Paraná (PUC-PR).
ORCID: <https://orcid.org/0000-0002-9273-8576>
LATTES: <https://lattes.cnpq.br/9719519596659041>
E-mail: leonardo_kasprike@hotmail.com



INTRODUCTION

Ayn Rand, a Russian-American philosopher and novelist, known for having developed the philosophy of Objectivism, states that every human being has a type of philosophy that guides their thoughts, emotions, and actions. Regardless of cultural background or educational level, each individual possesses what Rand called a "sense of life"—a subconscious emotional evaluation of existence, man, and morality. This implicit and unarticulated philosophy is such a fundamental human characteristic that ignorance of it is one of the main problems of humanity and one of the causes of cultural and philosophical decadence. According to Rand, most men are deliberately ignorant of the sense of life. In this context, Rand proposes that the understanding of the meaning of life necessarily involves reflection on three fundamental questions that every individual must ask himself, but that most men avoid. These three questions underlie your entire life, thoughts, emotions, and actions: "Where am I? How do I know that? What should I do?" These three questions are pertinent to all men, but "when they reach the age of understanding these questions, men believe that they already know the answers." (Rand, 1984).

According to Objectivist philosophy, the sense of life is something so crucial in man that it is present in all his expressions, posture, speech, choice of words, thoughts, clothing, art and romantic love. One's sense of life can be perceived almost instantaneously by interaction or in reactions to situations that occur in the moment, such as an immediate event in the context of a conversation, a news story about politics, or an appreciation of a cultural product.

This article seeks to present an introduction to the concept of sense of life created by Ayn Rand. Also in demonstrating how this concept works in practical form, in exposing what are the philosophical questions identified by Rand that form the sense of life and how the answers to these questions result in a benevolent or malevolent sense of life. Since the sense of life is a generally neglected human characteristic, the article seeks to argue about the importance of becoming aware of one's own sense of life and how this knowledge can contribute to a life that is more harmonious with one's values, convictions and actions. Ultimately, it is Ayn Rand's argument about how philosophy is fundamental and the primary cause of human experiences.

THE INEVITABILITY OF PHILOSOPHY

According to Ayn Rand, human beings have no choice as to the need for philosophy in their lives. But they have choices as to whether the philosophy that will guide their lives is



defined consciously or unconsciously. Whether by voluntary choice or by accident, by a rational and disciplined thought process, or by osmosis of various concepts accumulated, and potentially contradictory, over the course of random experiences in his life (RAND, 1984, p. 6). The result of a formed philosophy, whether consciously by choice or subconsciously by avoidance, is variation in the individual's self-confidence, in how he will determine his values, the extent of his ambitions, and the kind of emotions he will feel in each situation. The philosopher Leonard Peikoff, Ayn Rand's main follower, her intellectual heir and the one responsible for systematizing and promoting Objectivism, explains that for Rand, philosophy

it is the fundamental factor in human life; it is the basic force that shapes the minds and character of men and the destiny of nations. It shapes them for good or for bad, depending on the kind of philosophy that men accept. A man's choice, according to Ayn Rand, is not whether or not he will have a philosophy, but only what philosophy he will have. Their choice is whether their philosophy will be conscious, explicit, logical, and therefore practical—or random, unidentified, contradictory, and therefore lethal (PEIKOFF, In: Rand, 1984, p. 2).

Philosophy is an indispensable human need, because even before having any kind of technical knowledge about philosophy or abstract ideas, man will make choices or be silent, have opinions or be indifferent, will feel emotions of confidence or fear, will have moments of joy or sadness, will have desires and dreams or avoid having ambitions. The origin of all these experiences lies in the sense of life. What varies is whether man is aware of his sense of life or not (RAND, 1984).

The cognitive mechanism that integrates all of man's experiences, psychological activities, and conclusions is subconscious. For this reason, he performs integration automatically and emotionally, but not consciously and rationally. That which begins with concrete and immediate particular problems, usually in childhood, is generalized over the whole of existence. This results in a base emotion over all other emotions and experiences. This emotional response is the sense of life that Rand defined as "the preconceptual equivalent of metaphysics, an emotional, subconsciously integrated evaluation of man and existence. It defines the nature of a man's emotional responses and the essence of his character." (RAND, 1971, p. 14). Rand continues:

Long before man is old enough to understand a concept as metaphysics, he makes choices, forms value judgments, experiences emotions, and acquires a certain *implicit* view of life. Every choice and value judgment implies an evaluation of oneself and the world around oneself—particularly, one's ability to cope with the world. He can draw conscious conclusions, which may be true or false; or it can remain mentally passive and only react to events (i.e., just feel). Be that as it may, your subconscious mechanism summarizes your psychological activities, integrating your conclusions, reactions, or evasions into an emotional sum that establishes a habitual pattern and becomes your automatic response to the world around you.



What began as a series of isolated, specific conclusions (or evasions) about your own particular problems becomes a generalized feeling about existence, an implicit *metaphysics* with the enveloping motivational power of a constant, fundamental emotion—an emotion that is part of all your other emotions and underlies all your experiences. *This* is a sense of life (RAND, 1971, p. 14-15).

Onkar Ghate, director of philosophy at the *Ayn Rand Institute*, says that in this passage, when Rand speaks of a "generalized feeling about existence," she

refers to a perspective on the facts of reality—on the various things and events one faces throughout everyday life—that categorizes them into those that really matter and those that don't, those that are essential and therefore must be considered in all thoughts and actions, and those that are accidental and, therefore, must be considered in all thoughts and actions, and those that are accidental and, therefore, they must be left aside (GHATE, 2016, p. 119).

The key word here is "*important*." The sense of life is a pre-conceptual assessment of what is important within the context of the individual's development. Reality is complex, with a multitude of experiences and interactions of all kinds. Since childhood, man has been in contact with all sorts of possible, random and unpredictable situations. From his parents' rules, to what he consumes on television, what kind of things he listens to in church or on the street, how he is charged at school, what his friends like, etc. Since it is impossible for human cognition, especially that of a child, to understand, select, synthesize, and store all these materials consciously in a discriminated way, a subconscious mechanism will fulfill this role. It will integrate them and form a sense of life that will determine what is considered *important* to the subject, whether he knows it or not. Nathaniel Branden, a psychologist and one of Rand's main collaborators, explains that the sense of life is like a silent statement such as "this is what I consider important—important for me to project and for others to perceive—this is the world as I see it—this is the essence of things—this is what matters" (BRANDEN, 2011, Kindle position 7553).

Once the individual's sense of life begins to be formed from childhood, he is subject to the influence of everything that happens around him, his family, social and cultural context. All men will have some sense of life until their death, and the same sense of life will remain unchanged if the subject never carries out a philosophical exercise of reflection and confrontation with his conclusions. To do this, Rand suggests three questions.

THE THREE FUNDAMENTAL QUESTIONS

If the sense of life is a pre-conceptual equivalent of metaphysics (RAND, 1971, p. 42), it is important to define what metaphysics means to the philosopher. Peikoff explains to Rand, metaphysics is a branch of philosophy, a category of study that



identifies the nature of the universe as a whole. It tells men what kind of world they live in and whether there is a supernatural dimension beyond it. It tells them whether they live in a world of solid entities, natural laws, absolute facts, or in a world of illusory fragments, unpredictable miracles, and ceaseless flux. It informs them whether the things they perceive through the senses and the mind form an understandable reality, with which they can cope, or some kind of unreal appearance, which leaves them perplexed and defenseless (PEIKOFF, 1982, p. 23).

In this way, metaphysics is represented by the first question proposed by Rand: "*where am I?*" (RAND, 1984, p. 1). When confronted with the question, most men look around them, shrug off the philosophical implications of the question, and reply, "I'm in a room in New York." It turns out that this question does not deal with the particular – room, city – but with the fundamentals: *what is reality? what exists?* On a subconscious level, men already have the answers implicit and integrated into their sense of life, even if they don't know it. What they believe, and they may be mistaken, is that they also have the answers on an explicit level, and for this reason, the statement "I'm in New York City" would be enough. So they avoid asking the questions and suffer the consequences of their evasion (RAND, 1984, p. 2).

Hence the need to know all the philosophical implications and validate their conclusions. These implications appear in the form of the questions: am I in a natural, logical, and absolute universe or in a chaotic, unpredictable, and incomprehensible universe? Is what I see real or illusory? Do objects exist independently of the observer or does the observer create the objects? Are things what they are or are there contradictions in reality? Does consciousness merely observe, or does it also create existence? (RAND, 1984, p. 3).

This class of questions, Peikoff says, determines the individual's view of his or her ability to live and will directly affect his or her practical choices throughout life. If man "is an effective being in a benevolent universe, then certain choices and actions (expressing self-assertion, ambition, idealism) are appropriate to him; if not, no" (PEIKOFF, 1991, p. 415). Peikoff explains that Rand's understanding was that these questions are the bridge that connects metaphysics with ethics and that they will determine the foundation of man's values and, consequently, his actions.

Whatever the answer offered to "*where am I?*", there will always be a second, subsequent, necessary question: "*How do I know this?*" (RAND, 1984, p. 2). Again, most men also shy away from the philosophical implications of this question and claim things like "it's self-evident," "I feel it's true," or "I don't know." They accept that their conclusions are right without questioning them, or they go so far as to claim that it is not possible to conclude anything about anything. However, the "extent of your self-confidence—and your



success—will be different, according to the set of answers you accept" (RAND, 1984, p. 3) to the following questions Rand posed: Do I know by reason, by emotions, or by revelation? Are my sensory experiences valid or do my senses deceive me? Is my reason fed by experiences or are there innate ideas prior to my birth? Is my mind competent to deal with reality, or am I doomed to perpetual doubt? (RAND, 1984, p. 2-3). The answers will determine the confidence that man has in himself and the extent of his intellectual ambitions.

A third question: "*what should I do?*" necessarily follows from the other two previous ones. " Here," Rand says, men "are not very sure—but the usual answer is: whatever everyone else does" (RAND, 1984, p. 2). The result is the emotions of "fear without cause and undefined guilt" and in a practical way, these men "are not very active, they are not very confident, they are not very happy" (RAND, 1984, p. 2).

In order for the man to be able to ask the third question, he must first have answered the previous two questions. To know what is to be done, man must first understand the universe – where he will do it – and himself – who will do it. If man answers that he is incapable of dealing with an incomprehensible universe, he will present a certain class of answers. If man answers that it is possible to understand and deal with the universe, he will have totally different answers. The philosophical implications of this third question are: Do I have free will or am I predetermined? Do I believe that happiness is possible or should I escape suffering? Can I be morally good or will I always be a bad man? Are the men around me my equals or my enemies? Should I act for my goals or for the good of others? Should I dream big or should I be humble? (RAND, 1984, p. 3). The answers will determine the degree of activity or inertia, confidence or fear, happiness or guilt. In other words, your *self-esteem*.

The confrontation of these three questions "*where am I? How do I know that? What should I do?*" and its implications are extremely difficult, says Ghate. These questions

they are difficult to formulate explicitly, much less to answer correctly. However, Rand maintains that an individual nonetheless forms *implicit* answers to these questions as he grows up and reaches adulthood. Faced with numerous concrete issues and problems in their daily life, a maturing child must draw some specific conclusions, form some value judgments, and make some choices. The rationality and precision of these choices will add up in your mind, generating not only a sense of efficacy and self-worth, but also a sense of the kind of world you live in. (GHATE, 2016, p. 119)

Man will always make choices that will represent his estimate of the world and of himself. However, a fundamental choice that is never made is the validation of your conclusions by asking the questions above, discovering your meaning of life, and



confronting the answers. One way or another, your sense of life will be formed and throughout life. He will only know it or not.

Just as the human experience is a multiplicity, so the sense of life is a variable spectrum, explains Branden (2011, Kindle position 7558). The sense of life adds up all the individual values that are diffused into a base emotion that is integrated. However, the experiments that can give rise to these values may be random. Avoidance of a sense of life can result in conflicting values and contradictory emotions. Still, the sense of life is as inescapable as philosophy. Man will always make some estimate of the essence of things, will always select the "genius or the psychotic" as the representative of humanity, will always characterize man by "efficacy or impotence", will always understand that the essence of life is "fulfillment and happiness — or failure and misery" (BRANDEN, 2011, Kindle position 7558-7563).

About the process in which the sense of life is formed, Rand explains:

A sense of life is formed by a process of emotional generalization that can be described as a subconscious equivalent of a process of abstraction, since it is a method of classification and integration. However, it is a process of emotional abstraction: it consists of classifying *things according to the emotions they evoke* — *that is, uniting, by association or connotation, all those things that have the power to make an individual experience the same (or a similar emotion)* (RAND, 1971, p. 16)

To illustrate this spectrum variation, it is possible to imagine four different people. The first feels that happiness exists as a certainty and that suffering is only an exception. The second feels that happiness can be achieved with a lot of difficulty and effort to overcome the suffering that is natural. The third feels that happiness is fragile and made up of rare moments and that suffering is the norm. The fourth feels that happiness is a utopian illusion and that man is trapped in a permanent state of suffering.

These four examples illustrate how the sense of life can vary from person to person. Despite this variation, Rand located the sense of life to two fundamental opposing premises, the benevolent premise and the malevolent premise.

BENEVOLENT AND MALEVOLENT SENSE OF LIFE

The benevolent premise is present in the conviction that "ideas matter, that knowledge matters, that truth matters, that one's mind matters" (RAND, 1999, p. 122). Someone with the benevolent sense of life is incapable of believing in the triumph of evil as an omnipotent and inescapable force. When this subject looks at the events around him, he feels that that "injustice (or terror, or falsehood, or frustration, or pain, or anguish) is the exception in life, not the rule" (RAND, 1999, p. 122) and that even if in its immediate context



there is a lot of violence, poverty and suffering, somewhere in the world there are rational beings who live a life worthy of humans, that happiness is within your reach and that good is possible.

Peikoff explains that in this context, benevolence has a different meaning than kindness. The sense of benevolent life is one in which man understands that he must adapt to the universe, and not the other way around. "If it adapts to it," Peikoff explains, "then the universe is 'benevolent' in another sense: 'favorable to human life.'" The explanation continues:

If a man recognizes and adheres to reality, he can attain his values in reality; He can and, on equal terms, he will. To the moral man, failures, though possible, are an exception to the rule. The rule is success. The state of consciousness to be sought and expected is happiness (PEIKOFF, 1991, p. 342).

The practical demonstration of this premise can be seen in aesthetic terms in the story, says Rand. In ancient Greece, the sense of benevolent life predominated. Men were eager for knowledge, art exalted man as a beautiful and heroic being, science advanced for human well-being. In Rand's words, the sculptors of ancient Greece presented "man as a god-like figure" even though there were still men who "can be crippled, sick, or defenseless" (RAND, 1971, p. 26-27). To the Greek sense of life, human frailty and disasters were regarded "as accidental, as irrelevant to the essential nature of man—and he presents a figure that embodies strength, beauty, intelligence, and self-confidence as the proper and natural state of man." (RAND, 1971, p. 26-27).

As the sense of life is directly linked to the formation of self-esteem, explains Gathe (2016, p. 120), the benevolent premise indicates how the subject answered the aforementioned questions. He believes that he is a rational person, that his mind is effective and that his actions have the potential to succeed in a world that is receptive to human beings – his self-esteem will be higher. Conversely, the malevolent premise indicates other types of answers to the same questions. The subject lacks confidence in his mind, believes that reason is powerless to know a world that is hostile to human beings – his self-esteem is inferior, because the subject will feel powerless, failed and inert. "Self-esteem," says Gathe, "is an evaluation of oneself—in relation to reality; The sense of life is an evaluation of reality — in relation to oneself. (GATHE, 2016, p. 120).

The malevolent sense of life is contained in the conviction that man is naturally "powerless and doomed—that success, happiness, and fulfillment are impossible for him—that emergencies, disasters, and catastrophes are the norm of his life and that his main aim is to combat them" (RAND, 1964, p. 62-63). By looking at its immediate context, the subject



commits what Rand claims to be a philosophical error, which is to generalize that *all* reality is hostile to man, that catastrophes are present everywhere in the world, that man is *completely* powerless, that reason is flawed, that happiness is merely a utopia, and that good is impossible to overcome and man is guilty of being evil. In Rand's words: "what began as a series of isolated and specific conclusions (or evasions) about one's own particular problems, becomes a generalized feeling about existence" (RAND, 1971, p. 15). Peikoff adds that the malevolent premise "states that man *cannot* achieve his values; that successes, while possible, are an exception; that the rule of human life is failure and misery" (PEIKOFF, 1991, p. 342).

In a practical way in history, according to the objectivist understanding, the malevolent sense of life was predominant throughout the Middle Ages and is present in today's culture. The medievals, Rand explains, presented man as they understood him, "as a deformed monstrosity." While it was possible that there were "men who are healthy, happy, or confident," the medievals regarded "these conditions as accidental or illusory, as irrelevant to the essential nature of man." The malevolent sense of life of the Middle Ages "presents a tortured figure that embodies pain, ugliness, and terror as the proper and natural state of man" (RAND, 1971, p. 27).

In the context of today's culture, the malevolent sense of life is present in a kind of nihilism. Peikoff describes it as follows:

They seek the emotion of the new; and the new, for them, is the negative. What is new is annihilation, the annihilation of the essential in each field; they have no interest in anything that will replace it. Thus, the uniqueness of the century that was left behind: philosophy blissfully free of system-building, education based on the theory that cognition is harmful, science proud of its inability to understand, art that drove out beauty, literature that boasted anti-heroes, language "freed" from syntax, verse "free" from meter, non-representational painting, music *atonal*, *psychology of the unconscious*, *deconstruction in literary criticism*, *indeterminacy as the new depth in physics*, *incompleteness as revelation in mathematics—an emptiness everywhere hailed by the avant-garde with a metaphysical laugh. It was the sound of triumph, the triumph of the new* anti-ideal: of the unknowable, the unattainable, the unbearable (PEIKOFF, 1991, p. 457-458).

These examples by Peikoff serve to illustrate how the ultimate consequences of human actions begin with the role that philosophy plays in man's life. Although many intellectuals are completely clear about their implicit and explicit ideas, this does not exempt them from those fundamental questions that Rand posed. A sense of life that has originated in the conclusion that the universe is unknowable is unlikely to result in explicit ideas that sustain reason as an absolute, that exalt the search for truth and conclusions, that seek order in the universe and recreate order in art and in life – and in this case, Peikoff's examples are demonstrable.



SENSE OF LIFE IN PRACTICE

On an individual level, a benevolent or malevolent sense of life will translate into everyday details and preferences. The more benevolent his sense of life, the more self-confident the subject will be, the more attracted he will be to the idealized view of man and the more repelled by man as a vulnerable being. Conversely, the more malevolent his sense of life, the lower his self-confidence, the greater the attraction to the view of man as a frail and flawed being, and the more repelled by the view of man as a successful being.

In Rand's words, someone with a benevolent sense of life will be drawn to "a new neighborhood, a discovery, an adventure, a struggle, a triumph [...] a heroic man, the New York skyline, a sunlit landscape, pure colors, ecstatic music" (RAND, 1971, p. 16). Someone with a malevolent sense of life will be attracted by the quiet of "next-door neighbors, a memorized recitation, [...] a familiar routine, comfort [...] a humble man, an old village, a misty landscape, grayish colors, folk music" (RAND, 1971, p. 16). All of these preferences depend on the answers presented to the three questions at the beginning of the article. Rand continues:

For a man with self-esteem, the emotion that unites the elements of the first part of these examples is admiration, exaltation, and a sense of challenge; The emotion that unites the elements of the second part is disgust or boredom. For a man who lacks self-esteem, the emotion that unites the elements of the first part of these examples is fear, guilt, and resentment; the emotion that unites the elements of the second part is the relief of fear, the comforting reaffirmation and the security without demands of passivity (RAND, 1971, p. 16).

In human relationships, even though people have different lives, they can have a compatible sense of life. For example, one person can choose the library and another the soccer fields. And both can believe that success is possible by continuous practice, that man can be skilled, and that he is free to choose his career. In an opposite example, someone who is more intellectually educated, who maintains that life lacks meaning, who thinks that reality is incomprehensible and that man is an evil being, has a sense of life compatible with a depressive subject, who has given up learning, creating, producing and feels that the act of sleeping is a momentary relief from the pain of existence. In any of the above examples, the man will need a criterion that will structure his emotional abstractions. The criterion, Rand explains, is a veiled, nonverbal statement of "what is important to me" or, "The kind of universe that is suitable for me, in which I would feel at home" (RAND, 1971, p. 17).

Gathe reinforces Rand's argument with two more examples. A person who actively seeks knowledge will value understanding. When he obtains knowledge, he feels that this result is real and true. When there is an error in knowledge, it will assess that it is a



correctable accident and then act to correct its mistakes. On the other hand, a more passive person will lack a sense of effectiveness. While knowledge and understanding may be values to some degree to her, they will not be *important*. When obtaining knowledge about something, the assessment is that this would be accidental, because the failure to obtain the knowledge that is the expected thing (GATHE, 2016, p. 120).

As the sense of life is an implicit philosophy, it can be in contradiction with the explicit ideas of the individual himself, who will suffer from constant internal conflict and possible catastrophic consequences. To illustrate this point, Rand describes a real person she met. Mr. X was a young man who possessed "the most tragic face I had ever encountered." This young man was 26 years old, a "brilliant" engineering scholar with a promising future, but who lacked any energy or motivation. He was paralyzed by the indecision and frustrations of life, "he was like a cloak of colorless ashes that had never been set on fire." Once, while watching a film about a professional "driven by a passionate, uncompromising, and dedicated view of his work," Mr. X simultaneously felt two emotions—admiration and guilt for having felt that same admiration. His sense of life pointed the direction of exaltation, but his conscious ideas rebuked him: "Life is not like that." What saved Mr. X, Rand argues, is precisely what this article argues: the process of identifying the initial three questions, confronting the answers, and verifying the validation of the conclusions, followed by the construction of a conscious, disciplined philosophy that was integrated with his uncontradictory sense of life. In this way, Mr. X was able to make calculated decisions in his career and face professional challenges with self-confidence. His professional and financial success, Rand claims, was absent of any trace of guilt (RAND, 1971, p. 135-137).

During Mr. X's process of answering the three questions "*where am I? How do I know that? What should I do?*" and all the other derived questions, the man by doing the same, will begin to identify his sense of life from what he considers *important* in his conclusions. Rand explains:

"Important"—in its essential meaning, as distinct from its more limited and superficial uses—is a *metaphysical* term. It refers to an aspect of metaphysics that serves as a bridge between metaphysics and ethics: a fundamental view of the nature of man. This view involves answers to questions such as: Is the universe knowable or not? Does man have the power of choice or not? Can he achieve his goals in life or not? The answers to these questions are "metaphysical value judgments," for they form the basis of ethics. Only those values that he considers or comes to regard as "important," those that represent his implicit view of reality, remain in a man's subconscious mind and form his sense of life. "It's important to understand things" — "It's important to obey my parents" — "It's important to act on your own" — "It's important to please other people" — "It's important to fight for what I want" — "It's important not to make enemies" — "My life is important" — "Who am I to take risks?" Man is a self-formed soul-being—and it is from such conclusions that the substance of his soul is made. (By "soul" I mean "consciousness.") The integrated sum of a man's basic values is his sense of life. (RAND, 1971, p. 17)



In whatever case, man has the need to identify his sense of life, that is, his conclusions and estimates about his relationship to existence, and to take control, rather than be controlled, of generalizations and negative emotions. At the same time, he develops a coherent, contradiction-free, and integrated philosophy that puts him in the right direction.

The right direction is a sense of benevolent life, Rand says. For to see the world as receptive to man, governed by natural, stable, and comprehensible laws, and man as capable of understanding these laws, is merely a statement of reality—a necessarily true conclusion. For Ayn Rand, existence has primacy over consciousness, reason is an absolute and has epistemological validity and man must idealize and seek his personal happiness (PEIKOFF, 1991, p. 453).

As Peikoff explained, benevolence is different from kindness or intentionality. The universe is neutral and does not wish to help or harm man. Benevolence is a confirmation of man's relationship with the universe. If man is a being who has free will and is cognitively competent to overcome difficulties, then benevolence acquires the meaning of being conducive to human life and to man's actions (PEIKOFF, 1991, p. 342). But that man whose relation to the universe is one of passivity and stagnation, he will perceive the universe as hostile to him.

Nor does a benevolent sense of life imply ignoring that there are difficulties in the world, that there are unhappy and sick people, poor and miserable countries, tragedies that destroy entire populations, and violent and brutal wars. But it implies recognizing that it all exists and acting to change all these things to the side of good.

To do otherwise, the total acceptance of a malevolent sense of life, would be to condemn man to a life of ignorance without knowledge, of doubt without certainty, of fear without courage, of failure without success, of conflict without peace, of oppression without rights, of poverty without productivity, of ruin without reconstruction. of disease without medicine, of pain without anesthesia, of darkness without light, of silence without music, of ugliness without beauty, of apathy without passion, of loneliness without love. But since men are able to learn and educate themselves, to never accept ignorance, to fall in love with something or someone, to create the most beautiful things that evoke the deepest of emotions, to do science that illuminates the darkness of the world, to apply technology for human well-being, to fight for equal rights and peace, to love deeply and to value – the sense of benevolent life is a mere statement of facts. The malevolent, a contradiction with reality.



FINAL CONSIDERATIONS

For Ayn Rand, philosophy is not an intellectual luxury restricted to academics, but an urgent need for everyone. And the sense of life is just as necessary and essential. It is the subconscious emotional basis of the human experience and all decisions throughout life. Although men are ignorant of philosophy in the technical and academic sense, the sense of life is the implicit philosophy that everyone has and that will shape their interpretation of the world, of themselves, of their social relations and personal goals. Ultimately, the question of the sense of life is also a question of self-knowledge and personal development.

By dodging the questions "*where am I? How do I know that? What should I do?*" A fundamental part of the human being is lost and remains unknown to him, which can lead him to an existence guided by ideals never examined and often conflicting with his own life, which will be characterized by fear, guilt, insecurity and frustration. Your passivity is a surrender to uncertainties and allowing outside forces to control you and lead you to destruction.

On the other hand, Ayn Rand's proposal to confront these issues in a conscious and disciplined way is a constant exercise for life. Only in this way is it possible to align the sense of life with an explicit and coherent philosophy and obtain a full and fulfilled life with a benevolent sense of life. Therefore, man comes to recognize reality as a knowable and stable place, himself as a capable and rational being, and happiness as something possible and desirable. Your life will be more meaningful and your achievements will be greater and greater.



REFERENCES

1. Branden, N. (2011). *The benevolent sense of life*. In *The vision of Ayn Rand: The basic principles of Objectivism* (Digital Kindle version). Cobden Press.
2. Ghatge, O. (2016). A being of self-made soul. In A. Gotthelf & G. Salmieri (Eds.), *A companion to Ayn Rand* (pp. 105–129). Wiley Blackwell.
3. Peikoff, L. (1982). Part one – Theory. In *The ominous parallels: The end of freedom in America* (Digital Kindle version). Meridian, Penguin Group (USA) Inc.
4. Peikoff, L. (1991). *Objectivism: The philosophy of Ayn Rand* (Vol. VI, The Ayn Rand Library) (Digital Kindle version). Meridian; Penguin Group.
5. Rand, A. (1964). *The virtue of selfishness: A new concept of egoism* (Digital Kindle version). Signet, Penguin Group (USA) Inc.
6. Rand, A. (1971). *The romantic manifesto: A philosophy of literature* (Revised ed.) (Digital Kindle version). Signet, Berkley, Penguin Random House LLC.
7. Rand, A. (1984). *Philosophy: Who needs it* (Digital Kindle version). Signet, New American Library, Penguin Group (USA) Inc.
8. Rand, A. (1999). *Return of the primitive: The anti-industrial revolution* (Digital Kindle version). Meridian, Penguin Putnam Inc.

THE CHALLENGES OF THE NURSE PROFESSIONAL IN THE APPLICABILITY OF ACTIVE TEACHING METHODOLOGIES AND EDUCATIONAL LEARNING TECHNOLOGIES

<https://doi.org/10.56238/sevened2024.029-007>

Alex Alves Camargo¹ and Edson Roberto Arpini Miguel²

ABSTRACT

The use of active methodologies (AM) in the health sciences is justified by the need to overcome traditional teaching models and, consequently, has the purpose of training professionals who can reconstruct the knowledge acquired and not just transfer knowledge in a mechanical and uncritical way. This is a Scoping Review or Scoping Study, guided by the methodological guidelines proposed by the Joanna Briggs Institute (JBI) and in compliance with the PRISMA-ScR. The scoping review was recorded on the OSF-Open Science Framework platform. Subsequently, the descriptors listed were used to search for studies in the Pubmed, Scielo and VHL databases, the grouping and summarization of key information of the collected articles was carried out with the help of Mendeley®, a reference manager that facilitated the primary analysis of the collected studies. Finally, the data and information found were arranged in table format, encompassing the following variables: authors; year of publication; database where the study was indexed; title; type of research and outcome. The results of the scoping review will provide support for future discussions related to the challenges of the nurse in the applicability of active methodologies and innovative learning technologies. Possible knowledge gaps identified during the scoping review will be highlighted, offering suggestions for future research on the subject.

Keywords: Active methodologies. Nursing education. Educational learning technologies. Applicability of methodologies.

¹ Master's Degree in Health Sciences Teaching Institution: Faculdades Pequeno Príncipe Address: Curitiba – Paraná, Brazil

E-mail: alex.camargo@aluno.fpp.edu.br

ORCID: <https://orcid.org/0009-0001-0255-108X>

² Doctor in Sciences - Health Education Institution: State University of Campinas Address: Curitiba – Paraná, Brazil

E-mail: edson.arpini@professor.fpp.edu.br

ORCID: <https://orcid.org/0000-0002-8357-1110>



INTRODUCTION

The training of nursing professionals is carried out according to the bachelor's degree model, allowing them to develop their activities in the field of human health, performing technological interventions essential for the reestablishment of the health of the sick. Those who choose to teach seek to develop their pedagogical practices through the experiences acquired in the labor market (Lourenço; Barriento; Ribeiro, 2023).

Considering that at this level of education the vast majority of teachers have a bachelor's degree without a licentiate, it is necessary to tend to reproduce the teaching methods of their training, such as expository classes, which are simply a transfer of knowledge, centered on the teacher, with no discussions and construction of knowledge, consequently generating the weakening of the teaching-learning process (Fontana; Wachekowski; Barbosa, 2020).

Studies empirically observe that university professors in areas other than the human sciences are limited professionals in terms of knowledge about innovative teaching methods and pedagogical bases. Its practice is guided by expository classes that focus only on the curricular component, with little or no pedagogical preparation (Fontana; Wachekowski; Barbosa, 2020).

It is necessary to reflect on the construction of the nursing professional, to consider that professional training focused on aspects of patient care does not always allow us to understand the specificities of the pedagogical work. The process of preparation/training of nursing professionals should anticipate social changes and teaching proposals should dialogue with such changes (Fontana; Wachekowski; Barbosa, 2020).

In order to create an education based on critical-reflective references, teaching should be understood as a participatory process so that health practices, curriculum design, contents, assessment techniques and learning scenarios offer training opportunities centered on teamwork and human subjectivity (Manhães; Tavares, 2020).

The nurse professor is responsible for the development of a pedagogical proposal that includes actions aimed at the autonomy of the student through teaching models that reflect the daily life of the professional, based on a political-pedagogical project designed, executed and evaluated with the effective participation of all educational agents, especially teachers (Trombetta Franco; Fernandes; Fernandes Millão, 2020).

The use of active methodologies (AM) in the health sciences is justified by the need to overcome traditional teaching models and, consequently, has the purpose of training professionals who can reconstruct the knowledge acquired and not just transfer knowledge in a mechanical and uncritical way (Santos Dias; Freitas de Jesus, 2021).



In this context, AM emerge to promote a critical and reflective education based on stimulating teaching and learning processes, in which students actively seek knowledge and, consequently, it is essential to use this learning method in the training process of health professionals, considering that it will be useful in solving health issues of the population and later in their pedagogical practice as a teacher (Santos Dias; Freitas de Jesus, 2021).

The use of an active methodology ensures a connection between the university and the community. This process allows for direct interventions that are consistent with reality; values all those involved in the process of knowledge construction in their different knowledge, allowing academic training incorporated into the practices of the health system (Santos Dias; Freitas de Jesus, 2021).

By emphasizing intellectual protagonism in the education of students, the teacher provides a space for decision-making based on the problematization and innovation of approaches, both for themselves and for those involved in the implementation of the methodological content (Barbosa *et al.*, 2021a).

The benefits that active methodologies add to the learning process during the training of health professionals are notorious and indisputable, but it is necessary to know which of the numerous active methodologies have caused greater advances in the clinical-scientific development of professionals and which competencies and skills are developed throughout the application in each innovative method (Júnior *et al.*, 2023).

Knowing the effects of these new educational technologies will allow the expansion of the possibilities of transmitting knowledge, since new educational technologies provide a basis for new academic and professional research, emphasizing that this model is developed in the new training process based on the evolution of professional competencies and skills (Júnior *et al.*, 2023).

Still in this line of thought, we can reinforce that the applicability of active methodologies in the teaching of health sciences stems from the need to break with the traditional educational model (Carrijo *et al.*, 2020).

Innovative educational learning technologies that are accompanied by technological evolution and the advancement of information technology emerge as a strategy for the reconstruction of knowledge, not only for the reproduction and repercussion of care practices, but also demystifying the mechanical and uncritical subject, when it provides new possibilities for the applicability of knowledge transfer (Carrijo *et al.*, 2020).



METHODOLOGY

This is a scoping review or Scoping Study, guided by the methodological guidelines proposed by the Joanna Briggs Institute (JBI) and in accordance with what is proposed in PRISMA-ScR (Tricco AC, *et. al.*, 2018).

The scoping review was registered on the OSF-Open Science Framework platform for the science and development of this research, and the record is available for consultation through DOI No. 10.17605/OSF.IO/AKUGY.

In addition, some recommendations proposed by the PRISMA protocol, 2020 were also followed, such as: identification in the title of the study as being a scoping review, explicit presentation of the research objectives; specification of eligibility criteria (inclusion and exclusion); presentation of the databases from which the included studies were recruited; presentation of the research strategy used; explanation of the selection process and choice of data extracted from the studies; elaboration of the results containing the characteristics and synthesized results of their individual analysis; pointing out the limitations of the study based on the delimitation of evidence included in the review; declaration of conflicts of interest and disposition of data, codes and other materials consulted for the preparation of this study.

An order of 6 steps was used to construct the study. These phases consisted of the elaboration of the guiding question (1), the search or sampling in the literature (2), data collection (3), critical analysis of the included studies (4), discussion of the results (5) and presentation of the scoping review (6).

As mentioned in the 1st step, the elaboration of the guiding question was based on the application of the PICO strategy, where "P" corresponds to the Population (nursing faculty and student nurses), "I" corresponds to the phenomenon of interest (applicability of active methodologies and innovative learning technologies) and "Co" corresponds to the context (challenges in the applicability of active methodologies and innovative learning technologies), Resulting in the guiding question, what are the challenges faced by the nursing professional in the applicability of active teaching methodologies and educational learning technologies?

In the search for evidence in the literature described in step 2, the descriptors in Health Sciences (DeCS) were consulted. Subsequently, the descriptors listed for the search for studies in the Pubmed, Scielo and VHL databases were used. In addition, the "last 5 years" filter was applied on both platforms, being justified by the intention to work with more recent articles on the subject.



In the 3rd stage, the inclusion criteria for the articles that composed this study were defined, selecting as inclusion criteria studies that evaluated the challenges of the faculty nurse in relation to the applicability of active methodologies (AM) and innovative learning technologies. Studies that identify the applicability of AM during the teaching-learning process of nursing students and that describe the understanding of which tools need to be improved, so that there is certainty in the commitment to quality education, guaranteeing the labor market a professional trained to face the challenges related to the applicability of active teaching methodologies and educational learning technologies.

As exclusion criteria, articles and studies that were repeated in the databases or that did not fit the inclusion criteria were discarded.

After that, the grouping and summarization of key information from the collected articles was carried out with the help of Mendeley®, a reference manager that facilitated the primary analysis of the studies collected from the reading of the title and abstract.

After this initial process, a critical and detailed analysis of the articles was carried out according to the 4th stage, based on the reading of the full text. Subsequently, the 5th stage of the process was carried out, in which the articles were interpreted to extract indispensable and relevant information for the theme in question.

These stages of study selection were carried out using the double-blind methodology of both, the studies were selected according to the selection criteria, with divergences being resolved later through discussions and consensus. Those studies that met the inclusion criteria were read in full and had their references analyzed to identify additional articles.

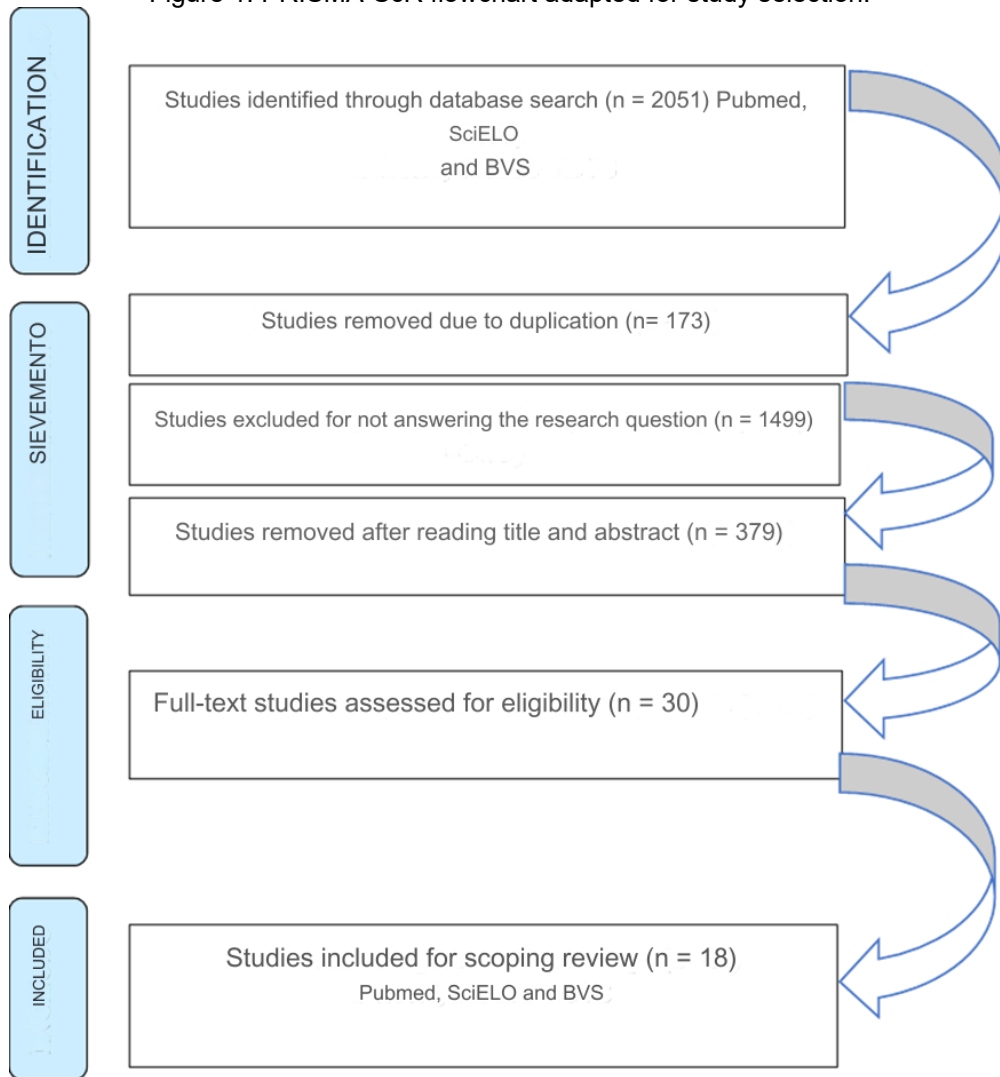
After reading the studies in full, the main characteristics were extracted and summarized by the authors who organized the database in the form of a spreadsheet in the Excel software, version 2016, of the Microsoft Office suite.

Finally, the data and information found were arranged in Chart 1, which includes the following variables: authors; year of publication; database where the study was indexed; title; type of research and outcome, thus concluding the 6th stage of this scoping review.

RESULTS

The search process identified 2051 articles in the three databases, and 1672 of them were initially excluded because they were duplicate or because they did not meet the criteria for inclusion in the study. Therefore, there were 379 studies that were filtered by screening titles and abstracts and, from this process, 30 articles were selected that were sent to full-text screening, after this analysis 18 articles were selected, thus concluding the search process, as presented in the adaptation of the PRISMA-ScR Flowchart (Figure 1).

Figure 1: PRISMA-ScR flowchart adapted for study selection.



Source: Prepared by the authors



Table 1: Results

YEAR	REFERENCES	TITLE	SOURCE	DESIGN OF STUDY	MAIN RESULTS	CONCLUSION
2023	(Silva <i>et al.</i> , 2023)	Meaningful learning in nursing education: an integrative review	UNIPAR Health Sciences Archives (2023) 27(9) 5224-5242	Integrative literature review	Meaningful learning (SA) can stimulate the student to be able to learn how to learn, becoming the subject of his own praxis.	Or development of AS by demonstrating that the student was seen as an active subject in the context of learning,
2023	(Júnior <i>et al.</i> , 2023)	Evaluation of the Applicability of Active Teaching-Learning Methodologies in Professional Nursing Education	Conjuncture Bulletin (BOCA) (2023) 14(N.40) 1-21	Literature review, descriptive, qualitative	The transformations in the curricular components in the training institutions, appropriating the active methodologies.	Therefore, it is necessary to have an education based on criticism-reflection that favors an adequate and effective professional practice. and the construction of a critical character –reflexive.
2022	(Souza & Batista, 2022)	The need for didactic teaching practices for Nursing Professionals	Ibero-American Journal of Humanities, Sciences, and Education (2022) 8(3) 979-987	Integrative literature review	At the beginning of the course, the student is not yet prepared to know which professional area of the field of nursing he will be directed to.	The need for nursing professionals to always be attentive to didactic practices is clearly and objectively shown.
2022	(Sousa Maia <i>et al.</i> , 2022)	Educational technologies for the teaching of semiology and semiotechnics in nursing in social distancing: an integrative review	Current Nursing In Derme Journal (2022) 96(40)	Integrative literature review	Regarding the contents covered, they were predominant in terms of theoretical and practical contents, including patient safety skills.	It was observed that the use of technologies enabled the continuity of teaching and the inclusion of the discipline of Semiology and Semiotechnics.
2021	(Nascimento & Pinho, 2021)	From Nurse to Teacher: trajectories of professionalism	Ibero-American Journal of Studies in Education (2021) 2493-2508	Qualitative research, from the philosophical hermeneutic to	In view of the numerous challenges in professional education, most pointed out deficiencies in the choice and use of methodological strategies.	Education is inseparable and related to the production of meanings about personal and professional experiences.



2021	(Reinaldi <i>et al.</i> , 2021)	Formação continuada para professores de Curso Técnico em Enfermagem / Continuing education for teachers of a Technical Course in Nursing	Brazilian Journal of Development (2021) 7(7) 75042-75058	Qualitative research	Most teachers do not use the teaching methodology covered in the course.	Continuing education is essential to teachers and technological evolution has increasingly integrated societies.
2021	(M. L. Barbosa <i>et al.</i> , 2021)	Evolution of nursing education in the use of educational technology: a scoping review	Brazilian Journal of Nursing	Scoping review	The evolution in nursing education is a reality and goes hand in hand with the modernization of teaching.	The implementation of ICT directed to learning must be aligned with pedagogical theories.
2021	(Dos Santos <i>et al.</i> , 2021)	Use of mobile applications in the teaching-learning process in undergraduate nursing	Bahian Journal of Nursing	Integrative literature review	Some challenges are pointed out for the use of mobile applications in the teaching-learning process, including the need for validation by judges and the target audience and the adoption of institutional channels.	The rationale and dissemination of the use of mobile applications become pertinent.
2021	(Santos Dias & Freitas de Jesus, 2021)	Application of active methodologies in the nursing teaching process: an integrative review	Health and Development Journal (2021) 15(n.21) 19-31	Integrative literature review	Nursing knowledge should be (re)constructed individually and collectively in tutorial groups.	The new pedagogical techniques can be applied in both active and conservative methodology.
2021	(After the death of Cavichioli <i>et al.</i> , 2021)	Continuing education and active methodologies in distance learning courses in nursing: an integrative literature review	Nursing (São Paulo) (2021) 24(276) 5670-5685	Integrative literature review	The need for new studies with methodological rigor capable of analyzing the courses that use one or more MAE.	Active Teaching Methodologies (MAE) contribute effectively to the learning process in distance courses.
2021	(Fontes <i>et al.</i> , 2021)	Use of active methodologies in undergraduate nursing courses: an opportunity to overcome the traditional teaching model	Research, Society and Development (2021) 10(1) e35410111774	Integrative literature review	The teacher needs to be sensitive to the needs of the student, respecting their autonomy and creativity	The use of active methodologies in undergraduate nursing leads to the education of a nurse critical-reflective.



2021	(K. K. Barbosa <i>et al.</i> , 2021)	Active Methodologies in Meaningful Nursing Learning	Humanities and Innovation Journal (2021) 8(n.44) 100-109	Integrative literature review	It has been proven that memorizing information does not form competent professionals in the fields of empathy and emotional intelligence.	It is indisputable that the Problematic Methodology requires a prior storage of information.
2020	(Trombetta Franco <i>et al.</i> , 2020)	Profile of nurses-teachers of technical professional education at the secondary level in nursing	Collective Health (Barueri) (2020) 10(56) 3164-3175	Quantitative study	Only professionals with teaching experience over 4 years seek training in the area of teaching/education.	Revealing the profile of nurse-teachers can allow contributions not only to Nursing.
2020	(Gonçalves <i>et al.</i> , 2020)	The Use of Digital Information and Communication Technologies as an Educational Resource in Nursing Education	Distance Learning in Focus (2020) 10(1)	Integrative literature review	Digital technologies integrated into nursing education and health education that indicate the effectiveness of theory-practice integration and specialized support.	They distinguish the effectiveness of the initiatives carried out in the course.
2020	(Fontana <i>et al.</i> , 2020)	The methodologies used in nursing education: with the word, the students	Education in Review (2020) 36	Descriptive cross-sectional investigation	Students are increasingly adhering to technologies and show interest in classes that use them;	From what has been observed, it is a relatively emerging area in the use of Information and Communication Technologies
2020	(Ribeiro <i>et al.</i> , 2020)	Implementation of active methodologies in the teaching-learning process in undergraduate nursing courses	Research, Society and Development (2020) 9(7) e708974709	Integrative review	Higher education institutions are poorly prepared.	The positive points related to the use of Active Methodologies in the undergraduate course.
2020	(Celestino <i>et al.</i> , 2020)	Active teaching-learning methodologies in the education of nurses	Revista Nursing (2019) 22(259) (2019) 3457-3464	Systematic review	The studies pointed out a wide variety of active methodologies used in undergraduate nursing education.	It is necessary to reformulate the process of training nurses.
2019	(Villas <i>et al.</i> , 2019)	Challenges of university teaching in health: pedagogical training, contemporaneity and new technologies	REVASF, Petrolina-Pernambuco - Brazil (2019) 9 283-297	Exploratory, qualitative research	It is essential to develop a culture of valuing teaching in universities.	Professional training is linked to the formation of ethical, responsible subjects committed to social reality.

Source: Prepared by the authors



DISCUSSION

PEDAGOGICAL TRAINING OF THE PROFESSIONAL NURSE

Nursing was recognized in Brazil in 1986 through the law that provides for the professional practice of Nursing (Law No. 7,498, of June 25, 1986). This regulation was necessary because it aimed to give scientificity and autonomy to the profession, which was previously seen as an auxiliary profession to medical practice (Souza; Batista, 2022).

The areas covered by nursing professionals are expanding, the category has advanced in a diversified way, expanding its areas of activity. The Cofen (Federal Council of Nursing) published a resolution with the list of nurses' specialties, by area of coverage, the list of specialties was released by the Federal Council of Nursing and has more than 60 specialties (Souza; Batista, 2022).

Didactics is included in all 60 nursing specialties, as nurses have a job of educating for health. The inclusion of the teaching and research area is an advance, it covers the role of nurses in technical professional training in nursing and in teaching in health courses at higher education levels (Souza; Batista, 2022).

Professional education is attended by many professors with a bachelor's degree, who arrive in the educational field of basic education with good professional experience (assistance), but without time or previous knowledge to develop a solid didactic-pedagogical action that is essential for the nursing teacher to be able to face (Nascimento; Pinho, 2021).

When becoming a teacher, nurses need to have the necessary understanding to plan educational situations that promote learning. Therefore, it is necessary not only to master the content, but also to seek the appropriation of teaching methods that favor the learning process (Nascimento; Pinho, 2021).

To train professionals with ethical commitments, imbued with a scientific spirit, the teacher must also be endowed with these same qualities, the contents need to be integrated with the lived reality and the methods must maintain coherence between theory and practice, a pedagogical approach consistent with a reflective praxis, providing meaningful learning guiding a transformative education (Trombetta Franco; Fernandes; Fernandes Millão, 2020).

The role of the university professor should be to help the student to think and act using the conceptual instruments and research processes of the science that the professor teaches. Thus, valuing the development and mastery of the management of intellectual and human capacities, in addition to teaching how to produce and apply new knowledge (Villas *et al.*, 2019).



It is essential that teachers are able to perceive, understand, analyze and monitor the changes that have occurred in higher education, aiming to develop pedagogical relationships compatible with an environment conducive to meaningful learning, considering the teacher as a mediator of knowledge, and not the holder of it (Villas *et al.*, 2019).

Nurses who currently teach in vocational education face limitations related to pedagogical, didactic knowledge and in-depth specific knowledge about educational practices. These limitations are related to the fact that during the bachelor's degree, training focuses on curative care activities, training future nurses who will be able to work in professional education institutions as teachers, but with little or no pedagogical preparation to develop the function (Reinaldi *et al.*, 2021).

In view of the limitations of nursing faculty professionals, there is an urgent need for a well-structured program, with trained professors and students, in addition to structural investments that allow easy access to information. The understanding of the philosophical aspects and the new profile that teachers and students must assume are essential elements for the development and application of active methodologies (Santos Dias; Freitas de Jesus, 2021).

The use of active methodologies during the training process allows them to have security, responsibility and the ability to manage new situations and work as a team. These are the main characteristics that bring positive impacts on the daily life of the nursing professional, it can be observed that the professionals after graduation, when evaluating their professional training, affirm that the use of active methods during training gives them more security and responsibility (Santos Dias; Freitas de Jesus, 2021).

Schools and vocational training centres have a responsibility to promote the development of increasingly complex skills and abilities in order to respond to the needs of postmodernity. The current traditional methods used in the teaching-learning process have shown students a growing lack of interest in the content taught and a great loss of recognition of the teacher's authority, making the mere traditional transmission of information inefficient (Júnior *et al.*, 2023).

This problematization emerges from the fact that most teachers obtained their training based on traditional methodologies, so that in the face of active methodologies it is natural to encounter difficulties and feelings of pedagogical limitation. For this, it is essential to continuously train teachers, so that they can overcome their doubts (Santos Dias; Freitas de Jesus, 2021).



Active teaching methodologies

Active methodologies include an interactive process of knowledge, analysis, studies, research and individual or collective decisions that aim to find a solution to a problem and the teacher's role must be performed as a facilitator, to make the student think and decide what to do to achieve the proposed objectives (Fontana; Wachekowski; Barbosa, 2020).

Since the twentieth century, several researchers have discussed teaching-learning models in order to understand the main challenges of teachers and emphasize the student's lack of autonomy (Júnior *et al.*, 2023).

From then on, several pedagogies seek to focus on the student as the main subject of the active exploration of teaching-learning. Among them, the most well-known educational philosophy is that of John Dewey, which aims to intensify the student's active search for knowledge (Júnior *et al.*, 2023).

The active methodologies conceived by John Dewey in the mid-nineteenth century result from the New School movement, whose philosophy is the change for the improvement and transformation of an ideal educational environment through a process of knowledge accumulation through the reconstruction of technical standards and the defense of traditional educational methods (Barbosa *et al.*, 2021).

Considered the first school antagonistic to traditional schools, because it was founded from the movement of renewal of teaching, this school offers a new model of relationship between teaching and learning with a more dynamic format, compared to traditional methods, actively including the student in the teaching-learning process (Barbosa *et al.*, 2021).

Consequently, this pedagogy is considered a significant expression of democracy in the field of education, since this pedagogical conception is constructivist, as there is a reconstruction of knowledge based on the experience lived by the student (Júnior *et al.*, 2023).

Educational strategies that fragment the curriculum and knowledge must be rethought, placing the teacher at the center of the pedagogical didactic process. It is important to adopt a broad and incorporated approach in study programs, prioritizing the formation of skills and promoting the use of active learning methodologies, thus building professionals with a broad visual perception of man (Ribeiro *et al.*, 2020).

Only through the use of active methodologies, aggregated in reflective practices, with a critical foundation and committed to the student's scenario as the protagonist of his knowledge, will it be possible to live a pedagogy that develops the autonomy of the student, thus enabling the confrontation of conflicting reactions. It is necessary for teachers to learn



new methodologies with progressive pedagogical approaches that provide support in the development of knowledge (Fontana; Wachekowski; Barbosa, 2020).

The problem-based learning method – PBL is an innovative teaching strategy where students are the main responsible for building their knowledge. The benefits of active methodologies are corroborated by experts in the field who contribute greatly to the development of students' critical reasoning, in order to transform the context in which they are inserted (Celestino *et al.*, 2020).

Problematization is a pedagogical approach that is based on practical activities, whether real or simulated, which demand direct experience. The process involves observing the context, followed by reflection that leads to a concrete action or practice. The groups focused on collective health mostly adopted this educational orientation after specific training for educators. This methodology has proven to be essential to address topics that go beyond theoretical knowledge, requiring social interaction between academia and health services, thus contributing to the construction of scientific knowledge applicable in everyday social life (Miguel *et al.*, 2023).

Team Based Learning (TBL) The BTL or Team-Based Teaching (EBE) is characterized by the acquisition of skills based on science and technical knowledge. It is combined with other approaches, organizing educational experiences in a safe environment, which ensures the clinical training essential for professional performance. However, this knowledge, when integrated, is not detached from reality and thus addresses the health needs of the population through health promotion and the prevention of diseases and mortalities specific to each stage of the life cycle (Miguel *et al.*, 2023).

It is important to emphasize that this transformation of paradigms that teachers must adopt is not something so simple to propose and constitute in an educational environment. Based on this perception, the emphasis is placed on each person in the learning process, whether student or teacher, acting in line with the conceptions of education and learning that they have. It is necessary, therefore, to bring them to reflection as a possibility of redefining educational practice. (Ribeiro *et al.*, 2020).

In general, the training of university teachers takes the form of updating, training or continuing education, but the increasingly rapid contemporary changes in the context of new technologies pose more complex challenges in their pedagogical practice, the contents of the curricular components are no longer sufficient, requiring innovative teaching experiences integrated with the interests and needs of students (Villas *et al.*, 2019).

Nursing students in their undergraduate courses have the discipline of didactics as a curricular requirement. However, at this moment, the student is not yet prepared to know



which professional area of nursing he will focus on, this discipline does not have the importance it deserves and, throughout his professional career, the nurse becomes aware of the need for teaching (Souza; Batista, 2022).

Teaching directed to health professionals does not aim to prepare them to assume the role of educator, or even teachers in the training of other nursing professionals. The importance of targeted teaching during the training of future health teachers is necessary in order to develop good educators (Souza; Batista, 2022).

Currently, one of the great challenges of nursing courses is to train professionals capable of facing changes, professional training must be based on a liberating methodology and not on methods restricted to the memorization of content (Ribeiro *et al.*, 2020).

As a result, in recent years, the adoption of problem-solving learning strategies has been incorporated into the teaching plans and schedules of undergraduate nursing courses. The change in the curricula of the courses solidified the idea that teaching needs to be reinvented (Fontes *et al.*, 2021).

Educational learning technologies

The process of integrating Digital Information and Communication Technologies (DICT) in educational contexts has offered different possibilities for recreating learning spaces. These technologies play a prominent role when instituted for the production and dissemination of information, in addition to contributing to the development of new forms of learning (Gonçalves *et al.*, 2020).

Nursing has been introducing Information and Communication Technology (ICT) in its teaching-learning processes, when differentiated and modern activities are inserted into traditional classes, favoring dynamism in the learning process (Barbosa *et al.*, 2021b).

Despite the perceived difficulties in the integration of technologies into nursing education, including structural aspects and lack of ability to use some tools, research results reveal their potential for the teaching-learning process. "ICT" leads to more substantial learning, due to the tools that provide auditory, visual and interactional means that are attractive and allow greater retention of information (Gonçalves *et al.*, 2020).

There are several possibilities for using ICT, including virtual clinical simulation, virtual learning objects, hypermedia, web platforms, videos and mobile applications. In general, such tools are characterized by interactivity, multimedia support, hypermedia language, and reusability, proving to be a strong supporter of learning at different levels of training (Barbosa *et al.*, 2021b).



The use of cell phones, computers and other instruments with information systems connected to the internet promotes the union of life in today's society. In the context of education, the use of these tools in the teaching-learning process strengthens the construction of knowledge, expanding the potential of this process (Dos Santos *et al.*, 2021).

Digital educational technologies are widely used as strategies in the teaching-learning process, especially with the advent of the COVID-19 pandemic. For nursing education, this approach can allow the development of new skills and competencies, as they actively stimulate the student's creativity and autonomy (Silva *et al.*, 2023).

Online classes (video lessons) and educational videos are a didactic teaching strategy because they stimulate and support students' understanding, videos contribute to the professional training of the nursing team by bringing the student to the clinical situation not yet experienced, improving cognitive knowledge and technical skills related to the procedure and are capable of improving the quality of care (Takaki Cavichioli *et al.*, 2021).

The use of digital technologies in the teaching-learning process reduces the distance between student and teacher, facilitates and makes access more flexible for different people, stimulates autonomy and reflection on learning itself, as it involves the student in an articulated process of strategies and resources related to the use of technology (Barbosa *et al.*, 2021b).

Nursing is in constant transition, and it is possible to observe that technological tools are important factors for the evolution of practical classes. Digital educational technologies are often seen as a modality that promotes more autonomy. Proper planning of activities is capable of stimulating students more than traditional theoretical classes (Sousa Maia *et al.*, 2022).

It is essential to prepare future professionals in simulated realities, the contributions of the use of digital educational technologies in nursing education are associated with nursing skills, such as the use of virtual simulators and mannequins, which aims to provide safety before they start practicing with humans. The use of these resources allows the author to recognize the student's possible errors before performing the procedure with the patient (Fontana; Wachekowski; Barbosa, 2020).

The teacher must analyze the social and political context of the student before choosing the appropriate method to be applied in the context portrayed. Among the methods currently in existence, the following can be mentioned: Problem Based Learning (PBL), game-based learning and gamification, learning between teams, flipped classroom, design thinking and peer instruction, blended study, simulators and technologies based on



virtual reality, augmented reality and Learning Analytics, case study, Evidence-Based Practice (PBE), teamwork, portfolio, practice-based learning, research, group discussion, videos, and role-play (Takaki Cavichioli *et al.*, 2021).

Educational technologies can provide possibilities in the context of nursing for students and professors to interact and discuss the skills and competencies necessary to provide reflections for academic teaching, an example that evidences this duality between active and passive methods resides in the discourses commonly expressed by professors and students, in which students complain about boring and not very dynamic classes (Barbosa *et al.*, 2021a).

Having the planning of the discipline focused on the insertion of digital technologies, it is necessary to understand its characteristics to help direct teaching strategies, respecting the learning pace of each student, which requires a new attitude from the teacher, so that the student has a leading role, developing autonomy in a participatory and reflective way of approximation and distancing (Sousa Maia *et al.*, 2022).

This context of advancement of digital technologies makes us reflect that it is necessary to invest in teacher training to manipulate information and communication technologies. Above all, it is necessary to highlight the important limitation regarding the lack of information technology infrastructure that covers teaching activities, however, it is important to highlight the need to build new learning spaces, taking into account dialogue and possible strategies that can improve current didactic resources (Gonçalves *et al.*, 2020).

FINAL CONSIDERATIONS

It is relevant to understand the importance of the applicability of active methodologies and innovative technologies during the teaching-learning process of nursing students, since nurses have little or no knowledge regarding active teaching methodologies and educational learning technologies during their training process.

The teaching nurse who works in the training of other professionals was commonly trained using a traditional teaching methodology, most of these professionals do not have a pedagogical basis or any teaching training course that brings them closer to the pedagogical methods necessary for teaching, and this makes us question the importance of having a different look in order to introduce a new way of teaching by teachers.

The study shows that it is necessary to understand which tools need to be improved, so that there is certainty in the commitment to quality training, which guarantees the labor



market a professional trained to face the challenges related to the applicability of active teaching methodologies and educational learning technologies.

This study made it possible to identify that the presence of more studies that evaluate the results of the use of these methodologies in educational institutions in which these active methods are already consolidated is relevant, with the objective of showing their effects on learning and their consequences for the academic community.

We also emphasize the importance of new studies that evaluate how new nursing professionals (graduates who have already experienced such methodologies) have used Active Methodologies in their teaching and care practices, such results solidify the importance of these methodologies and the repercussions to be expanded to ensure a solidified education based on the ethical commitment to quality education.




REFERENCES

1. Barbosa, K. K., et al. (2021a). Metodologias ativas na aprendizagem significativa de enfermagem. **Revista Humanidades e Inovação**, 8(44), 100–109.
2. Barbosa, M. L., et al. (2021b). Evolução do ensino de enfermagem no uso da tecnologia educacional: Uma scoping review. **Revista Brasileira de Enfermagem - Associação Brasileira de Enfermagem**.
3. Carrijo, M. V. N., et al. (2020). O uso de metodologias ativas na formação do profissional enfermeiro crítico-reflexivo: Experiência entre residentes. **Arquivos de Ciências da Saúde da UNIPAR**, 24(3), 20 de novembro.
4. Celestino, L. C., et al. (2020). Metodologias ativas de ensino-aprendizagem na formação de enfermeiros. **Revista Artigos.com**, 17, 1–4.
5. Dos Santos, T. R., et al. (2021). Uso de aplicativos móveis no processo de ensino-aprendizagem na graduação em enfermagem. **Revista Baiana de Enfermagem - Universidade Federal da Bahia**.
6. Fontana, R. T., Wachekowski, G., & Barbosa, S. S. N. (2020). As metodologias usadas no ensino de enfermagem: Com a palavra, os estudantes. **Educação em Revista**, 36.
7. Fontes, F. L. de L., et al. (2021). Utilização de metodologias ativas no curso de graduação em enfermagem: Uma oportunidade de superação do modelo de ensino tradicional. **Research, Society and Development**, 10(1), e35410111774. <https://doi.org/10.33448/rsd-v10i1.11774>
8. Gonçalves, L. B. de B., et al. (2020). O uso das tecnologias digitais de informação e comunicação como recurso educacional no ensino de enfermagem. **EaD em Foco**, 10(1). <https://doi.org/10.18264/eadf.v10i1.968>
9. Júnior, R. S., et al. (2023). Avaliação da aplicabilidade de metodologias ativas de ensino-aprendizagem na formação profissional em enfermagem. **Boletim de Conjuntura (BOCA)**, 14(40), 1–21.
10. Lourenço, A. E., Barriento, A. L., & Ribeiro, M. T. D. (2023). O enfermeiro docente e os saberes necessários para a atuação como professor: Estado da arte em teses. **Revista Caderno Pedagógico – Studies Publicações Ltda.**, 20(2), 942–964.
11. Manhães, L. S. P., & Tavares, C. M. de M. (2020). Formação do enfermeiro para atuação na docência universitária. **Reme Revista Mineira de Enfermagem**, 24.
12. Miguel, E. A., et al. (2023). Implantação curricular para curso de medicina: Superando desafios. **Revista Brasileira de Educação Médica**, 47(2), e053. <https://doi.org/10.1590/1981-5271v47.2-20220239>
13. Nascimento, A. T. P., & Pinho, M. J. S. (2021). De enfermeiro (a) a professor (a): Trajetórias de profissionalidade. **Revista Ibero-Americana de Estudos em Educação**, 2493–2508.
14. Reinaldi, M. A. de A., et al. (2021). Formação continuada para professores de curso técnico em enfermagem. **Brazilian Journal of Development**, 7(7), 75042–75058.



15. Ribeiro, W. A., et al. (2020). Implementação das metodologias ativas no processo de ensino-aprendizagem no curso de graduação em enfermagem. **Research, Society and Development**, 9(7), e708974709. <https://doi.org/10.33448/rsd-v9i7.4709>
16. Reinaldi, M. A. de A., et al. (2021). Formação continuada para professores de curso técnico em enfermagem. **Brazilian Journal of Development**, 7(7), 75042–75058.
17. Ribeiro, W. A., et al. (2020). Implementação das metodologias ativas no processo de ensino-aprendizagem no curso de graduação em enfermagem. **Research, Society and Development**, 9(7), e708974709. <https://doi.org/10.33448/rsd-v9i7.4709>
18. Santos Dias, E., & Freitas de Jesus, C. V. (2021). Aplicação de metodologias ativas no processo de ensino em enfermagem: Revisão integrativa. **Revista Saúde e Desenvolvimento**, 15(21), 19–31.
19. Silva, V. A., et al. (2023). Aprendizagem significativa na educação em enfermagem: Uma revisão integrativa. **Arquivos de Ciências da Saúde da UNIPAR**, 27(9), 5224–5242.
20. Sousa Maia, D. H. de, et al. (2022). Tecnologias educacionais para o ensino de semiologia e semiotécnica em enfermagem no distanciamento social: Revisão integrativa. **Revista Enfermagem Atual In Derme**, 96(40).
21. Souza, T. B. de, & Batista, R. C. (2022). A necessidade das práticas didáticas de ensino para o profissional de enfermagem. **Revista Ibero-Americana de Humanidades, Ciências e Educação**, 8(3), 979–987.
22. Takaki Cavichioli, F. C., et al. (2021). Educação continuada e metodologias ativas em cursos a distância em enfermagem: Revisão integrativa da literatura. **Nursing (São Paulo)**, 24(276), 5670–5685.
23. Tricco, A. C., et al. (2018). PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation. **Annals of Internal Medicine**, 169(7), 467–473. <https://doi.org/10.7326/M18-0850>
24. Trombetta Franco, M., Fernandes, M. C. F., & Fernandes Millão, L. (2020). Perfil de enfermeiros-professores da educação profissional técnica de nível médio em enfermagem. **Saúde Coletiva (Barueri)**, 10(56), 3164–3175.
25. Villas, A. M., et al. (2019). Desafios da docência universitária em saúde: Formação pedagógica, contemporaneidade e novas tecnologias. **REVASF**, 9, 283–297.

GENE INFLUENCE OF ACTN3 AND NOS3 ON SERUM LEVELS OF NITRIC OXIDE AND ON THE CAROTID CALIBER AFTER ECCENTRIC EXERCISE IN QUILOMBOLAS OVER 50 YEARS OLD

 <https://doi.org/10.56238/sevned2024.029-008>

Leonardo Costa Pereira¹, Marileusa Dosolino Chiarello², Mauro Karnikowski³, Eduardo Antônio Ferreira⁴, Isabel Cristina Rodrigues da Silva⁵, Frederico Santos de Santana⁶ and Margo Gomes de Oliveira Karnikowski⁷

ABSTRACT

Introduction: There are gaps in the literature related to genetic and hemodynamic influences in the face of the protocols of strength exercise, which hinders the prescription of interventions for health promotion. **Objective:** To check the gene influence of ACTN3 and NOS3 and the serum levels of nitric oxide on the carotid caliber, post-eccentric exercise, in quilombolas over 50 years old. **Methods:** This is a quasi-experimental study, performed in a community of Quilombola remnants. The 18 participants were submitted to 10 sets of 10 eccentric repetitions in the extension chair, with 120% of 1RM. Serum levels of the NO and carotid caliber were checked pre- and post-intervention. Mann Whitney was used for comparisons; and Spearman for correlations. 5% alpha was adopted. **Results:** An increase in serum NO and carotid caliber occurred after exercise ($p=0.0001$; $p=0.021$). There was no correlation between serum levels of the NO and carotid caliber ($r=-0.23$; $p=0.35$). As for the ACTN3 and NOS3 polymorphisms, no statistical differences were observed in the responses induced by eccentric exercise in both parameters ($\Delta\text{NO} = \text{ACTN3 R Homozygous}$ and presence of the X allele ($p=0.43$); NOS3 T Homozygous and presence of the C allele ($p=0.95$); Δ carotid caliber = ACTN3 R Homozygous of and presence of the X allele ($p=0.41$); NOS3 T Homozygous of and presence of the C allele ($p=0.52$). **Conclusion:** There were no significant variations between serum levels of the NO and carotid caliber for the ACTN3 and NOS3 polymorphisms.

¹ University Center Euro Americano - UNIEURO
University of Brasilia – UnB

Postgraduate Program in Health Sciences and Technologies – PPGCTS
These authors contributed equally to this work.

E-mail: leonardo.pclcp@gmail.com

² University of Brasilia – UnB

Technological Development Support Center - CDT/DPI/UnB
These authors contributed equally to this work.

³ Health School of Brazilian Army – HSBA

These authors contributed equally to this work.

⁴ University of Brasilia – UnB

Postgraduate Program in Health Sciences and Technologies – PPGCTS
These authors contributed equally to this work.

⁵ University of Brasilia – UnB

Postgraduate Program in Health Sciences and Technologies – PPGCTS
These authors contributed equally to this work.

⁶ University of Brasilia – UnB

Postgraduate Program in Physical Education – PPEF
These authors contributed equally to this work.

⁷ University of Brasilia – UnB

Postgraduate Program in Health Sciences and Technologies – PPGCTS
These authors contributed equally to this work.



Keywords: Resistance Exercise. Endothelium. Vasodilation. Ethnic Group.



INTRODUCTION

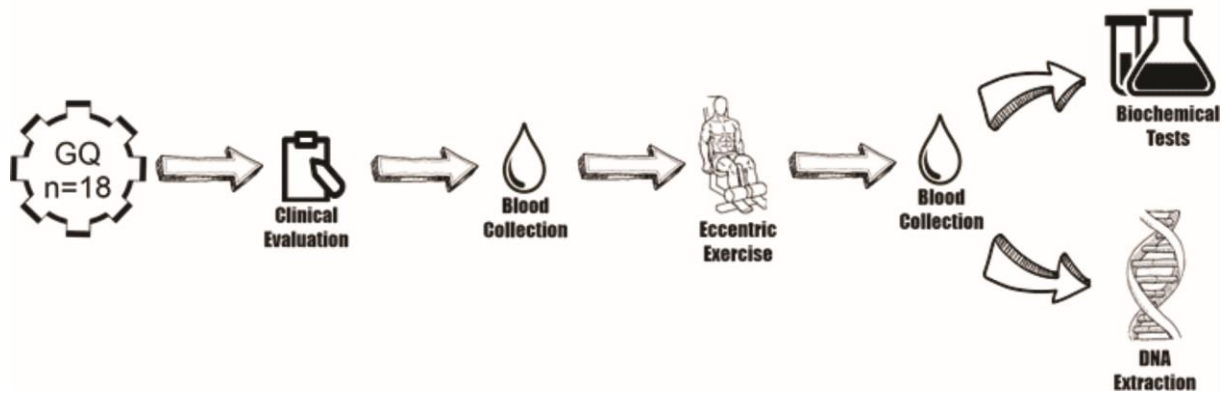
This study brings relevant information regarding the gene expression of ACTN3, which is a gene that promotes Alpha-actinin-3 in skeletal muscle sarcomeres (1,2), responsible for the morphological structure of the muscle cell, deliberating on the predominance of energy metabolism and magnitude of muscle strength (3,4). Together with the ACTN3 gene, the NOS3 gene was evaluated, responsible for the serum expression of the NO, an important gas for the regulation of endothelial processes in the body (5,6). The whole context of the experimental design occurs through a rare sample (7), living in isolated conditions, with difficult access to the means of transportation and communication, which is the community of Quilombola remnants (8-10 and they have never been submitted to a physical exercise program before, much less to eccentric exercise (11), narrowing the confounding conditions, resulting from adaptations arising from exercise (12). Accordingly, through this context, the gene and hemodynamic responses should be checked, not only to physical exercise, but to every experimental context that exposes the studied variables to aspects inherent to the formation of Quilombola communities (13–16). Thus, the current study has the objective of checking the gene influence of ACTN3 and NOS3 on serum levels of nitric oxide and on the carotid caliber post-eccentric exercise in Quilombolas over 50 years old.

MATERIALS AND METHODS

SAMPLE DESIGN

The current research was conducted in the state of Tocantins and in the Federal District, and it is a study with Quasi experimental design, of randomized field trial with double blind, where the groups were defined after gene sequencing analysis, and the researchers responsible for DNA extraction and biochemical analysis did not have access to the results of body composition evaluation or physical examinations. In turn, the evaluators who performed the clinical and physical examinations, as well as the stressful exercise, did not have access to the biochemical and DNA extraction tests (Fig 1). The study complied with all ethical principles, as stated in opinion nº 1.771.159, issued by the Research Ethics Committee.

Fig 1. Experimental Design



SAMPLE

The study sample consisted of individuals of both genders, aged 45 years or over, quilombola remnants living in the “Malhadinha” Quilombola Community. As inclusion criteria: being residents of the remaining quilombola communities; having ability to move around without assistance and being physically active according to the International Physical Activity Questionnaire – IPAQ. Exclusion criteria were: existence of metallic prosthesis; acute painful condition of lower limbs; Central or peripheral nervous system disease; using hormone replacement therapy and/or medications that could interfere with blood pressure levels; having manifestation of cardiovascular disease detected by alteration in blood pressure levels during blood pressure measurement; absence of pulmonary disorder, evaluated according to pulmonary auscultation; having osteomyoarticular problems that could prevent them from performing strength evaluation and strength exercise; not performing any of the study phases. The sample was later stratified, according to the criterion of gene clustering performed by DNA extraction and sequencing by means of the NOS3 and ACTN3 polymorphisms.

PROCEDURES

BODY COMPOSITION EVALUATION

The collection was performed by a qualified professional linked to a laboratory and in the hygienic conditions required by the responsible public agencies. All tubes used are from the Vacutainer brand, while the needles are Greiner Bio-One type, measuring 25X0.8mm, for vacuum blood collection. In order to make the blood comparison, blood was collected before and immediately after the execution of the training session.



DNA EXTRACTION AND SEQUENCING

Genomic DNA was extracted from 1 ml of whole blood by the salting out method. The genetic variants of the NOS3 and ACTN3 polymorphisms were determined by amplification, using a polymerase chain reaction.

The amplified products from the T-786C locis were hydrolyzed with MspI at 37 °C for 4 hours, which produced fragments of 140 and 40 bp for the wild type allele (T) or 90, 50 and 40 bp for the polymorphic allele (C). The fragments were separated by electrophoresis (12% polyacrylamide gel) and visualized by means of silver staining.

The genotyping of the R577X polymorphism alleles of the ACTN3 gene was performed with a system of two specific primers that provided the sequence where the polymorphism occurs in the gene, in order to amplify them and classify individuals into RR, RX and XX. To this end, the techniques described by Mills, Yang were followed (4).

EVALUATION OF SERUM LEVELS OF NITRIC OXIDE (NO)

The measurement of the NO was performed by the ELISA method (Enzyme-Linked Immunosorbent Assay), according to the specifications of the R&D Systems Quantikine high-sensitivity kit. The intra-assay coefficient of variation (CV) and the sensitivity were determined. In order to perform the detection of nitric oxide (NO₂-/NO₃-), a nitrite and nitrate concentration determination kit was used with sensitivities of 0.222 µmol/L for NO₂ (nitrite) and 0.625 µmol/L for NO₃ (nitrate).

ANALYSIS OF CAROTID MORPHOLOGICAL IMAGING

The carotid morphological analyses were obtained by means of a Terason t3000 portable device (Terason, division of Teratech Corporation, USA), with a 12L5 linear model transducer, with a frequency of 5-12 MHz. A conductive gel (Sonic Plus Gel – Hal industry and trade) was used to conduct the sound waves.

The analysis performed by Doppler was with a standard angle of 0° to 60° adjusted according to blood flow. Wall filters have been adjusted so that there is no interference from any artifacts. A color Doppler was used. Parameters such as vessel diameter, peak systolic velocity and resistance index were recorded in each patient's records. The anatomical reference point was 1 cm below the right carotid bulb. Delta analysis of the variation of the area and diameter of the carotid artery between the pre- and post-eccentric exercise moments was performed.



EVALUATION OF ANTHROPOMETRIC MEASUREMENTS AND BODY COMPOSITION

Body mass was measured with a resolution of 0.1 kg using a digital scale (Filizolla brand). Height was measured with a resolution of 0.1 cm using a stadiometer (CARDIOMED, Brazil). In order to evaluate body composition, the dual energy x-ray absorptiometry (DXA) test was used, equipment from the General Electric-GE brand, with Encore 2013 software.

EVALUATION OF MAXIMUM DYNAMIC AND ISOMETRIC STRENGTH

The maximum strength test (1RM) was performed bilaterally on the extension chair (CybexInternational, Medway, MA). The individuals will be submitted to eight repetitions with 50% of estimated 1RM (according to the capacity of each participant checked in the adaptation session carried out in the previous two days), after a one-minute interval, where three repetitions will be performed with 70% of estimated 1RM. After three minutes, subsequent trials will be performed for one repetition with progressively heavier loads until the 1RM is determined over three trials, using a 3-minute rest between trials. The standardizations of the angulations and movements of the exercises will be conducted according to the descriptions made by Brown et al., (2001)(17). It will be held in order to make sure that the pre-training 1RM will be adjusted before the start of training. The intraclass correlation will be determined between the second and third attempt of the 1RM test. The highest 1RM determined from the last two attempts will be used as the initial measure (18).

As an evaluation of isometric strength, the handgrip test was employed, using a JAMAR palm dynamometer, properly adjusted according to the size of the evaluated individual's hand. Three attempts were performed for each hand, with a 3-minute interval between each attempt. At the end of the 6 repetitions, the highest strength score for each hand was recorded. Relative strength was measured by the ratio between the highest score of the grip strength of the dominant hand and the total body mass (KgF/Kg).

ECCENTRIC TRAINING PROTOCOL

Having possession of the RM of each volunteer, the data was inserted in the application for creating EXCEL spreadsheets, where 120% of 1RM of each individual was calculated. After making this calculation, the training session was started, seven sets with ten repetitions were performed with emphasis on the eccentric phase. In order to make this possible, during the concentric phase, the load was lifted by external strength made by another person; during the eccentric phase, if the volunteer controlled the lowering of the



load, an external strength was also applied with an intent to generate greater damage to the muscles (19).

STATISTICAL ANALYSIS

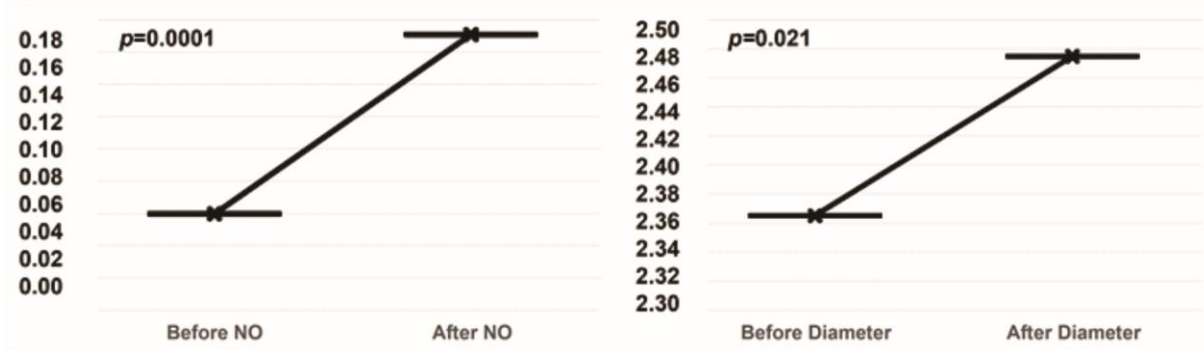
Statistical analyses were performed with the aid of the SPSS 19 software, which is properly licensed. The homogeneity of allelic frequencies of ACTN3 and NOS3 polymorphisms was checked by means of Levene's test. The results of the numerical variables for the characterization of the sample were expressed as mean and standard deviation, those of the dependent variables related to hemodynamic responses in relation to eccentric exercises were expressed as median \pm interquartile range, and the categorical variables were expressed as absolute and/or relative frequencies. Shapiro-Wilk test was used to check the normality distribution of the study variables. As for the correlations between serum levels of the NO and Carotid Caliber, Spearman's test was used. Comparisons between pre- and post-eccentric exercise moments for dependent variables were performed using Wilcoxon test. The current study took into consideration a 5% alpha.

RESULTS

The sample consisted of 18 individuals of both genders (66.7% women), all voluntary Quilombola remnants, without experience with strength training programs. Mean age of 66.00 ± 9.20 years, height of 1.55 ± 0.1 m, total body mass of 63.15 ± 10.28 kg and BMI = 26.26 ± 3.73 kg/m². The Quilombola volunteers reached 23.56 ± 7.32 KgF of absolute muscle strength on the handgrip and 47.41 ± 12.33 kg of load on the extension chair, making, respectively, 0.37 ± 0.1 KgF/Kg and 0.74 ± 0.13 KgF/Kg of strength relative to total body mass.

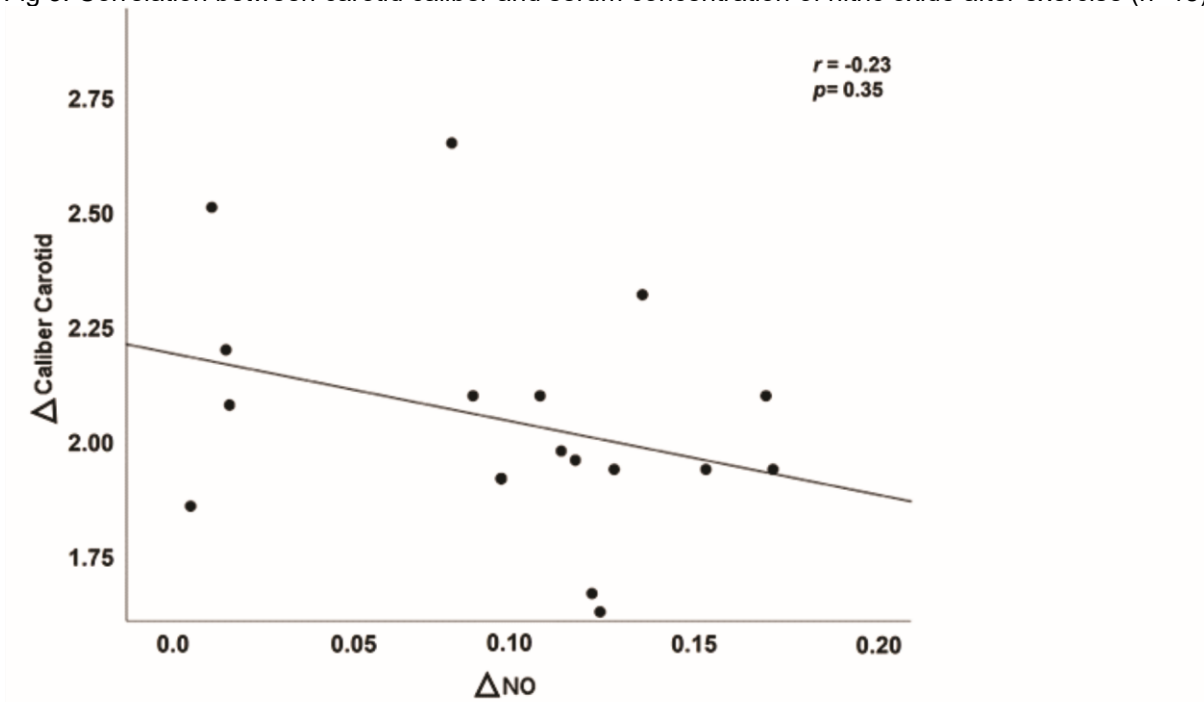
Fig 2 represents the expression kinetics of the NO and vasodilator response of carotid diameter, between pre- and post-eccentric exercise, of the 18 Quilombola remnants. The kinetics of the NO was almost tripled at the end of the eccentric exercise. The same behavior occurred in the carotid diameter, with a statistically significant increase ($p < 0.05$), but in a lower magnitude.

Fig 2. Acute response of the expression of the NO ($\mu\text{mol/L}$) and carotid diameter (mm) after eccentric exercise (n=18).



A correlational analysis was performed between the variations in serum levels of the NO ($\mu\text{mol/L}$) and the carotid diameter (mm) post-eccentric exercise, which are expressed in Fig 3. In general, the correlation results proved to be negligible ($r < 0.3$) between carotid vasodilation and production of serum NO, under the condition of physical effort.

Fig 3. Correlation between carotid caliber and serum concentration of nitric oxide after exercise (n=18).



Allelic variations for the ACTN3 and NOS3 polymorphisms showed a pattern of variation similar to the rest of the world population ($p > 0.05$). The stratification according to the ACTN3 and NOS3 polymorphisms are found in Table 1, together with the characteristics of body composition and of age range of each group. The table shows similarities between the age ranges of both ACTN3 and NOS3 gene polymorphisms. As for body composition, the NOS3 polymorphisms do not seem to influence this sample, unlike the ACTN3

polymorphisms, where the presence of the X allele has reduced and significant ($p < 0.05$) magnitudes in relation to variables related to coronary risk.

Table 1. Characteristics of age range and of body composition according to the ACTN3 and NOS3 polymorphism stratification.

	ACTN3 polymorphism			NOS3 polymorphism		
	Presence of the X allele (n=7)	R Homozygous (n=11)	p	Presence of the C allele (n=4)	T Homozygous (n=14)	p
Age (years)	70.33±10.8	62.75±6.76	0.11	78.5±0.71	63.92±8.17	0.88
BM (kg)	61.98±10.21	64.03±10.95	0.76	59±6.93	63.84±10.81	0.28
Height (m)	1.57±0.11	1.54±0.1	0.23	1.56±0.23	1.55±0.09	0.51
BMI (kg/m²)	25.3±3.98	26.99±3.62	0.76	24.8±4.53	26.51±3.76	0.44
WHR	0.97±0.06	0.91±0.05	0.02	0.93±0.06	0.93±0.06	0.80
DAM (kg)	2.38±0.44	2.13±0.74	0.09	2.49±0.41	2.2±0.66	0.90
% FAT	28.6±11.81	41.74±6.43	0.03	27.75±15.77	37.5±10.3	0.30

Legend: BM – Body Mass; BMI – Body Mass Index; WHR – Waist-to-Hip Ratio; DAM - Dominant Arm Mass; % FAT – Fat Percentage.

Regarding the state of muscle strength in groups formed by different allelic configurations of the ACTN3 polymorphisms, the results showed 25.17 ± 7.17 KgF for the group carrying the X allele (n=7) and 23.25 ± 7.54 KgF for the homozygous group of R (n = 11) ($p = 0.16$) in the handgrip dynamometry of the dominant limb. The same pattern was followed, respectively, for the relative handgrip strength (presence of the X allele = 0.42 ± 0.13 KgF/Kg; R homozygous = 0.36 ± 0.08 KgF/Kg; $p = 0.14$). As for relative strength of the lower limbs, no statistical differences were also observed between the groups (presence of the X allele = 0.76 ± 0.13 KgF/Kg; R homozygous = 0.70 ± 0.14 KgF/Kg; $p = 0.35$).

The analysis of muscle strength performance, according to the extratification by different NOS3 polymorphisms, indicated that, for the group carrying the C allele (n = 4), the handgrip strength was 17.00 ± 7.07 KgF. As for the T homozygous group (n=14), the performance shown was 25.25 ± 6.74 KgF ($p = 0.32$). Regarding the performance in relative strength, the groups followed the same previous pattern; however, with relevant clinical performance distinctions, where the relative strength was lower in the presence of the C allele (RHGS = 0.30 ± 0.16 KgF/Kg) than in the T homozygote (RHGS = 0.40 ± 0.09 KgF/Kg), but without statistical difference ($p > 0.05$). The evaluation of strength in the lower limbs revealed that the presence of the C allele obtained a score of 0.68 ± 0.07 Kg/Kg and T homozygous = 0.73 ± 0.15 KgF/Kg; ($p = 0.99$).

The serum levels of the NO and the carotid diameter pre- and post-eccentric exercise are shown in Table 2. The kinetics of the NO in relation to the moments pre- and post-eccentric exercise were significantly ($p < 0.05$) positive for the different ACTN3



polymorphisms; while, for NOS3, only the T homozygote showed a significant increase in serum levels of the NO. There were no statistical differences ($p>0.05$) in response to exercise between the different polymorphic groups of the ACTN3 and NOS3 genes. Only for the NOS3 gene, static differences ($p<0.05$) were identified at baseline between the different polymorphisms, where the presence of the C allele showed higher levels of the circulating NO than the T homozygote. As for carotid diameters, no significant differences were identified with respect to exercise exposure nor with respect to the different polymorphic groups of both genes.

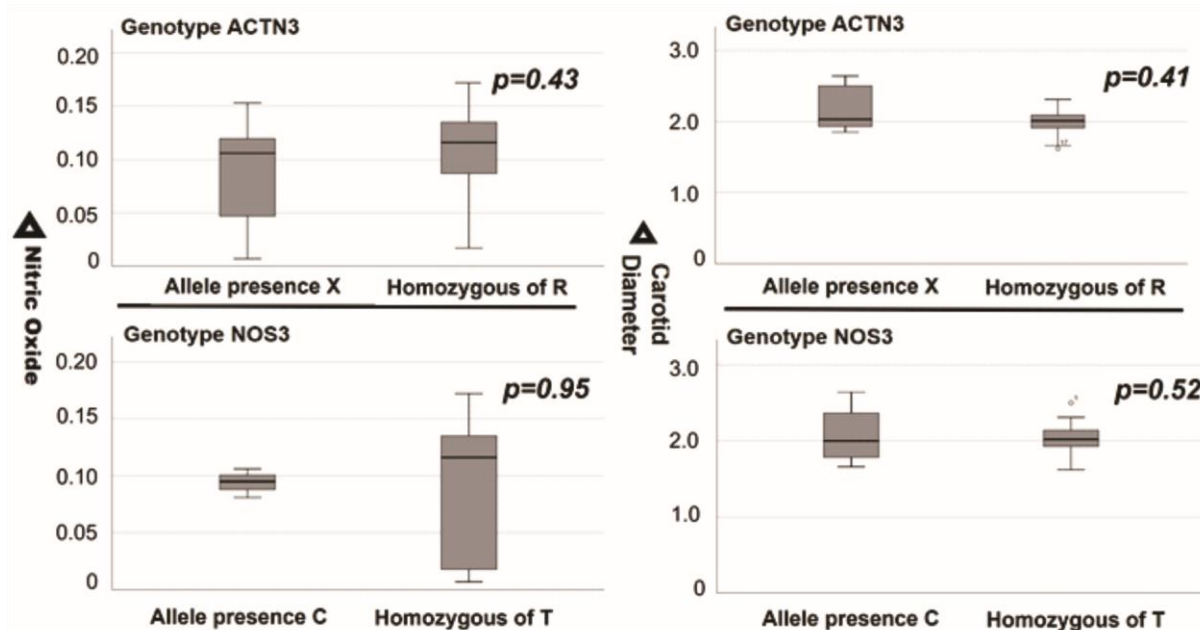
Table 2. Serum levels of nitric oxide and carotid diameters, pre- and post-extension chair exercise with eccentric movement, expressed as median and interquartile range.

	ACTN3 Group			NOS3 Group		
	Presence of the X allele (n=7)	R Homozygous (n=11)	<i>p</i>	Presence of the C allele (n=4)	T Homozygous (n=14)	<i>p</i>
SNO before (µmole/L)	0.06±0.04 [‡]	0.06±0.01 [‡]	0.17	0.07±0	0.06±0.01 [‡]	0.04
SNO after (µmole/L)	0.17±0.1 [‡]	0.17±0.09 [‡]	0.99	0.17±0	0.17±0,1 [‡]	0.80
Diameter before (mm)	2.42±0.83	2.41±0.49	0.32	2.3±0	2.45±0,47	0.33
Diameter after (mm)	2.5±0.97	2.46±0.37	0.83	2.51±0	2.48±0,37	0.88

Legend: SNO before - Serum Nitric Oxide before intervention; SNO after - Serum Nitric Oxide after intervention. [‡] Statistical difference between Pre- and Post-Eccentric Exercise; For statistical differences between different groups of polymorphisms, $p \leq 0.05$.

The variations between the serum levels of nitric oxide and the carotid caliber of the different polymorphic groups of ACTN3 and NOS3 are represented in Fig 4. In this, it is observed that all variations both in serum levels of the NO and in carotid caliber were positive, but no static differences ($p>0.05$) were identified between the different polymorphisms for the ACTN3 and NOS3 genes.

Fig 4. Variations in serum levels of nitric oxide ($\mu\text{mol/l}$) and carotid diameter (mm) by performing the eccentric exercise.



Legend: ACTN3 Genotype – presence of the X Allele (n=7) and R Homozygous (n=11); NOS3 Genotype – presence of the C allele (n=4) and T Homozygous (n=14). For statistical differences $p \leq 0.05$.

DISCUSSION

In the resting condition, a statistically significant difference was found in the release of serum NO only between gene groups in the presence of the C allele and in T homozygous. Similar results were found in other studies that analyzed the status of the release of serum NO in relation to G894T and T \geq 786C promoter genes to evaluate endothelial function(20).

The release of serum nitric oxide is a phenomenon that is observed at different times with different magnitudes in different stages of life, and Casey's group (2015) (21) evaluated the release kinetics of serum NO in different age ranges, identifying peculiarities to each one of them. They were also responsible for raising several questions about the etiology and casuistry of the observed changes, as it has been seen that, since, although the NO is considered by many studies to be only an important vasodilator, other works already indicate it as a precursor of several prophylactic processes linked to senescence or metabolic dysfunctions triggered in the human organism (20,22,23).

By observing the cross-analysis between the NOS3 and ACTN3 promoter genes, it was expected to notice the relationship between their respective gene expressions and the higher production of serum NO, concomitant with the increase in the carotid caliber, as mentioned in the study by Eynon and collaborators in 2013 (24). In the study above mentioned, the researchers identified that the higher frequency of the R allele (ACTN3), together with the higher frequency of the T allele (NOS3), would result in higher serum



expression of the NO and greater vasodilation of blood vessels. Nevertheless, these results seem to be more linked to the chronic adaptations arising from the training of the athletes participating in the observed studies (27–29), a fact that was not observed in the current study, as it has been seen that, although this sample is composed of Quilombola remnants, a community with rural characteristics and, in turn, with a high level of physical activity (9,25,26), they do not have a history of engaging in sports or physical exercise programs with a high training load.

Furthermore, one could question the efficiency of exercise as a stressful agent to generate changes both in serum levels of the NO and in the change in the caliber of the carotid vessel. Figure 2 shows the significant variations of approximately 0.11 $\mu\text{mol/L}$ in serum levels of the NO ($p=0.0001$) and 0.11 mm in the carotid caliber ($p=0.021$) immediately after exercise. Conversely, when the sample stratified by the ACTN3 and NOS3 polymorphisms is observed, these results are not significant, although they obey the same condition of elevation.

In a study published by WEIHL and GUILDER (2018), the chronic effect of 4 weeks of swimming training with high and low intensity was compared, where it was found that high intensity, although with less training volume, generated greater effects on changes in the endothelium of young female swimmers, as well as O'BRIEN and collaborators (2020) (31), who identified the acute effect of resistance training for the elderly population. Accordingly, when observing the protocols of the studies in question, high training intensities seem to be more effective than high training volumes together with low intensities, in the sense of deliberating on acute and chronic effects on vasodilation.

Even showing that there were changes in the area and diameter of the carotid artery between the pre- and post-eccentric exercise times, it cannot be said that these changes were due to the increased production of this gas, since the correlational test of serum levels of the NO did not identify any correlation with the carotid morphological variables ($r=0.23$; $p=0.35$). These findings were also found in the study published by Casey's group (2015) (32), where a test was performed using a similar protocol and with a sample of individuals consisting of 10 young people and 10 elderly people who performed rhythmic forearm exercises and received doses of inhibitors of nitric oxide; and, even under these experimental conditions, they showed vasodilation of the brachial artery, leading to the conclusion that the morphological changes that occurred were not mediated by the NO (33).

In a study directed by Wray and his team (2010) (34), they showed a relationship between NO and vasodilation, when, in their experiment, they used an inhibitor of the NO



and noticed that the intra-arterial use of *NG-monomethyl-L-arginine* generated inhibition of vasodilation and blood flow in the highest absolute intensity of strength, compared to the group where the inhibitor of the NO was not used. Therefore, the NO should be interpreted as an important signaling component of vasodilation, and not its precursor, mainly mediated by high intensities of physical exercise.

The study brings important contributions to the understanding of gene relationships in serum levels of the NO and morphological changes in blood vessel caliber, due to the fact that a better understanding of their relationships can identify prescription parameters of physical exercise, in order to generate chronic adaptations that protect the cardiovascular system (35).

According to studies (36-38), coronary heart disease is the world's leading killer. They also point out that black men and women have a rate of systemic arterial hypertension two to four times higher when compared to white men and women (39–41). Although this study did not record any Quilombola remnant with chronic arterial hypertension disease, the ancestry points to the risk for this evil, thus making the experimental design clinically representative and an important prophylactic interventional parameter (40,42,43).

Physical exercise is extremely important for any individual, through it, the biological system undergoes numerous transformations and adaptations that can be acute, that is, immediate, or chronic, which are those that will occur over time. These adaptations can be neurophysiological, metabolic and morphological (44). Numerous studies have been published guaranteeing the importance of physical exercise (45–48), some of them sought to prove the positive effect on improving cognitive function, understood here as the phases of the information process, such as perception, learning, memory, attention, surveillance, reasoning and problem solving (49); in others, possible effects mediated by nitric oxide have been proven (50).

CONCLUSION

Physical exercise generated an increase in serum levels of the NO for all gene configurations of the ACTN3 polymorphisms, but the same phenomenon was not repeated for the NOS3 polymorphism, where it was significantly responsive only for the homozygosity of the T allele. Even though there were significant changes in serum levels of the NO, the same phenomenon was not observed for morphological measures of vasodilation in carotid arteries.

The evidence found suggests the need for similar interventions that seek to understand the mechanisms of vasodilation not only acutely, but also chronically, as well as



to diversify the studied audiences, thus generating a portfolio suitable for the implementation of appropriate programs to check the dose and response of exercise to generate vasodilators.

ACKNOWLEDGMENTS

We thank Universidade de Brasília and Universidade do aging for the great support given to us throughout the development of the research.

PERSPECTIVE

This work seeks not only to contribute to the scientific literature, but also to generate important information about therapeutic alternatives related to a population with a defined stereotype and the presence of diseases in the circulatory system. Thus, the authors seek to generate a theoretical framework capable of assisting in the prescription of physical exercise.



REFERENCES

1. Baumert, P., Lake, M. J., Stewart, C. E., Drust, B., & Erskine, R. M. (2016). Genetic variation and exercise-induced muscle damage: Implications for athletic performance, injury and ageing. **European Journal of Applied Physiology, 116*(9), 1595–1625.*
2. Garatachea, N., & Lucía, A. (2013). Genes and the ageing muscle: A review on genetic association studies. **Age, 35*, 207–233.*
3. Ruiz, J. R., Arteta, D., Buxens, A., Artieda, M., Gómez-Gallego, F., Santiago, C., et al. (2010). Can we identify a power-oriented polygenic profile? **Journal of Applied Physiology, 108*(3), 561–566.*
4. Mills, M., Yang, N., Weinberger, R., Vander Woude, D. L., Beggs, A. H., & Easteal, S. (2001). Differential expression of the actin-binding proteins, α -actinin-2 and -3, in different species: Implications for the evolution of functional redundancy. **Human Molecular Genetics, 10*(13), 1335–1346.*
5. Da Silva, F. R., Tadeu, J., Sertório, C., Lacchini, R., Trapé, A., et al. (2014). Influence of training status and eNOS haplotypes on plasma nitrite concentrations in normotensive older adults: A hypothesis-generating study. **Aging Clinical and Experimental Research, 26*, 591–598.*
6. Gómez-Gallego, F., Ruiz, J. R., Buxens, A., Artieda, M., Arteta, D., Santiago, C., et al. (2009). The -786 T/C polymorphism of the NOS3 gene is associated with elite performance in power sports. **European Journal of Applied Physiology, 107*(5), 565–569.*
7. King, G., & Zeng, L. (2003). Logistic regression in rare events data. **Journal of Statistical Software, 8*, 137–163.*
8. Brasil. (2003). Lei 4883/03.
9. Funes, E. A. (2009). Mocambos: Natureza, cultura e memória. **História Unisinos, 13*(2), 146–153.*
10. Universidade Católica de Pelotas, S. C., & Brandão, A. A. P. (2018). Sociedade em debate. **Sociedade em Debate, 24*, 39–54.*
11. Roig, M., O'Brien, K., Kirk, G., Murray, R., McKinnon, P., & Shadgan, B., et al. (2009). The effects of eccentric versus concentric resistance training on muscle strength and mass in healthy adults: A systematic review with meta-analysis. **British Journal of Sports Medicine, 43*(8), 556–568.*
12. Chakur, P. B. R., Forjaz, C. L. M., Tinucci, T., & Negrão, C. E. (n.d.). Adaptações agudas e crônicas do exercício físico no sistema cardiovascular. **Revista Brasileira de Atividade Física e Saúde, 18*.*
13. Farias Júnior, E. de A. (2013). Territórios quilombolas em linhas de fronteira: Quilombolas do Forte Príncipe da Beira. **Ciência e Cultura, 65*(1), 36–39.* http://cienciaecultura.bvs.br/scielo.php?script=sci_arttext&pid=S0009-67252013000100015&lng=pt&tlng=pt

14. Brandão, A. A., dos Santos, N. C., & Jorge, A. L. (2018). Comunidades quilombolas sob a perspectiva da transição demográfica. **Revista de Ciências Sociais - Política & Trabalho*, 1*(48), 145. <http://www.periodicos.ufpb.br/index.php/politicaetrabalho/article/view/32351>
15. Brandão, A. A., Dalt, S. da, & Souza, S. C. de. (2018). Comunidades quilombolas e o Programa Nacional de Habitação Rural. **Novos Cadernos NAEA*, 21*(1). <https://periodicos.ufpa.br/index.php/ncn/article/view/4045>
16. Matos, F. de, Vasconcelos, L., & Santos, R. (2021). Subdiagnóstico da hipertensão arterial em adultos quilombolas de região baiana, Brasil. **Research, Society and Development**. <https://www.rsdjournal.org/index.php/rsd/article/view/11055>
17. Brown, L., & Weir, J. P. (2001). ASEP procedures recommendation I: Accurate assessment of muscular strength and power. **Journal of Exercise Physiology Online**.
18. Santos, L., Materko, W., Neves, C. E. B., & Santos, E. L. (2007). Modelo de predição de uma repetição máxima (1RM) baseado nas características antropométricas de homens e mulheres. **Revista Brasileira de Medicina do Esporte*, 13*(21), 1.
19. Barroso, R., Tricoli, V., & Ugrinowitsch, C. (2005). Adaptações neurais e morfológicas ao treinamento de força. **Revista Brasileira de Ciência e Movimento*, 13*(2), 111–122.
20. Erbs, S., Baither, Y., Linke, A., Adams, V., Shu, Y., Lenk, K., et al. (2003). Promoter but not exon 7 polymorphism of endothelial nitric oxide synthase affects training-induced correction of endothelial dysfunction. **Arteriosclerosis, Thrombosis, and Vascular Biology*, 23*(10), 1814–1819.
21. Casey, D. P., Ranadive, S. M., & Joyner, M. J. (2015). Aging is associated with altered vasodilator kinetics in dynamically contracting muscle: Role of nitric oxide. **Journal of Applied Physiology*, 119*(3), 232–241.
22. Zago, A. S., Reis Silveira, L., & Kokubun, E. (2010). Effects of aerobic exercise on the blood pressure, oxidative stress and eNOS gene polymorphism in pre-hypertensive older people. **European Journal of Applied Physiology*, 110*(4), 825–832.
23. da Silva, R. F., Sertório, J. T. C., Lacchini, R., Trapé, A. A., Tanus-Santos, J. E., Rush, J. W. E., et al. (2014). Influence of training status and eNOS haplotypes on plasma nitrite concentrations in normotensive older adults: A hypothesis-generating study. **Aging Clinical and Experimental Research*, 26*(6), 591–598.
24. Eynon, N., Hanson, E. D., Lucia, A., Houweling, P. J., Garton, F., & North, K. N. (2013). Genes for elite power and sprint performance: ACTN3 leads the way. **Sports Medicine*, 43*, 803–817.
25. Universidade Federal de Pernambuco, T. S., Hora, A. B., Paixão, A. L. S. S., Santos, J. dos, Almeida-Santos, M. A., & Oliveira, C. C. da C. (2017). *Revista de enfermagem UFPE on line*. **Journal of Nursing UFPE on line*, 11*, 3965–3970.
26. Mussi, R. F. de F., Queiroz, B. M. de, & Petróski, E. L. (2018). Excesso de peso e fatores associados em quilombolas do médio São Francisco baiano, Brasil. **Ciência & Saúde Coletiva*, 23*(4), 1193–1200.




27. Grealy, R., Herruer, J., Smith, C. L. E., Hiller, D., Haseler, L. J., & Griffiths, L. R. (2015). Evaluation of a 7-gene genetic profile for athletic endurance phenotype in Ironman championship triathletes. **PLoS ONE, 10*(12), 1–20.*
28. Puthuchery, Z., Skipworth, J. R. A., Rawal, J., Loosemore, M., Van Someren, K., & Montgomery, H. E. (2011). Genetic influences in sport and physical performance. **Sports Medicine, 41*(10), 845–859.*
29. Eynon, N., Alves, A. J., Yamin, C., Sagiv, M., Duarte, J. A., Oliveira, J., et al. (2009). Is there an ACE ID - ACTN3 R577X polymorphisms interaction that influences sprint performance? **International Journal of Sports Medicine, 30*(12), 888–891.*
30. Wehl, F. M., & Van Guilder, G. P. (2021). Endothelial vasodilation after a high-volume training load and tapered training in collegiate female swimmers. **Journal of Strength and Conditioning Research, 35*(3), 811–818.*
31. O'Brien, M. W., Johns, J. A., Robinson, S. A., Bungay, A., Mekary, S., & Kimmerly, D. S. (2020). Impact of high-intensity interval training, moderate-intensity continuous training, and resistance training on endothelial function in older adults. **Medicine & Science in Sports & Exercise, 52*(5), 1057–1067.*
32. Casey, D. P., Ranadive, S. M., & Joyner, M. J. (2015). Aging is associated with altered vasodilator kinetics in dynamically contracting muscle: Role of nitric oxide. **Journal of Applied Physiology, 119*(3), 232–241.*
33. Trinity, J. D., Wray, D. W., Witman, M. A. H., Layec, G., Keefe, Z. B., & Ives, S. J., et al. (2018). Ascorbic acid improves brachial artery vasodilation during progressive handgrip exercise in the elderly through a nitric oxide-mediated mechanism.
34. Wray, D. W., Witman, M. A. H., Ives, S. J., McDaniel, J., Fjeldstad, A. S., & Trinity, J. D., et al. (2011). Progressive handgrip exercise: Evidence of nitric oxide-dependent vasodilation and blood flow regulation in humans. **American Journal of Physiology-Heart and Circulatory Physiology, 300*(3), H1101–H1107.*
35. Irigoyen, M. C., Lacchini, S., De Angelis, K., & Michelini, L. C. (2003). Fisiopatologia da hipertensão: o que avançamos? **Revista da Sociedade de Cardiologia do Estado de São Paulo*, 20–45.*
36. Sociedade Brasileira de Hipertensão. (1998). III Consenso brasileiro de hipertensão arterial. **Revista Brasileira de Cardiologia, 1*, 92–133.*
37. Brant, L. C. C., Nascimento, B. R., Passos, V. M. A., Duncan, B. B., Bensenõr, I. J. M., Malta, D. C., et al. (2017). Variações e diferenciais da mortalidade por doença cardiovascular no Brasil e em seus estados, em 1990 e 2015: Estimativas do Estudo Carga Global de Doença. **Revista Brasileira de Epidemiologia, 20*(suppl 1), 116–128.*
38. Vanholder, R., Van Laecke, S., Glorieux, G., Verbeke, F., Castillo-Rodriguez, E., & Ortiz, A. (2018). Deleting death and dialysis: Conservative care of cardio-vascular risk and kidney function loss in chronic kidney disease (CKD). **Toxins, 10*(6), 237.*
39. R. R. I., N. F. M., R. F. L., F. M. C., E. N. S., P. P. M. M., et al. (2003). Ileo-ileal and ileocecal invagination due to intestinal lipomatosis. **Gastroenterologia y Hepatologia, 26*(8), 482–484.*



40. Braithwaite, R., & Warren, R. (2020). The African American petri dish. **Journal of Health Care for the Poor and Underserved, 31*(2), 491–502.*
41. Da Cruz, I. C. F., & De Lima, R. (2016). African-Brazilian ethny: A study related to arterial hypertension and cardiac risk factors. **Journal of Specialized Nursing Care, 8*(1).*
42. Mineoka, Y., Ishii, M., Hashimoto, Y., Tanaka, M., Nakamura, N., Katsumi, Y., et al. (2017). Relationship between limited joint mobility of hand and carotid atherosclerosis in patients with type 2 diabetes. **Diabetes Research and Clinical Practice, 132*, 79–84.*
43. Rao, S., Ali, K., Berdine, G., Test, V., & Nugent, K. (2021). The evolution of health care in the Texas correctional system and the impact of COVID-19. **Baylor University Medical Center Proceedings, 34*(1), 76–80.*
44. Brum, P. C., & Negrão, C. E. (2004). Acute and chronic adaptations of resistance exercises in the cardiovascular system. **Revista Paulista de Educação Física, 18*, 21–31.*
45. Balmain, B. N., Sabapathy, S., Louis, M., & Morris, N. R. (2018). Aging and thermoregulatory control: The clinical implications of exercising under heat stress in older individuals. **BioMed Research International, 2018*, 1–12.*
46. American College of Sports Medicine. (2013). **ACSM's health-related physical fitness assessment manual**.
47. Steingraber, A. G. M., Cohen, A. A., & Navarro, F. (2009). Efeito crônico do exercício aeróbio nos leucócitos e linfócitos de professores de ginástica em minitrampolim em duas academias de Joinville. **Revista Brasileira de Prescrição e Fisiologia do Exercício, 3*(15), 231–240.*
48. Liu, C., Shiroy, D. M., Jones, L. Y., & Clark, D. O. (2014). Systematic review of functional training on muscle strength, physical functioning, and activities of daily living in older adults. **European Review of Aging and Physical Activity, 11*(2), 95–106.*
49. Ian, P. P. (2003). Peranan program pelatihan dalam meningkatkan produktivitas kerja karyawan pada Kantor Akuntan Publik KBS - Bandung. **Universitas K*, 108–114.*
50. Coelho-Junior, H., Irigoyen, M., Silva Aguiar, S., Gonçalves, I., Olsen Saraiva Câmara, N., Cenedeze, M. A., et al. (2017). Acute effects of power and resistance exercises on hemodynamic measurements of older women. **Clinical Interventions in Aging, 12*, 1103–1114.*

THE PROCESSES OF WELCOMING VERY YOUNG CHILDREN AND PARENTS: AN INTEGRATIVE LITERATURE REVIEW

 <https://doi.org/10.56238/sevened2024.029-009>

Felicia Siemsen¹ and Tania Stoltz²

ABSTRACT

This integrative literature review aims to understand the process of welcoming very young children and parents in the collective environment. For the selection of articles, the following descriptors were used: adaptation, very young child, daycare, parents in Portuguese, English and Spanish, with the combination of the Boolean operator AND and OR. The articles were collected in the following databases: Capes, Web of Science, and EBSCO journals, considering the period from 2014 to 2022. The number of articles selected for full reading was 21 publications, which led to the discussion of five categories: adaptation and reception of babies from maternal separation; foster care as a right of the child and the family; collaboration between teachers and the family; acceptance of parental social and cultural identities; and parental individuation as a process of conscious acceptance. The results demonstrate that the adaptation of babies as a parental process lived in trust generates greater security in maternal separation from the child. Foster care, as a right of the child and the family, should be more respectful of social and cultural identities. The collaboration between school and family in the foster care process provides a parental individuation of less suffering. Shared care and education practices strengthen the child's development and the self-knowledge of mothers and fathers.

Keywords: Adaptation. Host. Very small child. Parents. Early Childhood.

¹ Doctor student in the Graduate Program in Education
Federal University of Paraná, Brazil

E-mail: feliciasiemsen028@gmail.com

ORCID: <https://orcid.org/0000-0002-3230-9462>

LATTES: <https://lattes.cnpq.br/1787626501832149>

² Full Professor of the Graduate Program in the Education Sector
Federal University of Paraná, Brazil

E-mail: tania.stoltz795@gmail.com

ORCID: <https://orcid.org/0000-0002-9132-0514>

LATTES: <https://lattes.cnpq.br/8495637038816664>

INTRODUCTION

Certainly, humanized reception as a place of right has been the subject of debate since the significant increase in enrollment of very young children in Brazilian daycare centers and preschools. (BARBOSA, 2013; COUTINHO, 2016; KRAMER; NUNES; PENA, 2020). Increasingly, mothers and fathers move on to professional life and seek the alternative shared care of grandparents, aunts and professionals who come to constitute a new family configuration around the child and a "social support network" (BRASIL, 2006, p. 24).

Studies show that, for families, the welcoming process means a moment of experiences of anguish, fear, pain and anxiety (MARTINS et al., 2014; SILVA; LUZ, 2019; VERCELLI; NEGRÃO, 2019). This is an important gap to be investigated, as there are life stories of children and families in the different contexts of the Brazilian territory who experience difficulties in having their voice heard (FRIEDMANN, 2022). There is a need to improve the adaptation period as a welcoming process, contributing to the field of research in early childhood (CARVALHO, 2005; CASANOVA, 2016; FERRÃO et al., 2017). In this sense, the present integrative review is justified, whose objective is to understand the process of welcoming very young children and parents in the collective environment.

METHODOLOGY

The study is an integrative literature review (WHITTEMORE; KNAFL, 2005). It is a method that summarizes the past of empirical or theoretical literature to provide the most comprehensive understanding of a particular phenomenon (BROOME, 2000). An analysis of the knowledge already built in previous studies on the subject was based on six stages, according to BOTELHO, CUNHA and MACEDO (2011).

For Sampieri, Collado and Lucio (2013), the selection of documents usually begins broadly and narrows as the researcher returns to the initial question. The movement of literary search is not always linear (BROOME, 2000). The guiding question of the integrative literature review was: How is the process of welcoming very young children and parents in the collective environment?

PROCEDURES

The review was carried out with the following descriptors in Portuguese, Spanish and English: adaptation, very young child, daycare, parents in Portuguese; adaptation, very small child, daycare, parents in Spanish; adaptation, very young child, nursery, parents in

English. The combination of descriptors was performed with the Boolean operator AND and OR.

The databases consulted were: Capes Journals, Web of Science and EBSCO for bringing together a considerable amount of articles from the fields of education. The inclusion criteria used were: theoretical and empirical articles that dealt with education, early childhood, early childhood education in the period between 2014 and 2022, in Portuguese, Spanish, and English. The exclusion criteria were: articles prior to 2014; in languages other than Portuguese, Spanish and English; repeated articles and articles with studies in the areas of Administration, Economics, Public Policy, Nutrition, Medicine, Foreign Affairs, Health and Primary, Elementary, Secondary and Academic Education.

First, the titles of the articles found were read to verify whether they met the criteria previously determined. Afterwards, the abstracts were read and, subsequently, the selection of the articles for the reading of the full text followed the criteria defined in the figure (attached at the link).

RESULTS

The documents in Portuguese, Spanish and English were first searched with the descriptors in Portuguese for the Capes Journals, with the descriptors in English for the Web of Science and EBSCO databases. In this first stage, 4658 (four thousand six hundred and fifty-eight) references were obtained, of which 258 (two hundred and fifty-eight) were references from the Capes Journal Database, 1861 (one thousand eight hundred and sixty-one) from the Web of Science and 2539 (two thousand five hundred and thirty-nine) from EBSCO. Using the inclusion and exclusion criteria described above, all documents prior to 2014 were excluded, obtaining the result of 2468 (two thousand four hundred and sixty-eight) documents, excluding all documents that were not articles, resulting in 2217 (two thousand two hundred and seventeen) articles. In total, 1562 (one thousand five hundred and sixty-two) articles from the areas of Health, Medicine, Nutrition, Economics, Administration, Public Management, Law, Primary, Elementary, Secondary and Academic Education, Psychiatry, Special Education and Linguistics were excluded. After reading the titles, 612 (six hundred and twelve) repeated articles and articles from the areas of Educational Management, Educational Law, Nutrition, Environment, Nursing and Psychopedagogy were excluded, resulting in 43 (forty-three) articles, 14 (fourteen) of which were from Capes, 11 (eleven) from Web of Science and 18 (eighteen) from EBSCO for the reading of the abstract. After reading the abstract, 22 (twenty-two) articles were excluded because they did not meet the inclusion criteria, leaving the final result of 21 (twenty-one)

articles for full reading. The analysis of the articles was done using a tabular instrument, which contains the data found on the selected publications: year of publication, title of the article, author(s), source of location, research objectives, nature of the research, theoretical framework, methodology, results and conclusion of the study.

After the articles were organized, an expanded discussion regarding the content of the articles was initiated. Eight articles in Portuguese from Brazil, one study in Spanish from Spain, and 12 articles in English from the following countries: Germany, Australia, Canada, China, Croatia, United States, England, and Sweden were identified. The 12 studies in English come from Germany, Australia, Canada, China, Spain and the United States, with two studies from Croatia and Sweden and three studies from England.

In total, it was observed that 11 studies are in the area of Education with an emphasis on the adaptation and reception of babies and very young children in a collective environment of daycare and preschool, and on the reception shared by family members, grandparents and professionals, while their parents need to return to the professional environment. 7 studies were found that are in the area of Psychology and deal with the adaptation and reception of babies and very young children in a collective environment of daycare and preschool and about the feelings, anxiety and fear expressed by mothers and fathers during the process. Among these, 3 studies are in the area of Social Pedagogy and deal with the adaptation and reception of babies and very young children in situations shared by a social program with an emphasis on music, songs and rhythms in the circle of women and children; about the reception experienced by families in situations of social vulnerability and poverty, and about the reception of children in a collective environment of immigrant groups and due to Covid 19.

Regarding the methodologies of the studies presented in Table 1, 12 articles present qualitative methodology (MARTINS et al., 2014; RAHMQVIST; WELLS; SARKADI, 2014; SIME; SHERIDAN, 2014; LAVELLE, 2015; GABRIEL; LOPES, 2016; GABRIEL et al., 2017; BARRS; DRURY, 2017; VERCELLI; NEGRÃO, 2019; SEHN; LOPES, 2019; SILVA; LUZ, 2019; LIU; TOBIN, 2021; SCHESTAG et al., 2021), three articles quantitative methodology (ÁLVAREZ et al., 2020; MIKOVIC; TOT, 2020; HU et al., 2021) and six articles describe mixed, qualitative and quantitative methodology (PÊSSOA et al., 2016; LING; TIBBETS; SCHARFE, 2017; VISKOVIC; JEVTIC, 2017; DEGOTARDI; SWELLER; PEARSON, 2018; BECKER; PICCININI, 2019; GRÖNLUND; ÖUN, 2020). The participants in these studies were mostly adults: educators, teachers, mothers, fathers, grandparents, and caregivers. The studies by Martins et al., (2014), Sime and Sheridan (2014), Lavelle (2015), Barrs and Drury (2017), Ling, Tibbets and Scharfe (2017), Becker and Piccinini

(2019), Sehn and Lopes (2019), Vercelli and Negrão (2019) and Liu and Tobin (2021) presented infants and young children as participants.

From the results shown in Table 1 (attached at the link), it is possible to see that all the studies found were empirical and used as data collection instruments: questionnaires, interviews, field observations, reflection circles, photographs, written and recorded records conducted with babies and very young children in daycare centers and preschools, teachers, mothers, parents, grandparents, family members and professionals belonging to the locus of each article researched. In quantitative studies, Álvarez et al. (2020) use the School-Family Relationship Scale (MARTÍNEZ-GONZÁLEZ, 1994) and descriptive analyses comparing groups of women and families. Mikovi and Tot (2020) use questionnaires (ANTULIC, OPIC and TOT, 2016) and analysis of results from the Shapiro-Wilk Test. The questionnaire used by Hu et al. (2021) was the MIXED instrument (HONG, 2004), with analysis in SPSS 19 and use of parental belief tests (AIKEN; WEST, 1991).

In the studies by Martins *et al.*, (2014), Rahmqvist, Wells and Sarkadi (2014), Sime and Sheridan (2014), Lavelle (2015), Gabriel and Lopes (2016), Gabriel *et al.*, (2016), Pêsoa et al (2016), Barrs and Drury (2017), Becker and Piccinini (2019), Sehn and Lopes (2019), Silva and Luz (2019), Vercelli and Negrão (2019), Grönlund and Öun (2020), Schestag *et al.*, (2021), Liu and Tobin (2021), the semi-structured interview, was the most used instrument.

Based on the inclusion and exclusion criteria, it was observed that the articles come from the fields of Education, Psychology and Social Pedagogy. The studies by Gabriel and Lopes (2016), Gabriel et al. (2017), Sehn and Lopes (2019), Becker and Piccinini (2019), Silva and Luz (2019) deal with the importance of a safe and trusting support network around the mother and father, encouraging the process of welcoming babies and very young children in daycare and preschool and parental knowledge; in the studies by Sime and Sheridam (2014), Lavelle (2015), Álvarez et al., (2020) the participation and collaboration between parents and teachers in the reception of very young children was observed. In the articles by Barrs and Drury (2017), Viskovic and Jevtic (2017), Mikovic and Tot (2020) and Hu et al., (2021), the integration of parental perceptions and family cultural values in the daycare and preschool environment was addressed. In the studies by Martins et al., (2014), Pessôa et al., (2016), Gabriel et al., (2017), Vercelli and Negrão (2019), Sehn and Lopes (2019), Silva and Luz (2019), the adaptation and reception of babies in daycare centers in the relationship with mothers, families, their beliefs and alternative care at the time of separation from children were presented. The importance of career, profession, gender, and family in the decision of mothers and fathers were deepened in two studies:

Degotardi, Sweller and Pearson (2018) and Grönlund and Öun (2020). The transformation of paternal involvement throughout the babies' adaptation period was found in two articles: Gabriel and Lopes (2016) and Becker and Piccinini (2019); the incorporation of parents and grandparents into the routine of infants and very young children was seen in the study by Liu and Tobin (2021). In addition, three articles, Rahmqvist, Wells and Sarkadi (2014), Ling, Tibbets and Scharfe (2017) and Schestag et al., (2021) state that parental prevention programs favor humanization in encounters between individuals, respect, values and dialogue. Also, the development of parental awareness from strategies applied in children's education was investigated in the article by Rahmqvist, Wells and Sarkadi (2014).

As for the theoretical references indicated in the articles, which refer to the separation and detachment of mother and father in the adaptation and reception of babies and very young children in the daycare environment, Bowlby is highlighted in the articles Gabriel et al., (2017), Vercelli and Negrão (2019), Liu and Tobin (2021). Ainsworth, on the other hand, is referenced in the studies of Sime and Sheridan (2014), Becker and Piccinini (2019), Liu and Tobin (2021) and Winnicott in the articles by Gabriel et al., (2017), Sehn and Lopes (2019), Vercelli and Negrão (2019) and Schestag et al., (2021). In turn, Bronfenbrenner is indicated in the studies by Barrs and Drury (2017), Álvarez et al., (2020), Mikovic and Tot (2020) to emphasize the importance of forming a support network for parents and children with daycare professionals. Lavelle's article (2015) emphasizes Foucault, as a philosophical foundation in the emergence of the phenomenon of distancing in public organizations and the importance of social responsibility in parental participation in contexts of vulnerability and poverty. The meaning of interactions in the socio-historical construction of relationships in the school community is discussed from Vygotsky in the article by Barrs and Drury (2017). The processes of social vulnerability in the diversity of parental cultural realities are analyzed taking Bourdieu's reference in Sime and Sheridan (2014). Thus, studies on the very young child have been based mainly on Bowlby, Ainsworth, Winnicott and Bronfenbrenner.

A greater number of studies (VERCELLI; NEGRÃO, 2019; LIU; TOBIN, 2021) with an emphasis on theoretical approaches to mother-child attachment (BOWLBY, 1984), and on the quality of mother-child interaction (SEHN; LOPES, 2019; BECKER; PICCININI, 2019) for child development, following the reference of Ainsworth (1978) was verified. Other studies deal with the function of maternal care for the positive adaptation of the baby in the daycare center and are based on Winnicott (1982, 2006), regarding the theme of mother-child distancing (SEHN; LOPES, 2019; VERCELLI; NEGRÃO, 2019). However, the biggest concern is to create an environment of trust. The importance of the teacher's role as an



agent of change in empathetic communication with families is emphasized. The studies emphasize that the attitude of mutual collaboration provides an increase in the quality of transactional interaction between the child and his environment, teachers and families, following the perspective of Bronfenbrenner (1989). Understanding the meaning of collaboration and mutual partnership in the environment of daycare centers and preschools favors the quality of relationships in the preschool environment for the achievement of common goals, such as the needs of families and healthy child development (MIKOVIC; TOT, 2020).

Other studies emphasize that, through human relationships, shared feelings, fears and anxieties worked through reliable support networks, in the participation and collaboration of dialogue circles, the role of mothers and fathers, grandparents, family members, caregivers, teachers and managers can contribute to the process of adaptation and reception of babies and very young children in the collective environment to be more individualized and less mechanized.

As for the data analysis in the articles found, in the article by Vercelli and Negrão (2019), the qualitative analysis is carried out based on Lüdke and André (2013), with observation favoring the researcher's personal contact with the participants to deal with the researched phenomenon. The categories mentioned in the first phase of the research are: a) direct experience as the best tool for verifying an event; b) the observer can resort to his knowledge and personal experiences to understand the phenomenon studied; c) approximation of the subjects involved in the research in the apprehension of meanings that are expressed by the participants; d) observation techniques to favor the capture of new data on the phenomenon studied; e) observation in data collection is considered the best tool to communicate in various situations (VERCELLI; NEGRÃO, 2019). In the second phase of the research, the semi-structured interview is highlighted (LÜDKE; ANDRÉ, 2013), to make clarifications and corrections in order to understand the phenomenon expressed by the participant (VERCELLI; NEGRÃO, 2019).

Qualitative content analysis based on Bardin (2016) was used to address categories on the factors associated with the baby's non-adaptation to daycare (MARTINS et al., 2014). The categories raised in this study were: a) the baby's temperament; b) parents' feelings linked to the separation of parents and babies and the inclusion of other people in the child's daily life; c) parenting beliefs and practices related to other alternative care; d) parents' attitudes towards daycare; e) parents' feelings related to the child's entry into daycare (MARTINS et al., 2014). For the quantitative analysis of the data, obtained from the

GIDEP questionnaire - Group of Social Interaction, Development and Psychopathology (1998a), the Nvivo8 Software was used (MARTINS et al., 2014).

Silva and Luz (2019) followed the content analysis based on Bardin (2016) and raised categories on the complex relationship between conceptions and practices (MINAYO, 2012): the function of guard and its relations with trust, security and well-being, conflicts and spatial-temporal dimensions of sharing (SILVA; LUZ, 2019). The central category discussed in the study is the sharing with the children's families in the care and education of daily life and its constitutive elements of conjugation in space-time, conceptions of childhood, child and education.

Sehn and Lopes (2019) analyzed clinical reports based on Epstein (2011) to treat the records of content manifested by the participants. Becker and Piccinini (2019) emphasize the discourse of psychoanalysis in the sense of building communication between the participant and the researcher. In the analysis of the quality of the interaction between the mother and the child from 12 to 18 months of age by Becker and Piccinini (2019), the Mother-Baby instrument NUDIF/CRESCI - Childhood and Family Center (PICCININI et al., 2011b) was used. Pederson, Moran and Bento (2013) also used the *Maternal Behavior Q-sort* (MBQS), arriving at the following categories: a) being aware of the child's signals, assessing the mother's awareness of the child's needs; b) efficacy and response, evaluating the mother's response to the child's signals; c) positive affect, evaluating the different forms of affection and emotions of the mother in the relationship with the child; d) rejection, to deal with whether the mother rejects the child; e) synchrony, to deal with the involvement between mother and child in adapting to the environment; f) control and interference, to deal with the way the mother responds to the child's behavior (BECKER; PICCININI, 2019).

The analysis of the video recordings in Liu and Tobin (2020) was based on Adair and Kurban (2019). This ethnographic research method seeks to combine the use of videos in the preschool environment to analyze the situations collected in the focus group recordings at minimal levels. They look for the movements of bodies in the daily practices of parents and grandparents when children enter daycare in the Chinese and North American contexts (LIU; TOBIN, 2020).

For Lavelle (2015), the beginnings that children make in the collective environment of daycare can be different when families are welcomed with affection and human warmth. The analysis of data from focus group interviews was done by the multilevel method and by the multiperspective method, according to Pole and Morrison (2003). In the article by Lavelle (2015), the concern with studying people in an objective way was highlighted, but

also with learning about them and with them in the construction of their discourses, following the reference of Spradley (1980), in everyday interactions. An analysis based on the structured theory of Glaser and Strauss (1967) arrived at five categories about the "*Parent-Child Mother Goose*"³ (PCMG) parental program, which were called: a) mothers' reports about PCMG facilitating the bond with the child; b) PCMG is a resource for new parenting tools; c) PCMG is an instrument of social interaction; d) mothers' reports describe warm dialogues between the facilitators; and e) reports of mothers who would like to repeat the experience at the PCMG (LING; TIBBETS; SCHARFE, 2017).

DISCUSSION

The analysis of the studies based on Bardin (2016) led to the survey of five categories on the reception of very young children and the parental experiences lived. 1) Adaptation and reception of babies from maternal separation (MARTINS et al., 2014; BECKER; PICCININI, 2019; SEHN; LOPES, 2019; SILVA; LUZ, 2019; VERCELLI; NEGRÃO, 2019); 2) Foster care as a right of the child and the family (DEGOTARDI et al., 2018; ÁLVAREZ; MARTÍNEZ-GONZÁLEZ; RODRÍGUEZ-RUIZ, 2020; GRÖNLUND; ÖUN, 2020); 3) Collaboration between teachers and the family (PÊSSOA et al., 2016; VISKOVIC; JEVTIC, 2016; BARRS; DRURY, 2017; SILVA; LUZ, 2019; HU et al., 2021); 4) Acceptance of parental social and cultural identities (PÊSSOA et al., 2016; BARRS; DRURY, 2017; LING; TIBBETS; SCHARFE, 2017; VERCELLI; NEGRÃO, 2019; LIU; TOBIN, 2021); and 5) Parental individuation as a process of conscious acceptance (RAHMQVIST; WELLS; SARKADI, 2014; SCHESTAG et al., 2021).

In this article we will be presenting the first two categories.

ADAPTATION AND RECEPTION OF BABIES FROM MATERNAL SEPARATION

The first category first demonstrates the emphasis on the dimension of adaptation during the family's transition to the daycare environment (MARTINS et al., 2014; BECKER; PICCININI, 2019; SEHN; LOPES, 2019; VERCELLI; NEGRÃO, 2019). Adaptation is presented in its characteristics, context and quality of interaction established between the mother and the caregiver. It seeks to study the separation and secure attachment of the mother and child based on Bowlby's attachment theory (MARTINS et al., 2014; VERCELLI; NEGRÃO, 2019); child development from the separation of the mother is based on Ainsworth (SEHN; PICCININI, 2019); and the influence of the subjective experiences of

³ *Parent-Child Mother Goose* (PCMG) is a parenting program that promotes maternal guidance through the sharing of songs, songs and rhythms with children, respecting the customs and culture of local communities (SCHARFE, 2011).

families on the child's adaptation to daycare (MARTINS et al., 2014). Stable bonds between teachers and children are indicated as favoring the adaptation period (VERCELLI; NEGRÃO, 2019). The impact of daycare on mother-child interaction and the reasons for dependence are analyzed from Winnicott (BECKER; PICCININI, 2019; VERCELLI; NEGRÃO, 2019). The role of transitional objects in the child's adaptation is studied (VERCELLI; NEGRÃO, 2019), and the reasons for the baby's non-adaptation to daycare (MARTINS et al., 2014). Investigating the use of transitional objects in the child's entry into daycare, for Vercelli and Negrão (2019), demonstrates the importance of the process of adaptation and reception in the daycare respecting the duration of one to three weeks, such as the time that the child remains in the institution and the modification of the child's entire daily life (ROSSETTI-FERREIRA et al., 2011). The change of context between the family environment and the collective environment, for some families, can be challenging. The reasons given are: baby being the center of attention; the child's temperament; feelings linked to the separation between parents and the child in the inclusion of other people in the child's daily life; parenting beliefs and practices related to other alternative care for the child; attitudes towards daycare; and feelings related to the mother and father when the child enters the daycare center (MARTINS et al., 2014).

FOSTER CARE AS A RIGHT OF THE CHILD AND THE FAMILY

Degotardi, Fenech and Beath (2018) deal with the complex reasons that lead Australian parents to decide to start adapting and welcoming babies and children in daycare and preschool. Grönlund and Öun (2020) study the right that Swedish parents of babies have for the stress caused by the double workday. The need for support in child care is evident when women need to follow the long journey in the profession. On the other hand, parents in rural areas need a preschool that serves a regular number of hours to work in the labor market for an irregular time. Especially for mothers in rural regions in Spain, there are difficulties in their participation in the education of children (ÁLVAREZ; MARTÍNEZ-GONZÁLEZ; RODRÍGUEZ-RUIZ, 2020).

Next, it is presented how each of the two categories responded to the objective of understanding the reception of the child and the parents in the collective environment.

(1) In the transition process between the family and the collective environment, the safe detachment of babies (BOWLBY, 1984) is influenced by the temporal factor in the planning of caregivers, teachers, mother and child (AHNERT et al., 2004; MARTINS et al., 2014; VERCELLI; NEGRÃO, 2019). The separation between mother and child presents more predictable results when the three-week time is respected (ROSSETTI-FERREIRA et

al., 2011). As well as when transitional objects (WINNICOTT, 1971) facilitate the adaptation process, providing calm and less anxiety for the child (VERCELLI; NEGRÃO, 2019). The child's satisfaction avoids regression in the process of separation between mother and child (RAPPOPORT; PICCININI, 2001). The child's non-adaptation can be caused both by maternal anxiety (BOWLBY, 1960) and by parental beliefs not considered by the institution (LIU; TOBIN, 2021). A child's difficult temperament can also affect the subjects involved in the process (MARTINS et al., 2014).

In addition, the parents' decision to include the child in the daycare center involves the presence of greater tension, feelings that may determine the future adaptation process (DUMONT-PENA; SILVA, 2018; SILVA; LUZ, 2019). For, for Aisworth et al. (1978), the quality of the interaction between the mother and child determines the entire progress of the process of adaptation and reception in the collective environment (BECKER; PICCININI, 2019). The organization and emotional maturity of both mother and child (WINNICOTT, 2006, 2011) indicate whether there is an integration of individuals in the generation of separation movements (SEHN; LOPES, 2019). Also the process of the child's adaptation (WINNICOTT, 1971, 1998), the relationships of adults, parents and teachers, established in an environment of trust, generate results with less suffering for the subjects (GABRIEL; LOPES, 2016; GABRIEL et al, 2017; VERCELLI; NEGRÃO, 2019).

(2) To enroll babies and very young children in daycare and preschool, several reasons are demonstrated prior to the parents' decision-making (DEGOTARDI et al., 2018). From dealing with the expectations of looking for an institution for the child to be full-time due to the parental work schedule, or needing institutionalized part-time care for the child (SOLLARS, 2016). The differences of the families can be welcomed in partnership by the teachers, forming a school community (EPSTEIN, 2011). For Lister (2003), it is a challenge experienced by countless mothers and fathers today, to reconcile the professional journey, financial independence and family. The stress caused by the accumulation of family tasks is accepted as a right to transform tension into time of shared care (GRÖNLUND; Öun, 2020). Since, the individualization of the woman in the maternal role can be less painful when she assumes the need for help in the care of the child. Thus, the child's care journey shared in shifts between the couple, grandparents and professionals is considered a familiarization process (LOHMANN; ZAGEL, 2016).

For Álvarez, Martínez-González and Rodríguez-Ruiz (2020), daycare and preschool institutions are considered by teachers as social centers, where there are several groups that interact with each other as microsystems (BRONFENBRENNER, 1979). The participation of families in schools, in the perception of teachers, proves to be a different

partnership (EPSTEIN et al., 2002). On the one hand, the greatest difficulty for families is to establish relationships and coexistence in urban centers, due to the numerous parental activities. On the other hand, despite the greater involvement of families from more remote areas, public access to daycare centers in rural areas needs to be rethought (ÁLVAREZ; MARTÍNEZ-GONZÁLEZ; RODRÍGUEZ-RUIZ, 2020).

CONCLUSION

The objective of the present study is to understand the process of welcoming very young children and parents in the collective environment. The reception of babies and very young children in public daycare centers needs to consider, from the beginning of the transition, the bond between the mother, the father and the child. Stable relationships between adults, teachers and parents prove to be the essential element in the effort for the collective preschool environment.

The child and the family have the right to live quality daily experiences in the collective environment (BRASIL, 1988). The social benefits for all child development that interactions provide are emphasized, even though the social and economic changes in today's contemporary society directly affect families who seek shared care for the child in order to return to the field of work. For this reason, we emphasize the importance of the role of caregivers, teachers and professionals in the daycare environment, for the recognition and satisfaction of families for the processes experienced.

This review indicates the need for greater teacher grounding on the complexity of families' emotions in the reception of children in the child environment (HAYASHI; KARASAWA; TOBIN, 2009). The valorization of cooperation between teachers and families at the time of reception is emphasized (MIKOVIC; TOT, 2020; HU et al, 2021). If, on the one hand, we highlight the diversity of experiences lived in the separation between mother and child, on the other hand, there is the challenge of providing a support network for families, which can respect a longer time of coexistence in preschool environments.

THANKS

The authors thank CAPES, CAPES/PRINT for promoting research.

DATA AVAILABILITY

The figure and table with the data of the article are available at the link:

https://docs.google.com/forms/d/1oa_7xFKmJYJFoiKRj9Ulj2uuhpiajtYTBD4BmQgfrE/prefil

|



REFERENCES

1. Adair, J. K., & Kurban, F. (2019). Video-cued ethnography in educational settings. **Anthropology & Education Quarterly**, 50(1), 245–254. <https://doi.org/10.1111/aeq.12311>
2. Ahnert, L., Gunnar, M., Lamb, M. E., & Barthel, M. (2004). Transition to child care: Associations with infant mother attachment, infant negative emotion and cortisol elevations. **Child Development**, 75, 639–650. <https://doi.org/10.1111/j.1467-8624.2004.00698.x>
3. Aiken, L. S., & West, S. G. (1991). **Multiple regression: Testing and interpreting interactions**. Sage.
4. Ainsworth, M. D. S. (1989). Attachments beyond infancy. **American Psychologist**, 44, 709–716. <http://dx.doi.org/10.1037/0003-066X.44.4.709>
5. Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978). **Patterns of attachment: A psychological study of the strange situation**. Erlbaum.
6. Ainsworth, J. W. (2002). Why does it take a village? The mediation of neighborhood effects on educational achievement. **Social Forces**, 81(1), 117–152. <https://doi.org/10.1353/sof.2002.0038>
7. Aloa, V. (2008). **Infants settled into care: More than attachment**. Flinders University of South Australia.
8. Álvarez, L. F. F., Martínez-González, R.-A., & Rodríguez-Ruiz, B. (2020). Estudio exploratorio sobre la percepción del profesorado acerca de la participación de las madres en los centros escolares de educación infantil y primaria. **Journal of Research in Social Pedagogy**, 36, 111–123. https://doi.org/10.7179/PSRI_2020.36.07
9. André, M. (2013). O que é um estudo de caso qualitativo em educação? **Revista da FAEEBA – Educação e Contemporaneidade**, 22(40), 95–103. <https://doi.org/10.21879/faeeba2358-0194.v22.n40.753>
10. Antulic, S., Opic, S., & Tot, D. (2016). Evaluation level in the process of self-evaluation of educational institutions. **Croatian Journal of Education**, 18(Special Ed. 1), 31–46. <https://doi.org/10.15516/cje.v18i0.2183>
11. Atkinson, A. (1987). Fathers' participation and evaluation of a family day care. **Family Relations**, 3(1), 146–151. <https://doi.org/10.2307/583944>
12. Bakeman, R., Deckner, D., & Quera, V. (2005). Analysis of behavioral streams. In D. M. Teti (Ed.), **Handbook of research methods in developmental psychology** (pp. xx-xx). Blackwell Publishers.
13. Barbosa, M. C. S. (2013). Creche: Uma estranha no ninho educacional. **Dialogia**, 17, 75–92. <https://doi.org/10.5585/Dialogia.n17.4410>
14. Barbosa, F. A., Machado, L. F., Vilela e Souza, L., & Scorsolini-Comin, F. (2010). Significados do cuidado materno em mães de crianças pequenas. **Barbaroi**, 33, 28–

49. http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid-S0104-65782010000200003

15. Bardin, L. (2016). **Análise do conteúdo** (1ª ed.). Edições 70.
16. Barrs, M., & Drury, R. (2017). "Documentation" in Pistoia preschool. A window and a mirror. **International Research in Early Childhood Education**, 8(1), 3–20. <https://files.eric.ed.gov/fulltext/EJ1173670.pdf>
17. Becker, S., & Piccinini, C. (2019). Impacto da creche para a interação mãe-criança e para o desenvolvimento infantil. **Psicologia: Teoria e Pesquisa**, 35, e3532, 1–10. <https://doi.org/10.1590/0102.3772e3532>
18. Botelho, L. L. R., Cunha, C. C. de A., & Macedo, M. (2011). O método da revisão integrativa nos estudos organizacionais. **Gestão e Sociedade**, 5(11), 121–136. <https://doi.org/10.21171/ges,v5i11.1220>
19. Bourdieu, P. (2000). Bodily knowledge. In P. Bourdieu, **Pascalian meditation** (pp. 128–163). Stanford University Press.
20. Bourdieu, P. (1989). Social space and symbolic power. **Sociological Theory**, 7(1), 14–25.
21. Bowlby, J. (2006). Psicanálise e cuidados com a criança. In J. Bowlby, **Formação e rompimento de laços afetivos** (4ª ed., pp. 13–41). Martins Fontes. (Original publicado em 1958).
22. Bowlby, J. (1988). **A secure base: parent-child attachment and healthy human development**. Basic Books.
23. Bowlby, J. (1984). **Apego e perda**. Martins Fontes.
24. Bowlby, J. (1960). Separation anxiety: A critical review of the literature. **Journal of Child Psychology and Psychiatry**, 1(4), 251–269.
25. Brasil. Presidência da República. Secretaria Especial dos Direitos Humanos. Conselho Nacional dos Direitos da Criança e do Adolescente. (2006). **Plano Nacional de Promoção, Proteção e Defesa do Direito de Crianças e Adolescentes à Convivência Familiar e Comunitária**. Conanda.
26. Braun, V., & Clarke, V. (2013). **Successful qualitative research: a practical guide for beginners**. Sage.
27. Bronfenbrenner, U. (1989). The ecology of the family as a context for human development: Research perspectives. **Developmental Psychology**, 22(6), 723–742. <https://doi.org/10.1037/0012-1649.22.6.723>
28. Bronfenbrenner, U. (1979). **The ecology of human development: experiments by nature and design**. Harvard University Press.
29. Broome, M. E. (2000). Integrative literature reviews for the development of concepts. In B. L. Rodgers & K. A. Knafl (Eds.), **Concept development in nursing: Foundations, Techniques and Applications** (2nd ed., pp. 231–250). W.B. Saunders Company.

30. Carvalho, A. M. O. T. (2005). Pais na creche: a arte do diálogo entre educadores e família. **Educação e Sociedade**, 26(91), 689–693.
31. Casanova, L. V. (2016). Creche e família ou creche e famílias: o contexto dessa relação na contemporaneidade. **Horizontes**, 34(2), 41–48.
32. Cohen, P. N., & Bianchi, S. M. (1999). Marriage, children and women's employment: what do we know? **Monthly Labor Review**, 122(12), 22–31.
33. Coutinho, A. S. (2016). Os novos estudos sociais da infância e a pesquisa com crianças bem pequenas. **Educativa**, 19(1), 762–773. <https://doi.org/10.18224/educ.v19i3.5426>
34. Creswell, J. W., Clark, V. L., Gutmann, M. L., & Hanson, W. E. (2003). Advanced mixed methods research designs. In A. Tashakkori & C. Teddie (Eds.), **Handbook of mixed methods in social & behavioral research** (pp. 209–240). Sage.
35. Degotardi, S., Sweller, N., & Pearson, E. (2013). Why relationships matter: Parents and early childhood teacher perspectives about the provisions afforded by young children's relationships. **International Journal of Early Years Education**, 21(1), 4–21. <https://doi.org/10.1080/09669760.2013.771325>
36. Dumont-Pena, E., & Silva, I. de O. (2018). **Aprender cuidar: diálogos entre saúde e educação infantil**. Cortez.
37. Epstein, R. (2011). El relato y la realidad. In M. Vorchheimer (Ed.), **XXXIII Simposio Annual: Relatos de la clínica** (pp. 31–46). Asociación Psicoanalítica de Buenos Aires.
38. Epstein, J. L. (2011). **School, family, and community partnerships: Preparing educators and improving schools** (2nd ed.). Westview Press.
39. Epstein, J. L., Sanders, M. G., Salinas, K. C., Jansorn, N. R., & Van Voorhis, F. L. (2002). **School, family and community partnerships: Your handbook for action**. Corwin.
40. Eunice Kennedy Shriver National Institute of Child Health and Human Development. (2006a). Child-care effect sizes for the NICHD study of early child care and youth development. **American Psychologist**, 61(2), 99–116.
41. Ferrão, E. S., Breder, L. L., Assis, J. C., Christ, L., & Caetano, C. (2017). Família e escola de crianças pré-escolares: experiência em atenção básica. **Temas em Educação e Saúde**, 13(2), 224–241. <https://doi.org/10.26673/rtes.v13.n2.jul-dez.2017.9538>
42. Field, A. (2009). **Discovering statistics using SPSS** (3rd ed.). Sage.
43. Foucault, M. (1977). **Discipline and punish: The birth of a prison**. Penguin.
44. Fraiberg, S. (1980). **Clinical studies in infant mental health: The first year of life**. Basic Books; Tavistock.
45. Freud, S. (1990). Inhibitions, symptoms and anxiety. In S. Freud, **The standard edition of the complete psychological works of Sigmund Freud** (Vol. 20, pp. 87–178). W.W. Norton & Company.

46. Friedmann, A. (2022). A importância do respeito às vidas das crianças na Primeira Infância na perspectiva antropológica. In A. Friedmann et al. (Eds.), **Olhares para as crianças e seus tempos: caminhos, frestas e travessias** (pp. 18–34). Passarinho/Diálogos Embalados.
47. Freire, P. (2003). **Educação como prática da liberdade** (27th ed.). Paz e Terra.
48. Fritzemeyer, K., Lebigier-Vogel, J., Rickmeyer, C., Schestag, L., Rossi, R., & Leuzinger-Bohleber, M. (2019). Das Frühpräventionsprojekt “ERSTE SCHRITTE” für Kleinkinder mit Migrationshintergrund: Erste Ergebnisse. **Kinderärztliche Praxis**, 90, 19–23.
49. Fullan, M. (2007). **The new meaning of educational change**. Teachers College Press.
50. Gabriel, M., & Lopes, R. de C. (2016). Transformações no envolvimento paterno ao longo dos seis primeiros meses do bebê na creche. **Psicologia: Teoria e Pesquisa**, 32(3), 1–10. <http://dx.doi.org/10.1590/0102-3772e32321>
51. Gabriel, M., Polli, R., Dall’Agnol, L., Tudge, J., & Piccinini, C. A. (2016). Envolvimento paterno aos 24 meses de vida da criança. **Psicologia: Teoria e Pesquisa**, 33, 1–10. <http://dx.doi.org/10.1590/0102-3772e33410>
52. Giovannini, D. (2018). The role of environments and spaces in the pedagogy of Pistoia. In G. Goodliff, N. Canning, J. Parry, & L. Miller (Eds.), **Young children’s play and creativity: multiple voices** (pp. 181–188). Routledge.
53. Giovagnoli, R. (2018). From habits to rituals: Rituals as social habits. **Open Information Science**, 2, 181–188. <https://doi.org/10.1515/opis-2018-0014>
54. Glaser, B. G., & Strauss, A. L. (1967). **The discovery of grounded theory: strategies for qualitative research**. Aldine Transaction.
55. Grönlund, A., & Öun, I. (2020). Minding the care gap: Daycare usage and the negotiation of work, family and gender among Swedish parents. **Social Indicators Research**, 151, 259–280. <https://doi.org/10.1007/s11205-020-02366-z>
56. Grupo de Interação Social, Desenvolvimento e Psicopatologia. (1998a). Entrevista de dados demográficos do casal. Instituto de Psicologia, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brasil.
57. Grupo de Interação Social, Desenvolvimento e Psicopatologia. (1998c). Entrevista sobre a gestação e expectativas da gestante. Instituto de Psicologia, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brasil.
58. Grupo de Interação Social, Desenvolvimento e Psicopatologia. (1998d). Entrevista sobre gestação e as expectativas do futuro pai. Instituto de Psicologia, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brasil.
59. Grupo de Interação Social, Desenvolvimento e Psicopatologia. (1999). Entrevista de experiência da paternidade. Instituto de Psicologia, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brasil.


60. Hayashi, A., Karasawa, M., & Tobin, J. (2009). The Japanese preschool's pedagogy of feeling: Cultural strategies for supporting young children's emotional development. **Ethos**, 37(1), 32–49. <https://doi.org/10.1111/j.1548-1352.2009.01030.x>
61. Hong, Q. (2004). Research of parents' need and satisfaction of childcare quality in preschool (In Chinese) (Master's thesis). Biblioteca Digital de Teses e Dissertações de Taiwan.
62. Hoover-Dempsey, K. V., & Sandler, H. M. (1995). Parental involvement in children's education: Why does it make a difference? **Teachers College Record**, 97(2), 310–331. <https://doi.org/10.1177/016146819509700202>
63. Hu, B., Alexander, C., Wu, H., Roberts, S., & Li, Y. (2021). Exploring home-school partnership and Chinese parental satisfaction of preschool services: The moderating effect of childrearing beliefs. **Journal of Child and Family Studies**, 30, 206–219. <https://doi.org/10.1007/s10826-020-01862-7>
64. Hu, B., Yang, Y., Song, Z., Wu, H., & Netzel, J. (2018). Structural and process predictors of Chinese parental satisfaction toward early childhood education services. **Children and Youth Services Review**, 89, 179–187. <https://doi.org/10.1016/j.childyouth.2018.04.022>
65. Huberman, A. M., & Miles, M. B. (1994). Data management and analysis methods. In N. K. Denzin & Y. S. Lincoln (Eds.), **The handbook of qualitative research** (pp. 428–444). Sage.
66. Jackson, D., & Needham, M. (2014). **Engaging with parents in early years settings**. SAGE. <https://doi.org/10.4135/9781473909359>
67. Keller, H. (2007). **Cultures of infancy**. Lawrence Erlbaum Associates.
68. Kim, E. M., & Sheridan, S. M. (2015). Foundational aspects of family-school connections: Definitions, conceptual frameworks, and research needs. In **Foundational aspects of family-school partnership research** (pp. 1–15). Springer. https://doi.org/10.1007/978-3-319-13838-1_1
69. Körner, R., & Betz, T. (2012). Die empirische Bestimmung der sozialen Herkunft und des Migrationshintergrunds von Kindern. **Das Erhebungsinstrument der standardisierten Elternbefragung. Ergebnisbericht aus dem Projekt EMiL** (EMiL Working Paper n. 1). Goethe-Universität.
70. Kramer, S., Nunes, M. F. R., & Pena, A. (2020). Crianças, ética do cuidado e direitos: A propósito do Estatuto da Criança e do Adolescente. **Educação Pesquisa**, 46, e237202. <https://doi.org/10.1590/S1678-4634202046237202>
71. Kude, V. M. M. (2004). Qualidade do atendimento na educação infantil: Um estudo em duas culturas. **Educação**, 53(2), 319–348. <https://revistaseletronicas.pucrs.br/faced/article/view/385>
72. Lamb, M. E., Pleck, J. H., Charnov, E. L., & Levine, J. A. (1985). Paternal behavior in humans. **American Zoologist**, 53(3), 883–894. <https://doi.org/10.1093/icb/25.3.883>

73. Lavelle, M. (2015). A storm in a tea-cup? 'Making difference' in two Sure Start children's centres. **Children & Society**, 29(6), 583–592. <https://doi.org/10.1111/chso.12091>
74. Laville, C., & Dionne, J. (1999). **A construção do saber: manual de metodologia em ciências humanas**. Artes Médicas.
75. Ling, D., Tibbets, G., & Scharfe, E. (2017). Once upon a time: Lessons learned from the benefits of parent-child Mother Goose. **Child Welfare**, 95(2), 9–31. <https://api.semanticscholar.org/CorpusID:164506544>
76. Lister, R. (2006). Children (but not women) first: New Labour, child welfare and gender. **Critical Social Policy**, 26, 315–355. <https://doi.org/10.1177/0261018306062588>
77. Lister, R. (2003). **Citizenship: feminist perspectives**. Palgrave.
78. Liu, C., & Tobin, J. (2021). Embodied routines and ethnotheories of morning drop-offs at US and Chinese preschools. **ETHOS: Journal of the Society for Psychological Anthropology**, 49(2), 171–193. <https://doi.org/10.1111/etho.12306>
79. Lohmann, H., & Zagel, H. (2016). Family policy comparative perspective: The concepts and measurement of familiarization and defamiliarization. **Journal of European Social Policy**, 26(1), 48–65. <https://doi.org/10.1177/0958928715621712>
80. Lordelo, E. R. (1997). Efeitos da experiência de creche no desenvolvimento da criança: Uma revisão. **Psicologia: Teoria e Pesquisa**, 13(2), 221–229.
81. Lüdtke, M., & André, M. E. D. A. (2013). **Pesquisa em educação: abordagens qualitativas** (2. ed.). EPU.
82. Malterud, K. (2012). Systematic test condensation: A strategy for qualitative analysis. **Scandinavian Journal of Public Health**, 40(8), 795–805. <https://doi.org/10.1177/1403494812465030>
83. Martins, G., Becker, S., Leão, L., Lopes, R., & Piccinini, C. (2014). Fatores associados à não adaptação do bebê na creche: Da gestação ao ingresso na instituição. **Psicologia: Teoria e Pesquisa**, 30(3), 241–250. <https://doi.org/10.1590/S0102-37722014000300001>
84. Martínez González, R.-A. (1994). Diagnóstico de necesidades en la cooperación entre familia y centro escolar. Informe de Investigación, Universidade de Oviedo.
85. McCutcheon, A. L. (1987). **Latent class analysis** (Sage University Paper Series on Quantitative Applications in the Social Sciences, n. 07-064). Sage.
86. Meurs, P., & Jullian, G. (2015). Das Projekt « Erste Schritte » - kultursensible und bindungsgerichte preventive Entwicklungsberatung für Migranteneltern und Kleinkinder. In K. Brisch (Ed.), **Bindung und Migration** (pp. 222–248). Klett-Cotta.
87. Mikovic, I., & Tot, D. (2020). The role of professional knowledge and skills of preschool teachers in building and developing partnerships with parents. **Croatian Journal of Education**, 22, Sp.Ed. 3, 71–81. <https://doi.org/10.15516/cje.v22i0.3910>

88. Minayo, M. C. S. (2012). Análise qualitativa: teoria, passos e fidedignidade. **Revista Ciência e Saúde Coletiva**, 17(3), 621–626. <https://doi.org/10.1590/S1413-81232012000300007>
89. Mollica, R., Caspi-Yavin, Y., Bollini, P., Truong, T., Tor, S., & Lavelle, J. (1992). The Harvard Trauma Questionnaire: Validating a cross-cultural instrument for measuring torture, trauma, and posttraumatic stress disorder in Indo-Chinese refugees. **The Journal of Nervous and Mental Disease**, 180(2), 111–116.
90. National Institute of Child Health and Human Development Eunice Kennedy Shriver. (2006). Child-care effect sizes for the NICHD study of early child care and youth development. **American Psychologist**, 61(2), 99–116.
91. Núcleo de Infância e Família/NUDIF/CRESCI. (2011a). Entrevista sobre a maternidade – 6º mês. Instituto de Psicologia, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS.
92. Núcleo de Infância e Família/NUDIF/CRESCI. (2011b). Observação da interação mãe-bebê – 6º mês. Instituto de Psicologia, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS.
93. Núcleo de Infância e Família/CRESCI. (2011a). Entrevista sobre adaptação do bebê à creche – versão pai. Universidade Federal do Rio Grande do Sul, Porto Alegre, RS.
94. Núcleo de Infância e Família/CRESCI. (2011b). Entrevista sobre gestação, parto e a experiência da paternidade. Universidade Federal do Rio Grande do Sul, Porto Alegre, RS.
95. O'Connor, B. P. (2000). SPSS and SAS programs for determining the number of components using parallel analysis and Velicer's MAP test. **Behavior Research Methods, Instruments, & Computers**, 32(3), 396–402. <https://doi.org/10.3758/bf03200807>
96. Pederson, D., Moran, G., & Bento, S. (2013). **The maternal behavior Q-Sort (MBQS): Assessing maternal sensitivity and the quality of mother-infant interaction**. University of Western Ontario.
97. Pessôa, L., Seidl-de-Moura, M. L., Ramos, D., & Mendes, D. (2016). Sistemas de cuidados e o discurso de diferentes cuidadores do Rio de Janeiro: Evidências de trajetória de desenvolvimento. **Estudos de Psicologia**, 33(1), 71–82. <http://dx.doi.org/10.1590/1982-02.752016000100008>
98. Piccinini, C. A., Silva, M. R., Gonçalves, T. R., Lopes, R. S., & Tudge, J. (2004). O envolvimento paterno durante a gestação. **Psicologia: Reflexão e Crítica**, 17(3), 303–314. <https://doi.org/10.1590/S0102-79722004000300003>
99. Piccinini, C. A., Becker, S. M. S., Martins, G. D. F., Lopes, R. C. S., & Sperb, T. (2011). Impacto da creche no desenvolvimento socioemocional e cognitivo infantil: Estudo longitudinal do sexto mês de vida do bebê ao final dos anos pré-escolares – CRESCI. Instituto de Psicologia, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS.

100. Piccinini, C. A., Tudge, J., Lopes, R. C. S., & Sperb, T. (1998). *Estudo longitudinal de Porto Alegre: Da gestação à escola*. Instituto de Psicologia, Universidade Federal do Rio Grande do Sul, Porto Alegre, RS, Brasil.
101. Picchio, M., Giovannini, D., Mayer, S., & Musatti, T. (2012). Documentation and analysis of children's experience: An ongoing collegial activity for early childhood professionals. *Early Years*, 32(2), 159–170. <https://doi.org/10.1080/09575146.2011.651444>
102. Pole, C., & Morrison, M. (2003). *Ethnography for Education*. Open University Press.
103. Rahmqvist, J., Wells, M. B., & Sarkadi, A. (2014). Conscious parenting: A qualitative study on Swedish parents' motives to participate in a parenting program. *Journal of Child and Family Studies*, 23(5), 934–944. <https://doi.org/10.1007/s10826-013-9750-1>
104. Rapoport, A., & Piccinini, C. A. (2001). O ingresso e adaptação de bebês e crianças pequenas à creche: Alguns aspectos críticos. *Psicologia Reflexão Crítica*, 14(1), 81–95. <https://doi.org/10.1590/S0102-79722001000100007>
105. Rege, K., & Almeida, N. (2013). Effective communication facilities partnering with parents: Perception of supervisors and teachers at preschool and primary school levels. *OIDA International Journal of Sustainable Development*, 6(7), 53–70. <https://ssrn.com/abstract=2383428>
106. Rossetti-Ferreira, M. C., Mello, A. M., Vitória, T., Gosuen, A., & Chaguri, A. C. (2011). *Os fazeres na Educação Infantil* (12. ed.). Cortez.
107. Rossetti-Ferreira, M. C., Amorim, K. S., & Vitória, T. (1996). Emergência de novos significados durante o processo de adaptação de bebês à creche. In *Investigação da criança em interação social* (Vol. 4, n. 1, pp. 111–144). Coletâneas da ANPEPP.
108. Sanders, M. R. (2008). Triple P – Positive Parenting Program as a public health approach to strengthening parenting. *Journal of Family Psychology*, 22(4), 506. <https://doi.org/10.1037/0893-3200.22.3.506>
109. Sanders, M. R. (1999). Triple P – Positive Parenting Program: Towards an empirically validated multilevel parenting and family support strategy for the prevention of behavior and emotional problems in children. *Clinical Child and Family Psychology Review*, 2(2), 71–90. <https://doi.org/10.1023/A:1021843613840>
110. Sampieri, R. H., Collado, C. H., & Lucio, M. P. B. (2006). *Metodologia de pesquisa* (3. ed.). McGraw-Hill.
111. Scharfe, E. (2011). Benefits of Mother Goose: Influence of community-based program on parent-child attachment relationships in typical families. *Child Welfare*, 90(5), 9–26.
112. Schestag, L., Mehrer-Gentner, J., & Stein, L. (2021). Ghosts in the nursery in exile: Supporting parenting in exile during the Covid-19 pandemic. *International Journal of Applied Psychoanalytics*, 18, 197–207. <https://doi.org/10.1002/aps.1702>
113. Sehn, A., & Lopes, R. C. (2019). A vivência materna da função de cuidar no período de dependência da criança. *Psicologia: Teoria e Pesquisa*, 35(esp.), e35nspe8, 1–11. <https://dx.doi.org/10.1590/0102.3772e35nspe8>

114. Sheldon, S. B., & Epstein, J. L. (2007). *Parent survey of family and community involvement in the elementary and middle grades*. Center on School, Family, and Community Partnerships, Johns Hopkins University.
115. Silva, I. O., & Luz, I. R. (2019). Relações entre famílias e instituições de educação infantil: O compartilhamento do cuidado e educação das crianças. *EccoS – Revista Científica*, (50), e14110, 1–22. <https://doi.org/10.5585/eccos.n50.14110>
116. Sime, D., & Sheridan, M. (2014). ‘You want the best for your kids’: Improving educational outcomes for children living in poverty through parental engagement. *Educational Research*, 56(3), 327–342. <https://doi.org/10.1080/00131881.2014.934556>
117. Sollars, V. (2016). Parents’ expectations about early years services. *Early Years*, 37(3), 1–15. <https://doi.org/10.1080/09575146.2016.1154507>
118. Spradley, J. P. (1980). *Participant observation*. Holt, Rinehart and Winston.
119. Stake, R. (2006). *Multiple case study analysis*. The Guilford Press.
120. Statistics Sweden. *Labour Force Surveys (LFS)*. Disponível em: <https://www.scb.se/en/finding-statistics/statistics-by-subject-area/labour-market/labour-force-surveys/labour-force-surveys-lfs/>. Acesso em: 20 mar. 2024.
121. Sure Start. *New performance management framework for Sure Start Children’s Centres*. Disponível em: <http://surestart.gov.uk/publications/?Document-1852>. Acesso em: 14 jul. 2022.
122. Sylvia, K., Stein, A., Leach, P., Barnes, J., Malmberg, L. E., & the FCCC team. (2011). Effects of early child-care on cognition, language, and task-related behaviors at 18 months: An English study. *British Journal of Developmental Psychology*, 29(1), 18–45. <https://doi.org/10.1348/026151010X533229>
123. Tashakkori, A., & Teddie, C. (2003). *Handbook of mixed methods in social & behavioral research*. Sage.
124. The Parent-Child Mother Goose Program. *Electronic references*. Disponível em: <http://www.nald.ca/mothergooseprogram/about.htm>. Acesso em: 20 dez. 2023.
125. Tobin, J., & Hayashi, A. (2017). Return interviews and long engagements with ethnographic informants. *Anthropology & Education Quarterly*, 48(3), 318–327. <https://doi.org/10.1111/aeq.12202>

CELL ADHESION MECHANICS: A WINDOW INTO THE EVOLUTION OF MULTICELLULARITY <https://doi.org/10.56238/sevened2024.029-010>

Henrique Rodrigues Correia Bacchi¹, Anderson Medeiros dos Santos², Geovanna Aguiar Alves Dias³, Maria Luiza Gomes de Jesus⁴, Guilherme Victor Nippes Pereira⁵ and Ricardo Rodrigues Bacchi⁶

ABSTRACT

Background: The study explores how single-celled organisms evolved into multicellular, focusing on the mechanisms of cell adhesion as a determining factor in this transition. Volvocaceae algae have evolved to form multicellular colonies, where cells communicate via cytoplasmic bridges. In contrast, multicellular animals have evolved complex junctions, such as gap-like junctions and desmosomes, that allow for communication and adhesion between cells. Cell adhesion is crucial for the formation of multicellular structures, ensuring cohesion and communication between cells.

Methodology: A literature review was carried out between 2000 and 2024, using databases such as Web of Science, Zoological Record, and Google Scholar. Search terms included "Cell Adhesion," "Intercellular Junctions," "Tissues," and "Green Algae." Only peer-reviewed articles comparing the evolution of the mechanisms of communication between cells of Volvocaceae algae and multicellular animals were included, excluding narrative and editorial studies.

Results: The results indicate that Volvocaceae animals and algae followed different evolutionary trajectories in the development of cell junctions. Animals have evolved complex

¹ Scholarship holder in the Institutional Program of Scientific Initiation – BIC-JÚNIOR
State University of Montes Claros (UNIMONTES)
E-mail: henriquebacchi2007@gmail.com
ORCID: 0009-0000-8750-5447
LATTES: 4212941818527253

² Doctor in Ecology of Continental Aquatic Environments
State University of Montes Claros (UNIMONTES)
E-mail: anderson.santos@unimontes.br
ORCID: 0000-0001-6454-7601
LATTES: 9905683948197460

³ Scholarship holder in the Institutional Program of Scientific Initiation – BIC-JÚNIOR
State University of Montes Claros (UNIMONTES)
E-mail: geojhtwt@gmail.com
LATTES: 5588247076231183

⁴ Scholarship holder in the Institutional Program of Scientific Initiation – BIC-JÚNIOR
State University of Montes Claros (UNIMONTES)
Email: maluugomes05@gmail.com
LATTES: 8671060744390872

⁵ Doctor in Genetics and Plant Breeding
State University of Montes Claros (UNIMONTES)
E-mail: guilherme.pereira@unimontes.br
LATTES: 5426677491589391

⁶ Doctor in Health Sciences
State University of Montes Claros (UNIMONTES)
E-mail: bacchiricardo@gmail.com
ORCID: 0000-0002-5161-0277
LATTES: 2073727271916525



junctions, such as desmosomes and gap-like junctions, which are essential for cell communication and adhesion. In comparison, the Volvocaceae algae maintained simpler adhesion mechanisms, using cytoplasmic bridges and connections with the extracellular matrix to maintain cell cohesion in the colonies, without the sophistication of the junctions observed in the animals.

Conclusion: The comparative analysis reveals that, although both the animals and the Volvocaceae algae evolved for multicellularity, the animals developed more advanced cell junctions, while the algae opted for simpler communication and adhesion strategies. This illustrates the diversity of evolutionary pathways that underpin multicellularity in different groups.

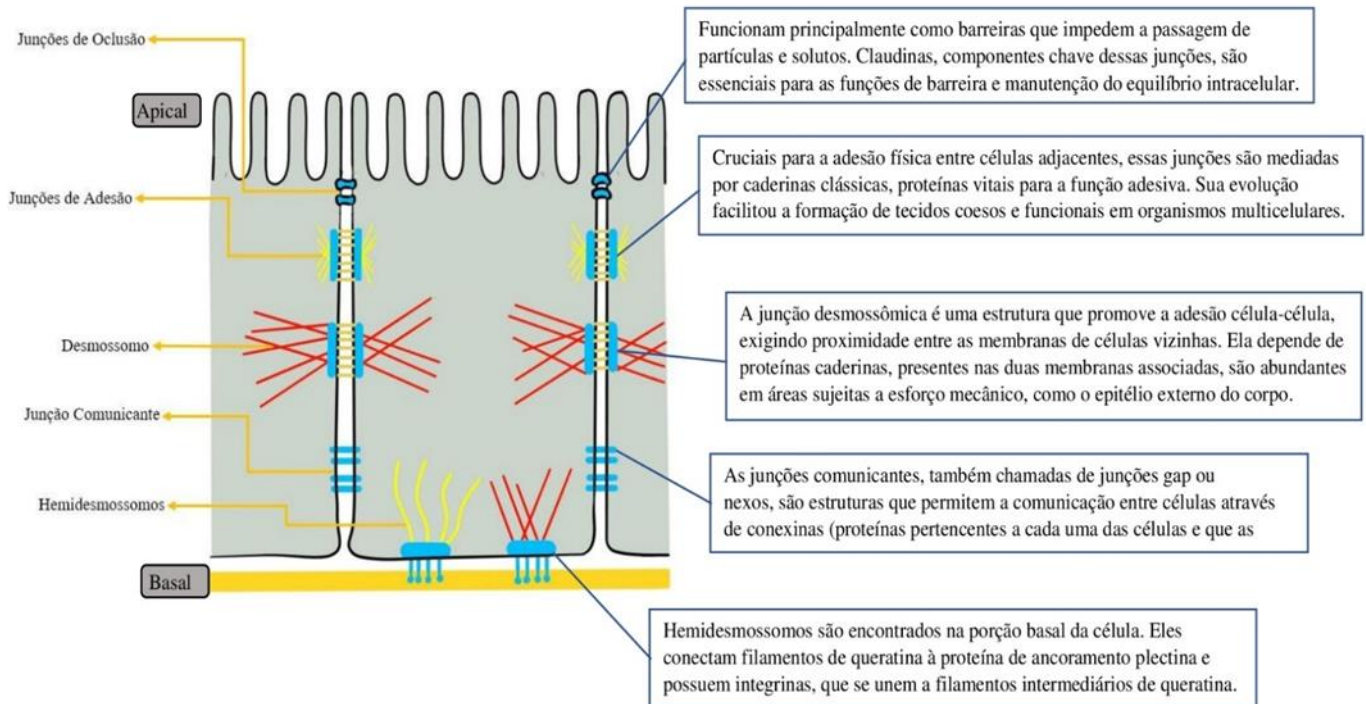
Keywords: Cell Adhesion. Intercellular junctions. Tissues. Green algae. Cytology.



INTRODUCTION

Cell adhesion is a basic property of animal cells (HARWOOD; COATES, 2004). It plays an important role in the emergence of multicellular animals (JOHNSON et al., 2013). The structure and functionality of multicellular organisms, as well as the viability of their survival, depend fundamentally on the ability to form and maintain stable cellular connections. This crucial ability allows previously autonomous cells to collaborate and operate as a unified entity, through specialized cell adhesion mechanisms. In addition to providing structural integrity, cell adhesion facilitates intercellular communication by allowing the exchange of chemical and electrical signals vital for the coordination of complex functions. This is especially evident in tissues and organs, where cellular cohesion is essential for maintaining homeostasis and response to external stimuli. A prerequisite for each origin of multicellularity was the evolution of mechanisms for stable cell-cell adhesion or fixation (ABEDIN; KING, 2010). Each junction performs a different function within the epithelium and contains a unique collection of proteins. Detailed studies of intercellular interactions in plants and animals have revealed dramatic differences, both in the types of molecules used to mediate cell adhesion and in the way these molecules interact with neighboring cells and the extracellular environment (JARVIS; BRIGGS; KNOX, 2003). Variations in the diversity and organization of junctions, as well as differences in the composition of junctional proteins, contribute to the development and differentiation of discrete tissue types and probably played a role in the evolution of new animal forms (ABEDIN; KING, 2010). Multicellular transitions in green algae, specifically in *Volvocaceae*, are elucidative when compared to single-celled organisms. These observations highlight the importance of *Volvocaceae* as a model to study these evolutionary processes (MURAMOTO et al., 2010). The evolution of *Volvocaceae* algae highlights a striking contrast to the structural and functional complexity found in animals. While animals have a characteristic epithelium that distinguishes animals from all other multicellular lineages (TYLER, 2003) facilitating adhesion and advanced communication both between cells and with the characteristic extracellular matrix, *Volvocaceae* algae use a simpler evolutionary pathway, forming physical connections between cells, such as cytoplasmic bridges resulting from incomplete cytokinesis and the transformation of cell wall components into a colonial limit (KIRK, 2005), mechanisms that allow cooperation and cellular integration within the colony, but without the sophistication of cellular connections observed in animal tissues.

Figure - Adhesion and communication cell junctions



Source: Image by the author himself, 2024.

METHODOLOGY

This study is a literature review conducted between May and July 2024, with the objective of analyzing the evolution of cell junctions and their importance in multicellularity in Volvocaceae animals and algae. The review used databases such as PubMed, Google Scholar, and Scopus, using keywords such as "Cell Adhesion", "Cell Junctions", "Tissue Evolution", "Multicellularity", and "Volvocaceae Algae", to identify relevant studies published between 2000 and 2024 in English or Portuguese. Peer-reviewed articles addressing the evolution and function of cell junctions were included, excluding narrative and editorial reviews. The selection of studies involved the screening of titles and abstracts, followed by the complete reading of the selected articles, with the extraction of relevant data on the specific cell adhesion mechanisms and their impacts on the evolution of multicellularity. The extracted data were analyzed qualitatively to identify junction patterns, comparing the evolutionary strategies adopted by Volvocaceae animals and algae.

RESULTS

The evolution of multicellularity represents a crucial milestone in the development of biological diversity. While metazoans, multicellular animals descended from some single-celled eukaryotic protozoa, developed complex tissues with specialized cell junctions that facilitate advanced adhesion and communication between cells and with the extracellular

matrix, *Volvocaceae* algae adopted a more basic evolutionary approach, relying on less sophisticated physical connections, such as cytoplasmic bridges resulting from incomplete cytokinesis (KIRK, 2005). This difference in the complexity of cell junctions can be attributed to the unique characteristics of the single-celled ancestors of each group. Animals evolved from protozoa that possessed the ability to form complex and permanent junctions, a trait that was essential for the development of highly organized and functionally differentiated multicellular organisms (TYLER, 2003). On the other hand, *Volvocaceae* algae, which also originated from single-celled ancestors, have maintained a simpler adhesion strategy that reflects their origins with cell walls, utilizing the extracellular matrix as a means to maintain cohesion and facilitate cellular interaction within colonies.

DISCUSSION

The comparison between cell adhesion mechanisms in *Volvocaceae algae* and animals highlights the adaptive variations in the evolution of multicellularity. Animals, derived from protozoa capable of establishing complex and permanent junctions, have evolved a wide range of specialized junctions, such as desmosomes, adherent junctions, and communication junctions. These junctions are vital for the structural and functional integrity of tissues, allowing both physical adhesion and the exchange of biochemical signals necessary for development and homeostasis. On the other hand, *Volvocaceae* algae demonstrate a simpler adhesion strategy, reflecting their origins with rigid cell walls. They rely primarily on an extracellular matrix to maintain cellular cohesion and facilitate communication within colonies. This matrix, although less complex than the junctions found in animals, is effective for cellular integration and cooperation, representing a preliminary stage in the transition to multicellular organisms.

CONCLUSION

The final considerations of this study highlight the diversity and complexity of evolutionary strategies in the transition from single-celled to multicellular organisms. Comparative analysis between *Volvocaceae* algae and animals reveals distinct adaptations in cell structures to face similar challenges in multicellular environments. While animals have evolved highly specialized cell junctions for communication and adhesion, *Volvocaceae* algae have chosen to maintain and adapt simpler structures for equivalent functions. This contrast underlines the importance of the extracellular matrix in algae as an essential means of adhesion and communication, emphasizing how differences in cell adhesion mechanisms shape the evolutionary trajectories of diverse lineages.



Understanding these variations provides valuable insights into the multiple pathways that multicellular life can take, reflecting life's adaptability and inventiveness in responding to evolutionary pressures.

ACKNOWLEDGMENTS


We would like to express our sincere gratitude to the Foundation for Research Support of the State of Minas Gerais (FAPEMIG) for the financial support provided through the Institutional Program for Junior Scientific and Technological Initiation – BIC-JÚNIOR/FAPEMIG. This support was fundamental for the realization of this study and for the development of research activities that made it possible to obtain the results presented.



REFERENCES

1. Abedin, M., & King, N. (2010). Diverse evolutionary paths to cell adhesion. **Trends in Cell Biology*, 20*(12), 734–742. <https://doi.org/10.1016/j.tcb.2010.08.002>
2. Harwood, A., & Coates, J. C. (2004). A prehistory of cell adhesion. **Current Opinion in Cell Biology*, 16*(5), 470–476. <https://doi.org/10.1016/j.ceb.2004.07.011>
3. Jarvis, M. C., Briggs, S. P. H., & Knox, J. P. (2003). Intercellular adhesion and cell separation in plants. **Plant, Cell & Environment*, 26*(7), 977–989. <https://doi.org/10.1046/j.1365-3040.2003.01034.x>
4. Johnson, M. S., et al. (2013). Evolution of cell adhesion to extracellular matrix. In **Evolution of Extracellular Matrix** (pp. 243–283). https://doi.org/10.1007/978-3-642-36002-2_9
5. Kirk, D. L. (2005). A twelve-step program for evolving multicellularity and a division of labor. **BioEssays*, 27*(3), 299–310. <https://doi.org/10.1002/bies.20197>
6. Muramoto, K., et al. (2010). Re-examination of the snow algal species **Chloromonas miwae** (Fukushima) Muramoto et al., comb. nov. (Volvocales, Chlorophyceae) from Japan, based on molecular phylogeny and cultured material. **European Journal of Phycology*, 45*(1), 27–37. <https://doi.org/10.1080/09670260903272607>
7. Tyler, S. (2003). Epithelium—the primary building block for metazoan complexity. **Integrative and Comparative Biology*, 43*(1), 55–63. <https://doi.org/10.1093/icb/43.1.55>

**VEGETABLE CULTIVATION AND AGROBIODIVERSITY CONSERVATION:
CHARACTERIZATION OF URBAN BACKYARDS IN VARGEM GRANDE, MA**

 <https://doi.org/10.56238/sevened2024.029-011>

Allana Tereza Mesquita de Lima¹, Raimundo Nonato Oliveira Silva², Gislanne Brito de Araújo Barros³, Alexandre Cristiano Santos Júnior⁴, Monique Moreira Moulin⁵ and Jardel Oliveira Santos⁶

ABSTRACT

The demand for unprocessed food makes urban spaces a required place for the cultivation and conservation of horticultural plant genetic resources that largely guarantee the valorization of agrobiodiversity, and are associated with a healthier diet. In this perspective, the objective of this study was to survey information on the profile of producers and to characterize the cultivation of vegetables in the backyards of the municipality of Vargem Grande, MA. The methodology used was the application of 40 questionnaires, the approach of the interviewees was made individually and randomly, the questionnaire was structured with objective questions focusing on the socioeconomic aspects of the producers, origin of the seeds, cultivated species, type of substrate, fertilization mode, phytosanitary aspects (weeds, pests and diseases) and harvest. The socioeconomic profile of vegetable producers in the urban perimeter of Vargem Grande, MA is formed mainly by women; aged 30 to 50 years; Married; with a family of more than four people; with an income of more than one, up to two salaries; with complete high school education and as the source of income work without fixed salaries. The most cultivated species are vinegar, chives, coriander, whose seeds are obtained in agricultural stores and planted directly in the soil, using cattle manure. Crops suffer interference from weeds, and harvesting is carried out in the morning and late afternoon, with the main objective of vegetable cultivation being family consumption.

Keywords: Plant Genetic Resources. Agricultural Biodiversity. North Maranhense.

¹ Msc.

National Rural Learning Service Maranhão, Central East Region;
E-mail: allana.agronoma@gmail.com

² Dr.

Federal University of Piauí, Amilcar Ferreira Sobral Campus
E-mail: jraio@ufpi.edu.br

³ Dr.

Federal Institute of Maranhão, Caxias Campus
E-mail: gislanne.barros@ifma.edu.br

⁴ Dr.

Federal Institute of Education, Science and Technology of Espírito Santo, Alegre Campus
E-mail: jdiassneto@gmail.com

⁵ Dr.

Federal Institute of Education, Science and Technology of Espírito Santo, Alegre Campus
E-mail: mmmoulin@ifes.edu.br

⁶ Dr.

Department of Biology, Center for Natural Sciences – CCN, UFPI;
E-mail: jardel_santos@ufpi.edu.br



INTRODUCTION

Population growth and the search for food products of high nutritional value, rapid growth and pleasant flavor, make vegetables an important source of food that deserves attention to be grown in urban spaces (DUARTE et al., 2022; MORETTI, 2003). However, in metropolitan regions, due to the rush of everyday life, there is a decrease in the family's time dedicated to domestic activities and especially to agricultural activities such as growing plants in their backyards (CARVALHO, 2010).

In view of this, the cultivation of vegetables in gardens in urban areas can awaken several motivations such as: a place of spiritual rest; the feeling of rescuing the agricultural culture of people who have lived some relationship with the countryside; the opportunity to obtain savings in the household budget and income generation; and, among others, the desire to democratize the use of urban space and to green the environment of cities and peripheries (MEDEIRO et al., 2021, MELO, 2011).

Valuing urban horticulture would be an option to improve the quality of life of people in urban centers, especially because Brazil has a large part of the population without an adequate diet, and idle urban spaces could have this proposal (VENZKE, 2020a; PESSOA et al., 2006).

Therefore, growing vegetables in domestic backyards ensures the origin and quality of the food consumed, in addition to contributing to the rescue and appreciation of traditional knowledge and conservation of Plant Genetic Resources. In this way, it becomes a responsible attitude that allows maintaining a habit that contributes positively to health and provides an alternative for physical activity and leisure for families and enables the recycling of organic household waste, producing healthy and low-cost food (VENKE, 2020b; CARVALHO et al., 2010).

Considering the geographical dimensions and the favorable climate for the development of agricultural activities in the State of Maranhão, it becomes a paradox, considering that the State is a major importer of vegetables and information related to the cultivation, consumption and preferences of these products are scarce in the literature of the State of Maranhão. MA.

MATERIAL AND METHODS

PLACE OF STUDY

The research was carried out in the municipality of Vargem Grande, located in the State of Maranhão, 175 km from the capital, São Luís. Located in the North of Maranhense, with a population of 49. 412 inhabitants, of which 54.1% lived in the urban area and 45.9%

in the rural area (IBGE, 2010). The climate of the region, according to the Köppen classification, is tropical (AW') with two well-defined periods: a rainy one from January to June, with monthly averages higher than 217.4 mm, and a dry one, corresponding to the months of July to December (CORREIA FILHO et al., 2011).

CHARACTERIZATION OF THE RESEARCH

The methodology used was the application of 40 questionnaires in residences in the urban area of the municipality of Vargem Grande, from February to April 2017. The interviewees were approached individually and randomly, in the morning or afternoon. The questionnaire was structured with objective questions focusing on the socioeconomic aspects of the producers, origin of seeds, cultivated species, type of substrate, fertilization mode, phytosanitary aspects (weeds, pests and diseases) and harvest.

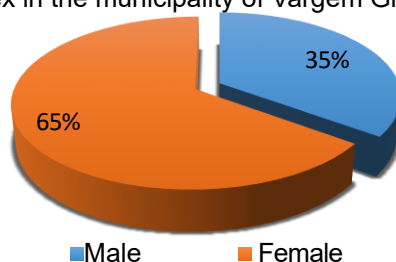
Data analysis was performed using descriptive statistics. The degree of importance of the items mentioned by consumers in each question was defined considering the modal class, and then the relative percentage frequency was obtained.

After the interviews, data were tabulated and analyzed, considering the variables above, thus allowing individuals or numerical variables to be approximated in data sets, expressed as percentages, and inferences can be made about the urban production/cultivation of vegetables in the municipality of Vargem Grande, MA.

RESULTS AND DISCUSSION

Considering the socioeconomic profile of the interviewees in the municipality of Vargem Grande-MA, the role of women was found to be preponderant as responsible for the activities of vegetable cultivation in the home gardens, 65% of the interviewees are female and only 35% are male (Figure 1). Oakley (2004) also proved the contribution of women as responsible for maintaining the practice of cultivation in their backyards in the city of Vargem Grande-MA, whether in the search for healthy foods, therapeutic activity, implementation in the family income or care for the health of their families.

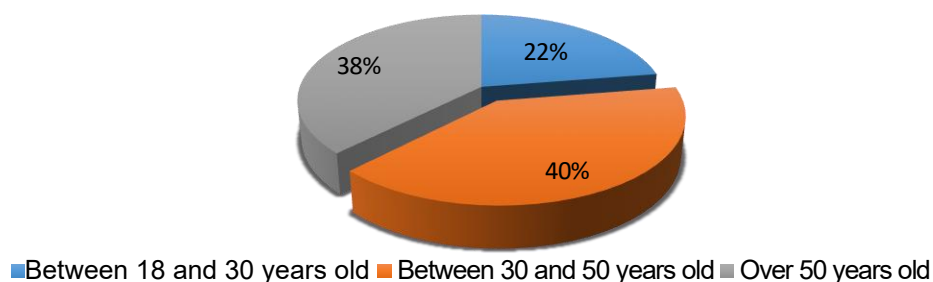
Figure 1: By sex in the municipality of Vargem Grande-MA, 2017.



The age range of vegetable producers and consumers in urban backyards in the target municipality of the study was determined between 30 and 50 years old (40% of the interviewees), considering this the main group active for production and who generally allocate time to the cultivation of vegetables, in addition to the regular activities of formal work. The second largest contribution was from individuals over 50 years of age, representing 38% of respondents; the smallest portion of the population of Vagem Grande that contributes to the production and consumption of vegetables is in the 18 to 30 age group (22% of the interviewees), which makes it an alarming data considering that parents can exert negative influences on the habit of growing in home gardens and later generations can repeat this attitude of not growing vegetables (Figure 2).

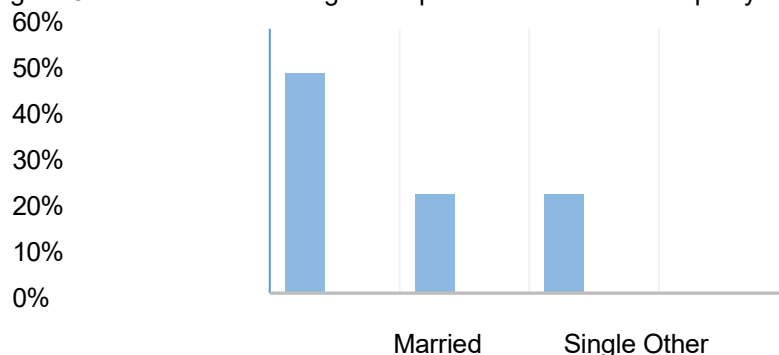
According to Carniello et al. (2010), the most significant rates of inhabitants who cultivated vegetables were found in the age group over 30 years, this fact may be linked to the issue of this generation having had greater contact with the cultivation of plants, due to having lived part of their life in the countryside (Figure 2).

Figure 2: Relative frequency of respondents by age group in the municipality of Vagem Grande-MA, 2017.



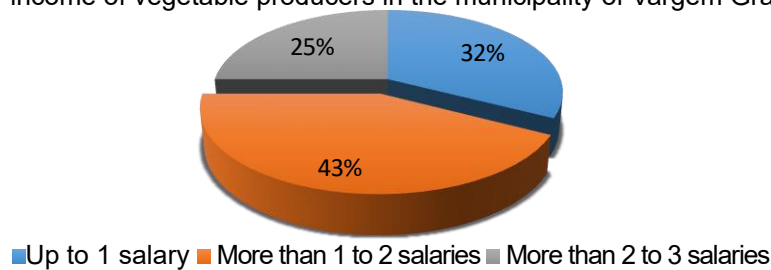
The urban perimeter of Vagem Grande, MA is very effective, as 50% of urban producers are married, while 22.5% are single, and 22.5% have another marital status, that is, widowed, divorced or just live with their partners without being legitimately married (Figure 3).

Figure 3: Marital status of vegetable producers in the municipality of Vagem Grande-MA, 2017.



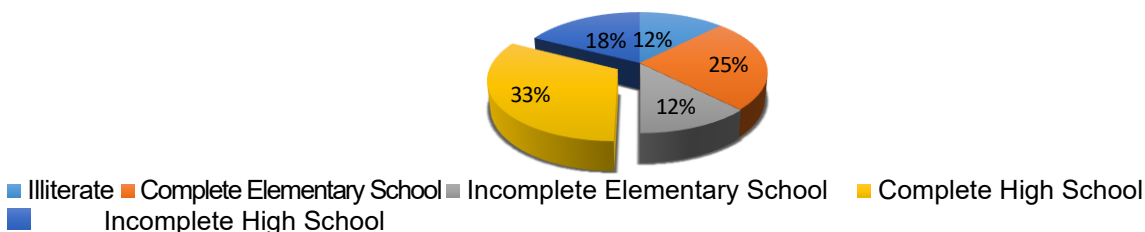
With regard to family income (Figure 4), it was found that 43% of the producers have an income of more than 1 to 2 salaries, 32% with an income of up to 1 salary and 25% have 2 to 3 salaries. It is inferred that the main activity that generates income is not enough to meet the basic needs of most of the interviewees, and the cultivation of home gardens by families in the municipality of Vargem Grande, MA aims to contribute to food and in some cases even as financial aid. As verified by Almeida (2004), describing that from the economic point of view, small production in domestic backyards has contributed to family income, through the reduction of expenses with food and health, exchange networks and eventually the transformation and commercialization of production surpluses, thus ensuring extra income.

Figure 4: Family income of vegetable producers in the municipality of Vargem Grande-MA, 2017.



Regarding the level of education of the respondents, 33% have completed high school, 25% have completed elementary school, 18% have incomplete high school, and 12% are illiterate or have incomplete elementary school (Figure 5). Literacy is indispensable for the population, as it facilitates access to information, goods and services, such as health, as well as enabling better living conditions for the person, since the individual with a higher level of education has better opportunities for employment and income (CARNIELLO, 2010).

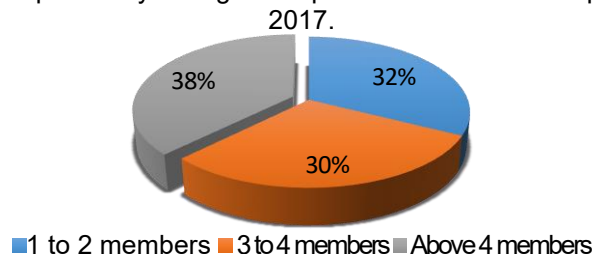
Figure 5: Education level of vegetable producers in the municipality of Vargem Grande-MA, 2017.



Regarding the number of family members, 38% of vegetable producers have a family group composed of more than 4 people, 32% is 1 to 2 people and 30% 3 to 4 people per family (Figure 6). Bezerra et al. (2008), when analyzing the home gardens in Cáceres-MT,

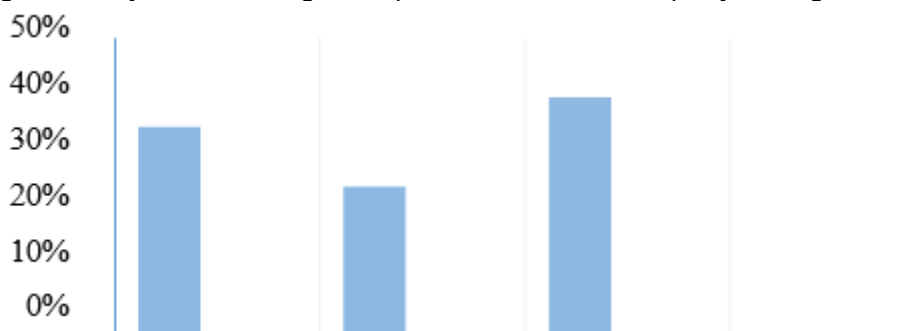
found that the families were made up of 48% adults, mostly with up to six people in the family nucleus and among them, 26.7% were children and 19.8% adolescents and 5.5% elderly, representing a family profile above the Brazilian average of 3 to 4 people per family (IBGE, 2010).

Figure 6: Number of members per family of vegetable producers in the municipality of Vargem Grande-MA, 2017.



Regarding the origin of family income, it was found that 40% of the interviewees have income from other means (self-employed, day laborers, activities related to agriculture and fishing), 35% are civil servants and 25% are retired. It is known that an individual's income determines their ability to acquire goods and services, and it is observed that a significant portion of producers have an income that is often uncertain, this reason may have motivated cultivation practices in their backyards, agreeing with Oakley (2004), who states that this activity performs important economic, cultural and agroecological functions, it also plays an important role in the financial security of households and helps to reduce dependence on fruits and vegetables from local markets (Figure 7).

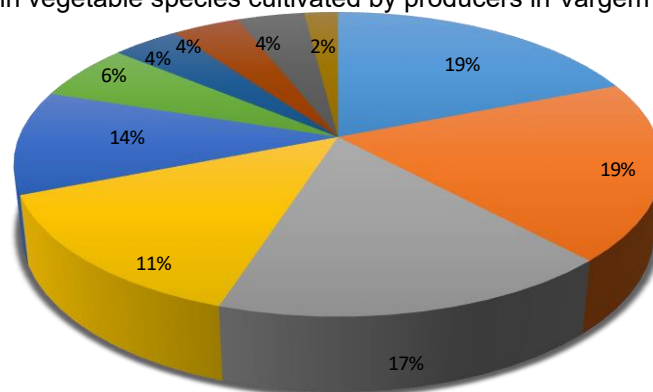
Figure 7: Origin of family income of vegetable producers in the municipality of Vargem Grande-MA, 2017.



It was observed that the most cultivated vegetable species in the urban backyards of the municipality of Vargem Grande-MA, are chives (*Allium schoenoprasum* L.) and vinegar (*Hibiscus sabdariffa*), being therefore the most followed by coriander (*Coriandrum sativum*) with 17%, after pepper (*Capsicum* sp.) with 14%, okra (*Abelmoschus esculentus*) 11%, watermelon (*Citrullus lanatus*) with 6%, then comes lettuce (*Lactuca sativa*), pumpkin (*Cucurbita* sp.) and sweet potato (*Ipomoea batatas*) with 4% respectively and watercress

(*Nasturtium officinale*) with only 2%. According to Bezerra et al. (2008), evaluating the home gardens of the families of the family health program in Cáceres-MT, they report that the most common vegetable species found were chives with 44.4%, pepper 40%, followed by coriander 33.3%, arugula 28.9% and parsley 24.4 (Figure 8).

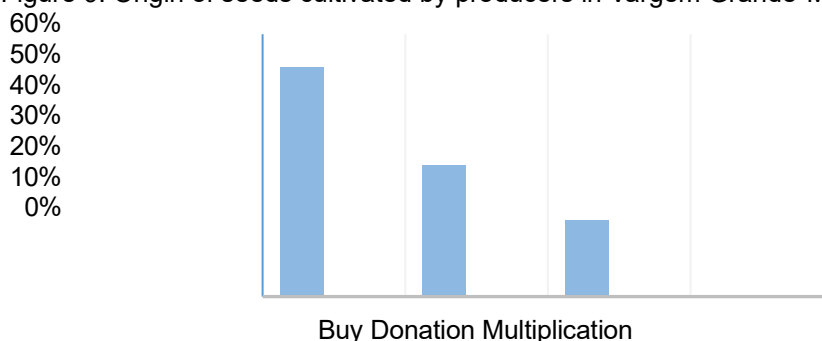
Figure 8: Main vegetable species cultivated by producers in Vargem Grande-MA, 2017.



■ cebolinha (*Allium schoenoprasum* L.) ■ coentro (*Coriandrum sativum*) ■ pimenta ■ quiabo ■ melancia (*Nasturtium officinale*) ■ alface (*Lactuca sativa*) ■ abóbora (*Cucurbita* sp.) ■ batata-doce (*Ipomoea batatas*) ■ agrião (*Nasturtium officinale*)

Regarding the origin of the seeds (Figure 9) used by the vegetable producers interviewed in Vagem Grande, MA, 52.5% of the vegetable seeds are purchased in agricultural stores in the city itself, 30% of the seeds are acquired through donations (friends or relatives) and 17.5% reuse seeds or the vegetative parts of the vegetables from previous crops (multiplication). Multiplication is done mainly in vegetable species that have difficulties to develop by other methods, or because their seeds are difficult to access (BERTALHA, 2010).

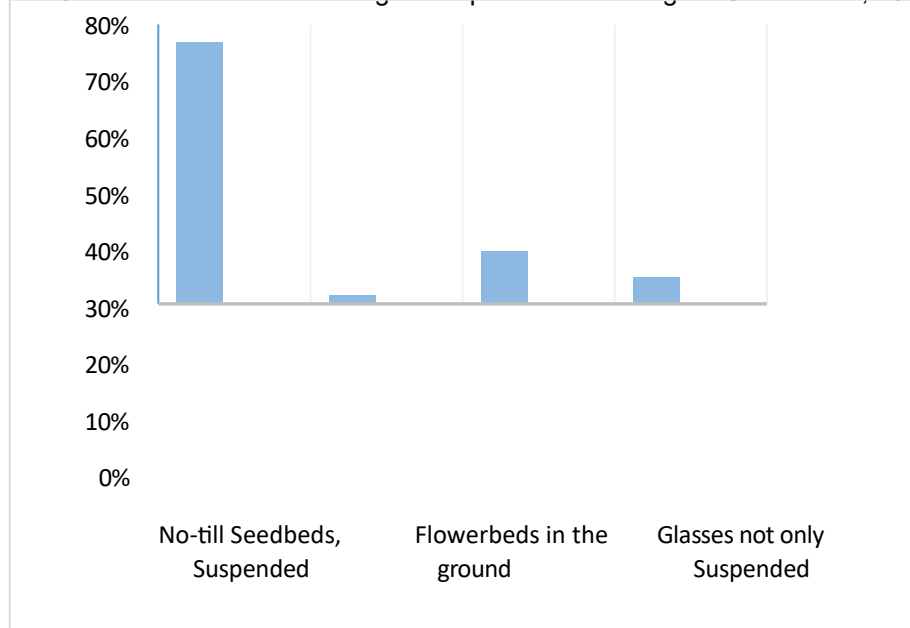
Figure 9: Origin of seeds cultivated by producers in Vargem Grande-MA, 2017.



Regarding the cultivation location adopted by vegetable producers in the municipality of Vargem Grande-MA, it was found that vegetable producing families presented specific ways of growing their vegetables (Figure 10), 75% of the interviewees grow vegetables

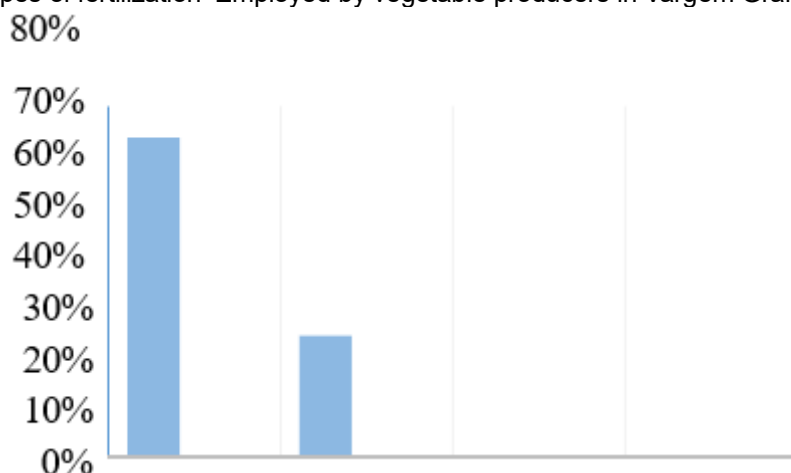
directly in the soil; 15% grow in beds on the ground; 7.5% grow their vegetables in hanging beds and 2.5% grow them in hanging pots; evidencing different cultivation methods. Bezerra et al. (2008) describe that often, in addition to growing crops in the soil, families improvised several containers for the production of vegetables, corroborating Carniello et al. (2010) by saying that any container that contains a certain volume of soil is capable of growing vegetables.

Figure 10: Place of cultivation of vegetable producers in Vargem Grande-MA, 2017.



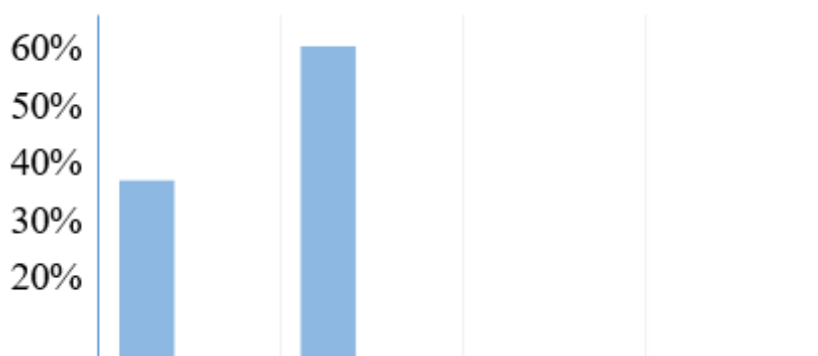
When asked about the type of fertilization applied (Figure 11), it was found that 27.5% of the interviewees use organic fertilization, and 72.5% of the producers do not use any type of fertilization, this is due to the fact that families are looking for healthier foods, seeking not to use products that may harm the family's health. Vegetable gardens provide those involved with an increase in the consumption of vegetables, making it possible to produce food at a low cost and of good quality, without the use of pesticides and chemical fertilizers, and its cultivation in backyards, especially in developing countries, such as Brazil, where a large part of the population is extremely poor, constitutes an excellent alternative to supplement the diet of poorer families (OAKLEY, 2004).

Figure 11: Types of fertilization Employed by vegetable producers in Vargem Grande-MA, 2017.



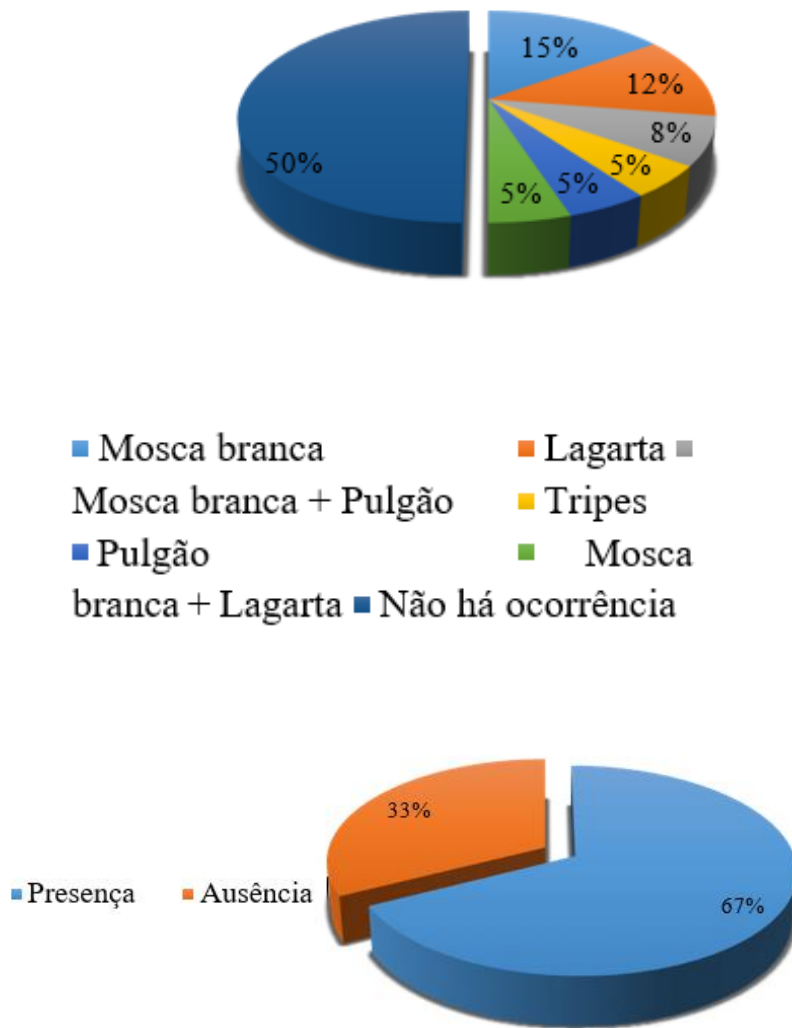
It was found that 36.4% of the vegetable producers in Vargem Grande, MA, fertilize in furrows and 63.6% use another method of fertilizer application, which generally depends on the type of fertilizer used and in which species of vegetable will be grown (Figure 12).

Figure 12: Fertilizer application method used by vegetable producers in Vargem Grande-MA, 2017.



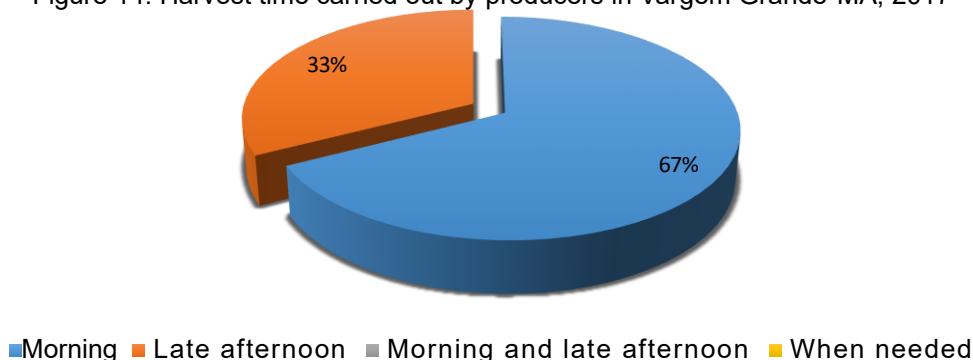
The vegetable producers in Vargem Grande interviewed provided information on the presence of pests and diseases in their crops, in which 15% stated that there is the presence of whitefly (*Bemisia* sp.) in production; 12.5% caterpillars; 5% of the interviewees reported that there is an aphid (*Aphidoidea* sp.); 5% exposed that there is the presence of thrips, 5% of whitefly + caterpillar; 7.5% showed that there is an occurrence of whitefly + aphid; 50% of the interviewees stated that there is no occurrence of pests in their crops. In terms of weeds, 67.5% report that there is a presence of these in their gardens. For Nascimento et al. (2013), in a study carried out in Uberlândia, MG, the occurrence of pests and diseases is the main problem faced by vegetable producers in that municipality (Figure 13).

Figure 13: Percentage of insect pests and weeds in the vegetable crop of Vargem Grande-MA, 2017.



Despite the recommendation that the harvest of vegetables be at the coolest times of the day, the time established by vegetable producers in the municipality of Vargem Grande-MA to carry out the harvests is very diverse, 28% of the interviewees informed that they harvest in the morning and also in the late afternoon, another 25% of the interviewees prefer the end of the afternoon to harvest, Another 25% reveal that they harvest vegetables only when there is a need, that is, when housewives are preparing meals, and only 22% prefer to harvest their crops in the morning. According to (Cenci, 2006) (Figure 14).

Figure 14: Harvest time carried out by producers in Vargem Grande-MA, 2017



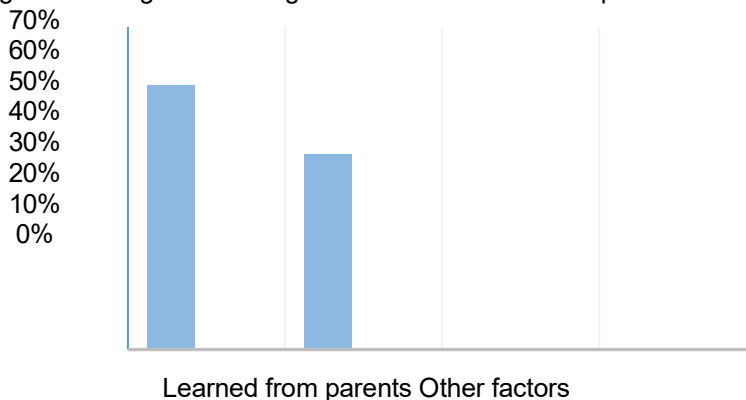
The interviewees revealed that the vegetables produced are intended for family consumption (90% of the producers), and a small part of the vegetables produced are destined for donations to relatives or are sold at the producer's own home (Figure 15).

Figure 15: Destination of vegetables produced by producers in the municipality of Vargem Grande-MA, 2017. 100%



Regarding the origin of the habit of growing vegetables, 57.5% of the interviewees responsible for growing vegetables in Vagem Grande, MA is due to the influence of parents who lived or live in the rural area and maintain the habit of planting and harvesting food species, whether horticultural species or not, noting that the parents' cultivation practice can influence the cultivation of their children (Figure 16).

Figure 16: Figure 16: Origin of the vegetable cultivation habit of producers in Vargem Grande-MA, 2017.





According to Bezerra et al. (2008), the form of cultivation and the selection of the species that will be cultivated reflect cultural expressions and the habits of a population. There were also people who did not have a family inheritance of vegetable cultivation, which represented 42.5% of the interviewees, however, other factors, such as the need to consume vegetables by medical indication, satisfaction with the consumption of vegetables or even the ornamental value attributed by some of them, contributed to the motivation for the implementation of vegetable gardens in their backyards (Figure 16).

Among the practices employed by vegetable producers in Vagem Grande, MA for seedling production, three substrate composition patterns were verified; 42.5% of the interviewees use cattle manure + soil, 30% of the interviewees goat manure + soil and 27.5% of the interviewees use an organic palm compost as substrate. According to Godoy and Farinacio (2007), the substrates used for production must provide adequate conditions for germination and good development of the root system, and must have good texture and structure, adequate pH, fertility and be free of pathogens (Figure 17).

CONCLUSION

The socioeconomic profile of vegetable producers in the urban perimeter of Vagem Grande, MA is formed mainly by women; aged 30 to 50 years, married, with a family of more than four people; with an income of more than one, up to two salaries; with complete high school education and as the source of income work without fixed salaries.

The most cultivated species are vinegar, chives, coriander, pepper and okra, whose seeds are obtained in an agricultural store and planted directly in the soil, without the use of chemical fertilization, but fertilization with cattle manure and soil is more used.

The plants are not affected by diseases and pests that limit crops, however, they are infested by weeds, and the harvest is carried out in the morning and late afternoon and the purpose of cultivation is for family consumption.

The habit of cultivating vegetable gardens in the urban perimeter is due to paternal and maternal influences that try to rescue the activities that were developed in the rural environment lived in the past.




REFERENCES

1. Almeida, D. (2004). ****Agricultura urbana e segurança alimentar em Belo Horizonte: cultivando uma cidade sustentável****. **Agriculturas**, Rio de Janeiro, 1(1), 25–28.
2. Andrade, D., Araújo, P. G. de, Abreu, V. M. de, Xavier, J. B., & Oliveira, E. R. de. (2011). ****Agricultura Urbana: Potencialidades e Desafios em Lavras - MG****. Disponível em <http://www.proec.ufla.br/conex/ivconex/arquivos/trabalho/a112.pdf>. Acesso em 13/06/2017.
3. Bertalha, M. C., et al. (2009). ****500 perguntas e respostas sobre hortaliças**** (1ª ed.). Brasília, DF: Embrapa Informação Tecnológica. Disponível em <http://www.cnph.embrapa.br/bib/saibaque/bertalha.htm>. Acesso em 21/03/2017.
4. Bezerra, K. C., Junior, S. S., Souza, E. A., & Santos, W. M. (2008). ****Horta Doméstica com famílias do Programa de Saúde da Família Vitória Régia em Cáceres - MT****. **Horticultura Brasileira**, Brasília, 26(22), 103–104.
5. Carniello, M. A. (2010). ****Quintais matogrossenses: espaço de conservação e reprodução de saberes**** (p. 15–26). Cáceres, MT: UNEMAT.
6. Carvalho, P. G. B., Machado, C. M. M., Moretti, C. L., & Fonseca, M. E. N. (2013). ****Hortaliças como alimentos funcionais****. **Horticultura Brasileira**, Brasília, 34(12), 303–304.
7. Cenci, S. A. (2006). ****Boas práticas de pós-colheita de frutas e hortaliças na agricultura familiar: Recomendações básicas para a aplicação das boas práticas agropecuárias e de fabricação na agricultura familiar**** (1ª ed., p. 67–80). Brasília: Embrapa Informação Tecnológica.
8. Correia Filho, F. L., et al. (2011). ****Projeto Cadastro de Fontes de Abastecimento por Água Subterrânea, estado do Maranhão: Relatório diagnóstico do município de Chapadinha****. Teresina: CPRM – Serviço Geológico do Brasil. Disponível em http://www.cprm.gov.br/publique/media/hidrologia/mapas_publicacoes/Atlas_Digital_RHS/maranhao/chapadinha/Rel_Diagnostico.pdf. Acesso em 19/02/2017.
9. Duarte, P., Teixeira, M., & Silva, S. C. (2021). ****A alimentação saudável como tendência: A percepção dos consumidores em relação a produtos com alegações nutricionais e de saúde****. **Revista Brasileira de Gestão e Negócio**, São Paulo, 23(3), 1–17.
10. Filgueira, F. A. R. (2003). ****Novo manual de olericultura: Agrotecnologia moderna na produção e comercialização de hortaliças**** (3ª ed., p. 464). Viçosa: UFV.
11. Godoy, W. I., & Farinacio, D. (2007). ****Comparação de substratos alternativos para a produção de mudas de tomateiro****. **Revista Brasileira de Agroecologia**, 2(2), 1095–1098.
12. Pessoa, C. C., Souza, M. de, & Schuch, I. (2006). ****Agricultura urbana e segurança alimentar: Estudo no município de Santa Maria – RS****. **Segurança Alimentar e Nutricional**, Campinas, 13(1), 23–27.



13. IBGE (Instituto Brasileiro de Geografia e Estatística). (2012/2013). ****População: Indicadores sociais: Indicadores sociais mínimos****. Disponível em <http://www.ibge.gov.br>. Acesso em 10/02/2017.
14. Junqueira, A. H. ****Tendências e desafios da distribuição de produtos hortícolas no Brasil****.
15. Medeiros, G. A., & Furuta, K. K. D. (2021). ****Agricultura urbana: Desenvolvimento de um protótipo para o cultivo de hortaliças em ambiente residencial****. **Revista Ibero Americana de Ciências Ambientais**, 12(3), 651–663.
16. Melo, P. C. T. ****Panorama atual da cadeia de produção de hortaliças no Brasil****. **Palestra**.
17. Moretti, C. L. ****Boas práticas agrícolas para a produção de hortaliças****. **Horticultura**.
18. Nascimento, A. P. B. do, Alves, M. C., Molina, S. M. G., & Ribeiro, M. C. (2013). ****Quintais domésticos e sua relação com o estado nutricional de crianças rurais, migrantes e urbanas****. **Revista Multiciência**. Disponível em Acesso em 24/06/2017.
19. Oakley, E. (2004). ****Quintais domésticos: Uma responsabilidade cultural****. **Agriculturas**, Brasília, 1(1), 37–39.
20. Reis, A., et al. (2012). ****Hortas: O produtor pergunta, a Embrapa responde**** (2ª ed.). **Revista de Preços Agrícolas**, São Paulo, 13(4), 114–115.
21. Venzke, T. S. L. (2020a). ****Experiência de agroecologia em horta urbana: Sucessos e dificuldades do cultivo de hortaliças na cobertura de prédio, Pelotas, RS****. **Revista Brasileira de Agroecologia**, 15(1), 40–46.
22. Venzke, T. S. L. (2020b). ****Experiência de agroecologia em horta urbana: Sucessos e desvantagens do cultivo de hortaliças em um terraço, Pelotas, RS****. **Revista Brasileira de Agroecologia**, 15(1), 40–46.

**COMPARATIVE STUDY OF THE MEANS OF TRANSPORT USED IN
SELECTIVE COLLECTION**

 <https://doi.org/10.56238/sevened2024.029-012>

Moises Leão Gil¹ and Giovani Manso Ávila²

ABSTRACT

This article aims to evaluate the economic and environmental efficiency and the impacts on urban traffic of models of door-to-door collection and transportation of recyclable materials, through the analysis of the three models in execution in Brazil, namely: compactor truck, box truck and unmanned combustion engine vehicle, associated with a support point. Due to the scarce literature found related to the transportation of selective collection, this analysis intends to contribute as a subsidy to the decision-making by the agencies and institutions responsible for the management of municipal solid waste and in the planning of the best means of transportation for this purpose, taking into account the local characteristics. The work corroborates the thesis that adequate planning for the optimization of resources, efficiency and quality in the provision of services is fundamental for the implementation and maintenance of selective collection programs, in order to comply with the National Solid Waste Policy.

Keywords: Transportation. Vehicles. Solid Waste. Selective Collection.

¹ M.Sc.

Master in Urban Engineering from the Urban Engineering Program / UFRJ

Institution: UFRJ / Urban Engineering Program

Email: moiseslgil@hotmail.com

² Degree and area: Doctor in Transportation Engineering / Federal University of Rio de Janeiro / Polytechnic School / Urban Engineering Program

Institution: Federal University of Rio de Janeiro / Associate Professor / Polytechnic School of UFRJ

E-mail: giovani@poli.ufrj.br

INTRODUCTION

With the growing population increase, a result of community life, and the voracious occupation of spaces, evidenced in an unbridled way from the eighteenth century onwards with the industrial revolution, one of the most serious environmental problems emerges: the constant increase of solid waste in cities. Based on this premise, garbage could be considered as one of the oldest focuses addressed in works of a social, economic and environmental nature.

The problem of urban garbage stemmed from the association between the precarious or total lack of adequate infrastructures in cities and the lack of ecological awareness, leading to a situation of chaos (SILVA et al, 2001).

Within basic sanitation, which is composed of water supply, sewage, rainwater and solid waste management systems, there seems to be a greater importance for the water supply system, relegating the urban sewage collection and treatment system to the background, followed by urban cleaning, solid waste management and urban rainwater management.

The problems caused by the inadequate disposal of solid waste are related to visual pollution, pollution of water bodies and groundwater, atmospheric pollution, degradation of ecosystems, diseases related to public health, clogging of rainwater drainage galleries and social problems.

In Brazil, the unbridled population growth also led to an increase in the number of workers, but without enough jobs to meet this demand, exposing unemployed people to inhumane situations, finding in garbage a way to support themselves and their families (MARTINS, et al., 2004).

This issue makes it essential to address the issue, both in the legislative sphere and in public policies. Bringhenti (2004) draws attention to the fact that the disposal of solid waste means a threat to public health and the environment. In this sense, it is necessary to have good planning for its management, based on knowledge of sanitary engineering, economics, administration, and other related areas, using more appropriate management techniques and avoiding high costs that make its execution unfeasible.

Thus, the present study intends to relate the adequate transport infrastructure in selective collection to the characteristics of each city, through the comparison of the costs involved, capacity and scope of each of the infrastructures analyzed.



RECYCLING AND SELECTIVE COLLECTION

Financial crisis, limitation of natural resources, associated with the damage to the environment and public health, due to the inadequate disposal of waste, made society aware of the need for recycling. As a result, the return of recyclable waste to the production chain as raw material for the production of new products was established due to occasional needs, such as in times of crisis and scarcity, experienced during the last two great wars (WELLS, 1995 apud PERIOTTO, 2013).

The first records of selective collection and recycling programs date back to the period of the Second World War, when European countries and the United States campaigned for the population to dispose of metal and paper scrap for recycling, in order to supply the war industry with raw materials (SANTOS, 1995 apud RIBEIRO, 2000).

Martins (2002), apud Besen (2006), points out that in developed countries the management of solid waste went through 3 specific moments: the first, during the 70s, centered on final disposal; the second, during the 80s, in reduction and recycling; and the third, after the 90s, with the establishment of laws and standards for the implementation of selective collection, recycling and energy use.

In Brazil, with the advent of law 12.305/2010, National Solid Waste Policy, all municipalities in the federation are obliged to close their dumps and dispose of their waste, which cannot be recycled, to landfills. The law also provides for the implementation and progressive expansion of municipal solidary selective collection with the participation of organizations of recyclable material collectors. Solidary selective collection is an environmental management instrument that must be implemented with a view to the recovery of recyclable material for recycling purposes (BRASIL, 2010).

According to Ribeiro and Besen (2011), selective collection plays a fundamental role in the integrated management of solid waste in several ways: it promotes the practice of segregating solid waste directly in the generator for later use, encourages the practice of actions to reduce consumption and waste through environmental education, promotes the socioeconomic inclusion of recyclable material collectors and provides a better organic waste for composting.

However, one of the main bottlenecks for recycling to become efficient is the collection stage of recyclable materials. Due to planning and the fact that recyclable materials have a high volume in relation to their weight, collection often ends up not being economically viable.

Grimberg and Blauth (1998) point out that in Brazil there are two basic modalities of selective collection: door-to-door, where cleaning agents and/or environmental agents walk

the streets together with the collection vehicle, collecting recyclable materials previously separated and arranged in front of homes and commercial establishments; and the Voluntary Delivery Points (PEV's), in which the population travels to strategically defined locations to dispose of the segregated material at home. However, the same authors observe that it is difficult to measure the community's adherence to selective collection through PEV's, as well as the risk of vandalism that can present itself from the deposit of organic waste and/or dead animals in the collectors to their damage and destruction.

As for door-to-door selective collection, although it requires greater infrastructure and presents higher costs for collection and transportation, it provides greater convenience to the population, which results in greater participation of society in selective collection programs, in addition to enabling better control and inspection by the bodies responsible for the execution of the service, allowing the taking of specific measures to have greater popular participation (GRIMBERG and BLAUTH, 1998).

OBJECTIVES

This article aims to evaluate the economic and environmental efficiency of models for the collection and transportation of recyclable materials door-to-door through the analysis of the three models in execution in Brazil, namely: compactor truck, box truck and unmanned combustion engine vehicle associated with a support point. This last model, which is based on the unmanned combustion engine vehicle associated with a support point, has recently been used by small, medium and large cities, such as the municipality of Caetité/BA, Jacobina/BA, João Monlevade/MG and Belo Horizonte/MG.

BRAZIL AND SELECTIVE COLLECTION

Selective collection is still a recent theme in Brazil, and most of the initiatives and actions in this regard, still informal, carried out by organizations of recyclable material collectors. In the country, only 16.66% of the 5,561 municipalities are operating selective collection programs, which corresponds to 927 experiences implemented and in operation, as shown by a survey on the subject, developed by the Business Commitment to Recycling (CEMPRE, 2014).

The Ministry of Cities, through the National Sanitation Information System (SNIS), annually publishes the "Diagnosis of Urban Solid Waste Management", which in its thirteenth edition for the year 2014, points out that out of a total of 3,765 municipalities surveyed, 1,322 reported carrying out any type of selective collection, either by PEV or door-to-door. However, an evaluation of the scope of selective collection in these

municipalities was not made, and it could be only in one location, in part of the municipality, or in the entire city. Of these 1,322 municipalities, 1,178 said that they carry out door-to-door selective collection, serving a total of 52 million inhabitants, a value much higher than that presented by CEMPRE (2014), which presented the number of 28 million people served with selective collection in the country.

VEHICLES USED

Selective collection can be carried out with the use of various equipment, from animal/human traction vehicles, to open-body trucks and compactors, which are capable of reducing the initial volume of waste by one third (Roth *et al.*, 1999). ABNT (1993), through NBR 12980, presents two of these vehicles: Trucks with non-compaction bodywork, which are rectangular metal bodies with rear and/or side opening and their unloading occurs by tipping; and Truck with compactor, which are vehicles with closed bodies, equipped with mechanical elements that enable the compaction of the material inside, and its unloading can be done by ejection or tipping.

Recently, new technologies have been developed to reduce impacts on traffic and the environment, reduce costs and optimize the process of selective collection of recyclable materials. In 2007, through the renewable energy program of the Itaipu Binacional Hydroelectric Power Plant - ITAIPU, an unmanned electric vehicle for selective collection powered by tug was launched, with a capacity of up to 1000 kg and low operating speed, reaching up to 8 km.h⁻¹ (LAZZARI, 2010). However, despite having a range of 30 km with a full charge, the vehicle was not very well accepted by waste pickers' organizations who, due to their experience of use, claimed that the vehicle loses power at the end of the load, running out completely before reaching the base again, causing great difficulties for its locomotion, because empty, It weighs around 400 kg and there are no points for easy refueling.

Around 2009, the company TECSCAN, created the "Collector". It is an unmanned combustion engine vehicle powered by gasoline, with a cargo cage with a capacity of approximately 3 m³ and up to 500 kg. The speed of this vehicle is 4 and 6 km.h⁻¹ (average speed of an average person walking) and average autonomy of 30 km.l⁻¹ (TECSCAN, 2017). The possibility of refueling with gasoline turned out to be a differential in relation to ITAIPU's electric vehicle, as it is possible to carry an extra tank of fuel next to the vehicle, or refuel it at the nearest station, being able to return to the base without major problems.

METHODOLOGY

Taking into account that there are few studies in the literature that address the transport of selective collection in Brazil, the present work presents an exploratory research of a qualitative-quantitative nature, based on the information collected from the means of transport used to carry out this collection, focusing on the truck without compaction (cage or box body), compactor truck and unmanned vehicle with combustion engine associated with a support point - Ecopoint (photos 1 and 2).

Photos 1 and 2: Ecopoint and waste pickers with mechanized collection cart in the municipality of Jacobina/BA.



Source: The author himself (2016).

It is important to mention that due to the difficulty of obtaining data, the areas of influence chosen are not the same for each case, which can generate some differences mainly in costs and routes, however, the intention of the work is to show the characteristics of the vehicles and the form of collection, observing the different case studies and areas chosen

A survey of primary and secondary data was carried out, later, the parameters to be analyzed were defined, such as; scope of collection, taking into account the capacity of the equipment and the size of the routes; occupation of spaces on public roads, with a view to the impacts on traffic resulting from different means.

The scope of the collection was defined based on the routes and capacities of the devices of the means of transport analyzed. For this, data collection from three waste pickers' organizations and the Municipal Company of Urban Cleaning – COMLURB of the municipality of Rio de Janeiro/RJ were evaluated. Each one operates with a vehicle studied, namely: Cooperativa Popular Amigos do Meio Ambiente Ltda – COOPAMA, which receives the material from the selective collection of COMLURB, made with the use of a truck with a compactor; Association of Cleaning and Recyclable Materials Workers of João Monlevade – ATLMARJOM, which carries out selective collection in the municipality of João

Monlevade/MG with the use of a truck with a trunk body; Cooperative of Recyclable Material Collectors Recicla Jacobina, which operates selective collection in Jacobina/BA using the unmanned vehicle with a combustion engine.

The information regarding the routes of the vehicles was obtained in two ways:

- 1- Through the "My Route" application, available free of charge for Smartphone devices; used for the data of the unmanned vehicle with combustion engine of Recicla Jacobina and the box truck of ATLMARJOM. The routes of each vehicle were measured for a period of one week and the material collected during the measured route was subsequently weighed;
- 2- Through the form "Daily Bulletin of Operations", to obtain the route data of the compactor truck of the Municipal Company of Urban Cleaning – COMLURB, which destines the material to COOPAMA. In this form, the driver informs the schedules and mileage of the vehicle in the following situations: when leaving the garage, at the first and other collection points (roads and/or specific establishments), at the last collection point, when arriving at the road scale and when depositing it at COOPAMA.

Figure. 1 and 2: Routes of the ATLMARJOM truck (17.1 km) and the unmanned vehicle with combustion engine of Recicla Jacobina (3.6 km), respectively, measured with the "my route" application.



Source: The author himself (2016).

Regarding the capacity of storage devices, it should be noted that according to the Ministry of the Environment (2012), the apparent density of recyclable materials is 0.25 ton.m⁻³, while for mixed and compacted waste, the value of 0.6 ton.m⁻³ is attributed.

Information regarding capacity was obtained from the manufacturers, through quotations, access to their electronic address, and data collected from the waste pickers' organizations monitored in this study. Thus, the values of maximum capacity were compared with values collected from the organizations of waste pickers studied. Another aspect considered was the depreciation of vehicles over a period of one year.

The operating costs were calculated using the simulation spreadsheet of the operating costs of road cargo transport, made available by the National Land Transport Agency – ANTT, which was prepared based on ANTT Resolution No. 4,810, of August 19, 2015 (ANTT, 2015). The spreadsheet divides operating costs into two: fixed costs and variable costs.

Fixed costs have as parameters the costs of the truck and device, the depreciation of the vehicle and equipment, monthly remuneration of the capital invested in the vehicle, cost of the driver's labor (based on the salary floor of the category), taxes and vehicle insurance. Variable costs take into account the costs of maintenance, fuel, lubricants, washing, and tires.

In the same way, the cost of the labor force of the collection agents was analyzed in parallel, where the composition of the team varies according to the means used, being considered as follows in the present study: truck with compactor and truck with box body composed of a driver and three collection agents; Unmanned vehicle with combustion engine, two collection agents.

The ANTT spreadsheet was filled with data collected in the field and market research, calculated based on the mileage driven per month, obtained by measuring the routes, also taking into account the time spent per route. It is worth remembering that due to the different capacities, there is a difference in the distance traveled between the different means.

RESULTS

The results of the information collected from each of the three media presented will be presented below. Table 1 presents a comparison of the dimensions and capacities surveyed for each means of transport.

Table 1: Comparison of the dimensions and capacities surveyed for each means of transport studied.

		Veículo		
		Caminhão compactador	Caminhão sem compactação	Veículo motorizado não tripulado
Capacidade	Peso nominal (kg)	9.000	4.860	500
	Peso aparente (kg)	3.170	500	200
	Volume (m ³)	15	26	3
Dimensões	Comprimento (m)	7,9	7	1,5
	Altura (m)	3,4	3,4	2
	Largura (m)	2,5	2,1	1,2
Tempo médio por rota		6h37m	1h51m	2h27m
Km médio rodado por rota		76,0	19,5	4,1

Fonte: Elaborada pelo próprio autor (2016).

Regarding the capacity of each equipment, the information obtained by the manufacturers of the compactor, truck and unmanned motor vehicle was 9,000 kg, 4,860 kg and 500 kg, respectively. However, the values obtained from the waste pickers' organizations showed an average of 3,140 kg per trip of the compactor, 700 kg per trip of the truck and 200 kg per trip of the unmanned motor vehicle.

Regarding the time per trip, the compactor truck takes in the range of 8 hours per trip, resulting in only one trip per day. The trips of the box truck and the unmanned motor vehicle last in the range of 2 hours, allowing 2 to 3 trips to be made per day. Table 2 presents a comparison of the fixed and variable costs for each means of transport used.

Table 2: Comparison of fixed costs and variable costs for each means of transport used.

		Veículo		
		Caminhão compactador	Caminhão sem compactação	Veículo motorizado não tripulado
Custos Fixos	Veículo	R\$ 177.500,00	R\$ 140.000,00	R\$ 16.700,00
	Depreciação*	R\$ 44.375,00	R\$ 35.000,00	R\$ 4.175,00
	Dispositivo de armazenamento	R\$ 70.000,00	R\$ 14.800,00	R\$ -
	Depreciação dispositivo	R\$ 17.500,00	R\$ 3.700,00	R\$ -
	Motorista	R\$ 3.562,48	R\$ 3.562,48	R\$ -
	Tributos	R\$ 7.290,38	R\$ 5.790,38	R\$ -
	Seguro veículo	R\$ 6.100,00	R\$ 4.500,00	R\$ -
	Seguro dispositivo	R\$ 3.000,00	R\$ -	R\$ -
	Custo fixo mensal	R\$ 15.594,15	R\$ 8.538,98	R\$ 444,36
Custos Variáveis	Manutenção/Km	R\$ 0,96	R\$ 1,48	R\$ 1,77
	Combustível/km	R\$ 1,61	R\$ 0,82	R\$ 0,11
	Lubrificante/km	R\$ 0,02	R\$ 0,02	R\$ -
	Lavagem/km	R\$ 0,20	R\$ 0,20	R\$ -
	Pneu/km	R\$ 0,22	R\$ 0,20	R\$ 0,40
		Custo variável por km	R\$ 3,01	R\$ 2,72

Source: Prepared by the author himself (2016).

The fixed costs used as parameters are: vehicle, storage device, depreciation, driver, taxes and insurance. It can be evidenced that the unmanned motor vehicle does not present storage device and driver costs, as it already comes with the storage device installed and it is not necessary to have a qualified professional to drive the vehicle, as shown in photo 1, unlike trucks, where the storage device is not a factory option and needs to be purchased separately from another manufacturer. The variable costs considered were: maintenance per kilometer, fuel per kilometer, lubricant per kilometer, washing per kilometer and tire per kilometer.

Regarding fuel consumption per month, the data collected from the 3 waste pickers' organizations presented the following figures: the truck with a compactor travels in the range of 76 km.trip-1; the truck with a trunk travels around 19.5 km.trip-1; and the unmanned motor vehicle travels around 4.1 km.trip-1.

Considering a monthly working day of 24 days, which compactor truck makes only one trip per day, while the box truck and the unmanned motor vehicle make 3 trips per day, we will have the compactor truck traveling 1824 km.month-1, the trunk 1404 km.month-1

and the unmanned vehicle km.month-1. It should be noted that the unmanned motor vehicle starts the collection when leaving the Ecopoint, while the compactor truck travels approximately 76 km to carry out the collection, dispose of the material to the cooperatives and return to the garage.

The information obtained from manufacturers and waste pickers' organizations indicates an average consumption of kilometers per liter of the compactor truck of 2 km.l-1, the box truck of 4 km.l-1 and the unmanned motor vehicle of 35 km.l-1. The values of the fuels found were R\$ 2.79 for diesel and R\$ 3.79 for gasoline.

Table 3 presents a simulation with the total costs per ton, per 10 kilometers and per trip. It is verified that the unmanned motor vehicle has the lowest costs in all three cases, followed by the compactor truck and the non-compaction truck.

Table 3: Simulation of total costs per ton, 10 kilometers driven and trips.

		Veículo		
		Caminhão compactador	Caminhão sem compactação	Veículo motorizado não tripulado
Custos Totais	Tonelada	R\$ 208,49	R\$ 418,94	R\$ 70,96
	10 Km	R\$ 86,14	R\$ 150,39	R\$ 35,48
	Viagens	R\$ 654,65	R\$ 293,26	R\$ 42,58

Source: Prepared by the author himself (2016).

The unmanned motor vehicle presented R\$ 70.96.ton-1, for each 10 kilometers R\$ 35.48.km-1 and R\$ 42.58.trip-1. Regarding the cost per ton, the compactor truck presented the value of R\$ 208.49.ton-1 and the truck without compaction R\$ 418.40.ton-1. As for the costs for each 10 kilometers, the compactor truck showed the value of R\$ 86.14.km-1 and the box truck R\$ 150.39.km-1. When analyzing the simulation of costs per trip, we see that the truck without compaction is less expensive than the compactor truck, with a cost of R\$ 293.26 per trip and the compactor R\$ 654.65 per trip.

DISCUSSIONS

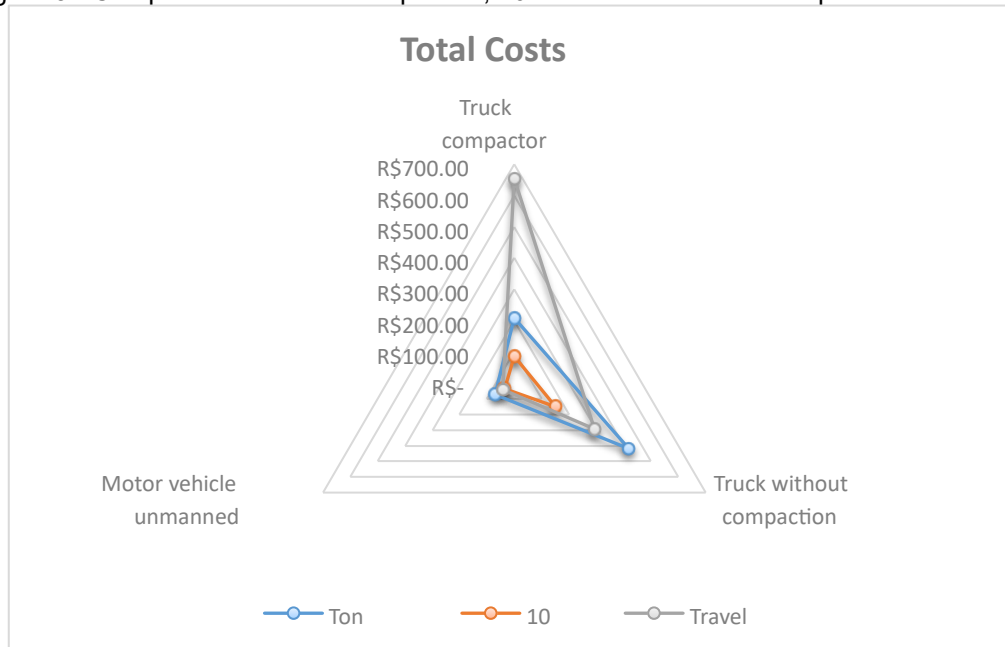
As shown in Table 1, the vehicle with the compactor device had a higher collection capacity, with values around 3,140 kilograms per trip, followed by the truck with a trunk body, with 500 kilograms, and an unmanned motor vehicle, with 200 kilograms per trip. However, it is worth noting that according to data from COOPAMA, the loss rate of

recyclable material reaches 10.5% due to the compaction of the material. It is also noted that none of the devices were able to reach their maximum load capacity, and volume is a limiting factor for collection planning.

It is also observed that trucks, due to their size, cause significant negative interference in traffic, which does not happen with unmanned motor vehicles; which has a width equivalent to half that of trucks, with the possibility of partially climbing the curb, not causing significant impacts on traffic. It is also important to note that trucks have certain restrictions, such as the impossibility of accessing specific areas, difficulties in maneuvering on dead-end streets, and restricted circulation in some regions.

Regarding the total cost, table 3 and figure 3 present the simulation of the values of the three media studied.

Figure 3 - Comparison of total costs per ton, 10 kilometers driven and trip of the three means.



Source: Prepared by the author himself (2016).

As previously noted, the unmanned motor vehicle has lower costs in the simulations. However, in general, when analyzing the total costs, it is observed that the capacity and, consequently, scope of the compactor truck's collection ends up being higher when compared to the other means, being six times higher than the box truck and fifteen times higher than the unmanned motor vehicle.

It is verified that the highest cost is mainly due to the costs of equipment and maintenance and fuel costs, considering that the truck does in the range of 2 km.l-1, the box truck 4 km.l-1 and the unmanned vehicle 35 km.l-1.

Taking into account the differences in the study areas as well as other parameters involved in the transportation of selective collection, it is difficult to indicate only one of the vehicles as the best means of transportation, which is not the focus of this work, however, the evaluation of each case with the purpose of adaptation to other regions, represents a support for future planning.

FINAL CONSIDERATIONS

Adequate planning aimed at optimizing resources, efficiency and quality in the provision of services are fundamental for the implementation and maintenance of selective collection programs, in view of compliance with the National Solid Waste Policy.

An analysis of factors related to local aspects, population density, income and gravimetry is essential to define the most appropriate means to be used.

Although it presents lower costs and less impact on urban traffic, the unmanned vehicle with a combustion engine provides a low storage capacity, making it necessary to have a local support point (Ecopoint) for transshipment of the collected material, being a good option for regions of difficult access for trucks and more horizontal urban occupation areas, but not being a good alternative for a region of high population density.

The box truck, despite having significant costs, has an average transport capacity and a relatively lower maintenance cost than the compactor, in addition to having a greater autonomy, which can represent an alternative in regions with higher population densities, however, it is important to analyze traffic conditions.

The compactor vehicle presents better efficiency in relation to the collection coverage, being considerably superior to the other means studied. However, the use of this means requires high investments, in addition to presenting high operational costs, both in terms of fuel consumption and maintenance, as also pointed out by MILANEZ (2002).

The use of the compactor truck presents itself as a good alternative for regions with high population density, where there is a high generation of waste per area. However, according to COOPAMA data, where the loss of this material reaches 10.5%, more precise analyses are needed with regard to the quality in which this material arrives at the sorting areas, because the premise of selective collection is the return of this product to the production chain, mitigating the negative impacts caused by inadequate management and incorrect disposal of these materials in the environment, thus reducing the extraction of raw materials from nature.

Thus, the present study is important in supporting information for decision-making by the agencies and institutions responsible for municipal waste management in planning, in




order to determine which would be the best option of means of transport to be used according to local characteristics.

REFERENCES

1. ABNT. (1993). *NBR 12.980 – Coleta, varrição e acondicionamento de resíduos sólidos urbanos: Terminologia*. Rio de Janeiro.
2. ANTT. (2015). Resolução N° 4.810, de 19 de agosto de 2015. Estabelece metodologia e publica parâmetros de referência para cálculo dos custos de frete do serviço de transporte rodoviário remunerado de cargas por conta de terceiros. Disponível em: <http://www.antt.gov.br/index.php/content/view/41427/ANTT_publica_metodologia_par_a_calculo_dos_custos_de_frete_do_transporte_rodoviario.html>. Acesso em: 27 ago. 2019.
3. Besen, G. R. (2006). *Programas municipais de coleta seletiva em parceria com organizações de catadores na Região Metropolitana de São Paulo: Desafios e perspectivas* (Tese de doutorado, Universidade de São Paulo).
4. DNIT. (2010). *IPR-740. Manual de projeto geométrico de travessias urbanas*. Publicação.
5. Brasil. (2012). *Planos de gestão de resíduos sólidos: Manual de orientação—Apoiando a implementação da Política Nacional de Resíduos Sólidos: Do nacional ao local*. Ministério do Meio Ambiente.
6. Brasil. (2010). *Política Nacional de Resíduos Sólidos: L.E.I. 12.305/2010* (Vol. 2). Brasília.
7. Bringhenti, J. (2004). *Coleta seletiva de resíduos sólidos urbanos: Aspectos operacionais e da participação da população* (Tese de doutorado, Universidade de São Paulo).
8. CEMPRE. (2014). *Pesquisa CICLOSOFT*. Disponível em: <<http://www.cempre.com.br>>. Acesso em: 27 ago. 2019.
9. Cunha, V., & Caixeta Filho, J. V. (2002). Gerenciamento da coleta de resíduos sólidos urbanos: Estruturação e aplicação de modelo não-linear de programação por metas. *Gestão & Produção, 9*(2), 143–161.
10. Grimberg, E., & Blauth, P. (1998). Coleta seletiva: Reciclando materiais, reciclando valores. In *Coleta seletiva: Reciclando materiais, reciclando valores*. Pólis.
11. Lazzari, M. A. (2010). *Avaliação ambiental de um veículo elétrico coletor de resíduos sólidos urbanos recicláveis* (Tese de doutorado, Universidade Tecnológica Federal do Paraná, Curitiba).
12. Martins, L. A. de T. P., et al. (2004). Cooperativa de trabalho: Experiência do reciclador solidário de Piracicaba. In *Cooperativa de trabalho: Experiência do reciclador solidário de Piracicaba*. UNIMEP.
13. MCIDADES.SNSA.SNIS. (2016). *Diagnóstico do manejo de resíduos sólidos urbanos – 2014*. Brasília. Disponível em: <<http://www.snis.gov.br/diagnostico-residuossolidos/diagnostico-rs-2014>>. Acesso em: 27 ago. 2019.
14. Milanez, B. (2002). *Resíduos sólidos e sustentabilidade: Princípios, indicadores e instrumentos de ação* (Tese de doutorado, Universidade Federal de São Carlos).

15. Periotto, A. J., & Furlan, L. A. (2013). Um estudo sobre a gestão de resíduos sólidos no município de Cidade Gaúcha–PR. *Caderno de Administração, 20*(2), 66–82.
16. Ribeiro, H., & Besen, G. R. (2011). Panorama da coleta seletiva no Brasil: Desafios e perspectivas a partir de três estudos de caso. *InterfacEHS: Revista de Saúde, Meio Ambiente e Sustentabilidade, 2*(4).
17. Lima, S. do C., & Ribeiro, T. F. (2000). A coleta seletiva de lixo domiciliar: Estudos de casos. *Caminhos de Geografia, 2*, 50–69.
18. Roth, B. W., Isaia, E. M. B. I., & Isaia, T. (1999). Destinação final dos resíduos sólidos urbanos. *Ciência e Ambiente, 18*(1), 25–40.
19. Schirmer, W. N., et al. (2009). Avaliação de implantação da coleta seletiva em municípios de pequeno porte–Estudo de caso da cidade de Irati (PR). *Tecno-Lógica, 13*(1), 46–51.
20. Silva, E. da C., et al. (2001). Lixo x sobrevivência: Uma análise socioeconômica e ambiental do. In *Congresso Brasileiro de Engenharia Sanitária e Ambiental, 21.* Feira Internacional de Tecnologias de Saneamento Ambiental, 4. ABES, 1–10.
21. Tecscan. Recibel. Equipamentos industriais para reciclagem. Produtos. Coletortec. Disponível em: <<http://www.tecscan.com.br>>. Acesso em: 27 ago. 2019.

INCLUDE LABORATORY: CONTRIBUTIONS TO THE SCHOOL EDUCATION OF STUDENTS FROM THE MUNICIPAL EDUCATION NETWORK OF LINHARES-ES

 <https://doi.org/10.56238/sevened2024.029-013>

Ana Carolina Rodrigues Nunes de Souza¹, Marlúcia Carriço dos Santos² and Marcia Perini Valle³

ABSTRACT

The motivation for this investigation is due to the implementation of a social inclusion project for public school students, through digital technologies, on the premises of Faceli (the researchers' place of academic activities). This study aims to analyze the contributions of the "Include Laboratory" project to the school education of students from the municipal school network of Linhares-ES enrolled in this project. The methodology adopted involves a qualitative approach, with interviews with the former president of the Faceli Foundation, the facilitator and the monitor who develop the activities in the Include Laboratory, and a focus group with students who attended the project. The results indicate that this laboratory contributes to the school education of students regarding the appropriation of essential skills in the use of technologies, connection with school content and realization of projects in a collective way. Thus, the experiences lived in the course promote the digital and social inclusion of the participating students.

Keywords: Digital inclusion. Education. Technologies. Faceli. Linhares-ES.

¹ Undergraduate student in Pedagogy
Training institution: Faculty of Higher Education of Linhares (Faceli)
E-mail: ana.carol.rodrigues2001@gmail.com

² Undergraduate student in Pedagogy
Training institution: Faculty of Higher Education of Linhares (Faceli)
E-mail: marluciacarrico91@gmail.com

³ Master in Education, Administration and Communication
Educational institution: Universidade São Marcos - SP
E-mail: marciapvalle@gmail.com



INTRODUCTION

The concept of inclusion is a central theme in education because it promotes the participation and involvement of all students, regardless of their individual abilities, needs, or characteristics. In this way, an inclusive laboratory is a space designed to offer equitable and accessible learning opportunities, considering the diversities of each student.

The Include Laboratory, implemented on the premises of the Faculty of Higher Education of Linhares (Faceli), emerges as a practical example of this approach, aiming to ensure that all students have access to fair and equal learning, while promoting inclusion, diversity and mutual respect.

According to these premises, this study seeks to answer the central question: how does the Include Laboratory work on Faceli's premises and what are its contributions to the school education of enrolled students? To address this issue, the general objective of this research is to analyze the contributions of the Include Laboratory to the school education of students enrolled in the program and has the following specific objectives: to identify the methodology used in the Include Laboratory program; describe how the Include Laboratory works on the premises of the Faculty of Higher Education of Linhares (Faceli) and investigate the students' perception of the contributions of the Include Project to their school life.

To this end, the methodology of this study presents a bibliographic review on the subject and a field research that included an interview with the former president of the Faceli Foundation, the facilitator and the monitor who develop the activities in the Include Laboratory and a focus group with students who attended the project in the first semester of 2024.

THEORETICAL FRAMEWORK

THE USE OF TECHNOLOGY IN BASIC EDUCATION

The concept of technology is broad and multifaceted, it refers to the set of scientific knowledge and principles used to create products, services, and tools that facilitate problem-solving and the accomplishment of tasks (Kenski, 2012). Thus, the author emphasizes the dynamic character of technology and its presence in different spheres of daily life, whether in the educational, social or professional sphere.

In Brazil, initiatives aimed at the use of information technology in basic education date back to the 80's with government investments, especially by the Ministry of Education (MEC) (Valente; Almeida, 2020). "In the 90s, the *internet* promoted great changes in the social and economic spheres. These changes also altered school dynamics" (Araújo *et al.*,



2017, p.924-925).

Thus, *online* education began to develop, allowing students to have access to a wide range of information and educational resources. Since then, technology has been increasingly integrated into the educational process, transforming it significantly. According to Moran (2013), technologies are increasingly present in the educational sphere. There are a variety of digital materials on any subject and available for the teaching and learning process.

In this way, the use of current technologies enriches the school space by providing students with "[...] to actively learn, to research all the time, to be proactive, to know how to take initiatives and interact" (Moran, 2013, p.31). As protagonists in the educational process, students seek new knowledge, expanding their experiences and meaningful learning.

The COVID-19 pandemic has contributed to the advancement of the use of digital technologies in the teaching and learning process. An abrupt transformation in education led to the emergency adoption of remote teaching as a strategy to not stop school activities. This period forced both educators and students to quickly adapt to new technologies and the virtual environment, which, despite the challenges, accelerated the process of digitalization in teaching (Ribeiro, 2021).

As a result, remote teaching, which was initially seen as a temporary solution, has proved to be a catalyst for the reassessment of educational practices and the resignification of the role of technologies in education.

Valente and Almeida (2022, p.10), highlight that:

[...] the experiences, productions, and transformations that occurred during the pandemic period will last (Latour, 2021) and will profoundly influence educational processes, causing the resignification of the curriculum and public policies.

Thus, the changes caused by the COVID-19 pandemic in education were not limited to the emergency period, but generated a permanent resignification of the role of technologies in teaching. The experiences lived during the pandemic have highlighted the need to adapt to new educational realities and have shown that digital technologies have become not only auxiliary tools, but central elements in the construction of a modern curriculum and in the formulation of educational policies.

It can be highlighted that, although the pandemic imposed significant difficulties, such as the lack of adequate access to the *internet* and the adaptation to new teaching platforms, it also accelerated digitalization in education (Ribeiro, 2021). Previously seen as a complementary or temporary resource, technology has become central to the teaching-



learning process, which has led to the reevaluation of pedagogical practices and the exploration of new ways of teaching and learning.

In addition, it can be noted that this experience has forced the educational community to recognize the importance of technologies in education, not only as support tools, but also as essential elements for the modernization of teaching. The period of remote teaching catalyzed a deeper reflection on the role of technologies, potentially leading to lasting changes in educational practices, even with the return to face-to-face teaching.

The pandemic has also accelerated innovation and the adoption of digital technologies in education, promoting greater use of online learning platforms, video conferencing tools, and digital educational resources. The experience with remote teaching during the pandemic brought to light the need to rethink pedagogical models and educational policies to better integrate technology into the educational process, in an equitable and inclusive way, even in normal times (Ribeiro, 2021).

According to Moran (1999, p.1),

Many ways of teaching today are no longer justified. We waste too much time, learn too little, and continually become demotivated. Both teachers and students have the clear feeling that many conventional classes are outdated. But where to change? How to teach and learn in a more interconnected society?

We know that today's generation finds it easy to handle instruments such as *tablets*, *notebooks*, cell phones, etc. In this context, it is up to education professionals to renew their teaching methods and school managers to renew the resources of educational institutions, seeking public policies for this purpose.

Brito and Purificação (2007, p.41) emphasize that:

In order for technologies not to be just a novelty and not to lend themselves to the disguise of the real existing problems, we believe it is convenient for teachers to understand and accept that, currently, changes provide us with the necessary instruments to respond to the quantitative and qualitative demand for education that it causes. What we need to know is how to recognize these technologies and adapt them to our educational purposes.

Therefore, technologies should be seen as instruments to improve the quality and accessibility of education, but this is only possible if teachers know how to integrate them effectively and with a clear purpose. The pandemic served as an example for this reflection, showing that technological innovation in education does not lie only in the adoption of new tools, but in the ability to use them to transform pedagogical practices in a meaningful and inclusive way.

The National Common Curriculum Base (BNCC) recognizes the importance of



technologies in education as an essential tool for the development of students' skills and abilities, by emphasizing the integration of digital information and communication technologies in all areas of knowledge, promoting digital culture, citizenship and student protagonism (Brasil, 2017).

The general competencies of the BNCC reflect a comprehensive and integrated vision of education, where digital culture and technologies play a fundamental role in the training of students. The intersection between education and technology, as outlined in the BNCC competencies, highlights the importance of a curriculum that responds to contemporary demands and prepares students for an ever-changing future (Brasil, 2017).

CHARACTERIZATION OF THE INCLUDE LABORATORY AND ITS EXTENSION AT THE FACULTY OF HIGHER EDUCATION OF LINHARES-ES (FACELI)

Faceli is a municipal public institution of higher education, created by Municipal Law No. 2,561 of 12/15/2005. It is located in the Novo Horizonte neighborhood and offers undergraduate courses in Administration, Law and Pedagogy. Faceli's mission is to train professionals participating in the social environment with technical competence, ethical attitude, critical spirit and competence for professional practice. In this institution, several extension projects are developed, such as the "Free Training Course in Community Mediation of Conflicts" (Faceli, n.d.).

The institution is maintained by the Faceli Foundation and funded with resources from the Municipality of Linhares. Since its creation, Faceli has stood out for its contribution to the social and economic development of the region. The institution promotes research and extension in all branches of knowledge, encouraging scientific, technical, and cultural dissemination (Faceli Foundation, 2023).

The Faceli Foundation, in partnership with the Campus Party Institute, started the activities of the first Include Laboratory in the State of Espírito Santo on October 19, 2023, aiming at the social inclusion and technological development of young people in the community (Include by Campus Party, 2024).

The Include Laboratory is a social program of the Campus Party Institute that promotes the digital and social inclusion of young people from 8 to 18 years old, from low-income communities. This program includes the implementation of technological laboratories with free technology courses, such as robotics, programming, *design*, and other equivalent technologies (Campus Party, 2021).

In this sense, the central objectives of this social program are:

- Promote digital and social inclusion, using technology as a tool to transform the



lives of young people and prepare them for the challenges of the future.
- Provide communities with a leading role in the use of technology to solve problems.
- Support formal education, promoting the integral development of learners through active methodologies (Campus Party Institute, 2024).

Currently, there are 80 laboratories implemented throughout the national territory, 63 active in 11 states and 59 cities (Instituto Campus Party, 2024). Include Laboratories have equipment such as: furniture, *notebooks*, 3D printers, drones, robotics *kits*, among others. The courses offered are taught by scholarship holders, who live in the community where the laboratory operates, trained by the Campus Party Institute (Campus Party, 2021).

METHODOLOGY

In order to meet the expectation of the problem, the research was conducted as a qualitative case study of exploratory and descriptive nature. According to Flick (2009, p.37), "Qualitative research is aimed at the analysis of concrete cases in their local and temporal peculiarities, starting from the expressions and activities of people in their local contexts".

To carry out the research, prior authorization was requested from the sector responsible for the Include Laboratory, of the Campus Party Institute, which returned the appropriate authorization by *e-mail*. Next, the instruments used in this research were scheduled and carried out.

In this stage, a semi-structured interview was used with the former president of the Faceli Foundation, articulator of the partnership between the Faceli Foundation and the Campus Party Institute (responsible for the project, at the national level), with the facilitator and the monitor who develop the activities in the Include Laboratory. The research also included a focus group with five students in order to investigate their perception of the contributions of the Include Project to their school life.

The focus group allows interaction between participants, enabling different perspectives and opinions on the subject studied. Group discussions not only reveal the opinions of the participants, but also how these opinions evolve through dialogue and the exchange of ideas, enriching the qualitative analysis of the process of social construction of knowledge and its beliefs (Flick, 2009).

The collected data are presented and analyzed, in a contextualized way, in the light of the theoretical foundation presented with the objective of elucidating the practical implications of the experience lived by its implementers and target audience.



RESULTS AND DISCUSSIONS

The research was carried out in two different moments. At first, interviews were conducted with the monitor and facilitator and the focus group was held with five students enrolled in the program on Faceli's premises. In the second moment, an interview was made with the former president of the Faceli Foundation at his residence. All interviews and the students' perceptions were recorded and transcribed below.

THE PROCESS OF IMPLEMENTING THE INCLUDE LAB AT FACELI

To better understand how the process of implementing the Include Laboratory at Faceli took place, an interview was conducted with the former president of the Faceli Foundation (maintainer of the Faceli college) who was responsible for articulating the partnership with the Campus Paty Institute. The former president of the Faceli Foundation has a degree in Chemical Engineering and Economic Sciences and a master's degree in Education with 24 years of experience in Higher Education.

Asked about the implementation process of the Include Laboratory at Faceli, the former president of the Faceli Foundation replied:

Initially, it was assumed that the Faceli Foundation should be open to partnerships that would add value and innovation to the institution, allowing greater institutional visibility, better use of its physical structure, at no significant cost and, mainly, a new way of providing educational services to the society of Linhares, within the requirements of social inclusion in which the Foundation and its maintenance are inserted. Faceli. Having established this assumption, an opportunity in this sense was sought in the national scenario, which culminated in the Foundation's candidacy in the selection process of educational institutions interested in implementing a laboratory of social inclusion through digital technologies (Include Laboratory), maintained by the Campus Party Institute, which has a network of major supporters from the private sector and the Renova Foundation.

Regarding the partnerships that were established to make the Include Laboratory viable, the former president of the Faceli Foundation reported that the Include Laboratory is the result of several institutional partnerships. According to the interviewee, "[...] it was up to the Faceli Foundation to seek to meet the requirements required in the selection process, such as a minimum space of 50m², exclusivity for use, power and *internet points*, in addition to guaranteed accessibility to the place".

According to the report of the former president of the Faceli Foundation, based on the guarantee given by the institution, the process of documentary analysis and on-site visit for photographic registration of the space (room 28 on the first floor) began, culminating in the signing of the partnership. The partnership between the Faceli Foundation and the Include



Laboratory is marked by a low cost ratio for the Foundation, which only guarantees the use and conservation of a physical space for the operation of the project.

Regarding the resources (human, technological, financial) available for the operation of the Include Laboratory at Faceli, the former president of the Faceli Foundation stated that they are minimal, such as the expenditure on energy on site (directed to the use of computers, lighting and environmental comfort), in addition to the permission to use access to the *wifi* signal institutional. "The Faceli Foundation also includes weekly cleaning of the space and, eventually, provides some support from its Information and Communication Technology sector when there is an intermittency of the *wifi signal*", points out the interviewee.

According to the report of the former president of the Faceli Foundation, the Include Laboratory is located in room 28 on the first floor of the faculty with an area of 63 m² and a 60,000 BTU air conditioning unit. It has energy structure and *internet* for all equipment installed by the laboratory.

Asked if there were difficulties during the process of implementing the laboratory, the interviewee stated that there were no difficulties, but the need for small adjustments, such as repositioning a *modem* inside the room (to better receive the *wifi* signal), installing more power points and access to the *internet* network. Some measures related to the access of the project's students to Faceli were also necessary, which has a specific protocol for this.

Also according to the interviewee, the implementation process of the Include Laboratory, at Faceli, was conducted in a planned and efficient manner, ensuring that the space offered all the necessary conditions for the development of the proposed activities. The partnership between the Faceli Foundation and the Campus Party Institute proved to be fundamental for the implementation of the project, which is in line with the institution's social and digital inclusion objectives.

OPERATIONAL ASPECTS OF THE INCLUDE NA FACELI LABORATORY

The facilitator of the Include Laboratory is pursuing a bachelor's degree in Control and Automation Engineering from the Federal Institute of Espírito Santo (Ifes/Campus Linhares) with 10 months of experience working in technologies with Basic Education students. Her weekly workload is 20 hours, 8 hours of which are teaching classes for students enrolled in the program and the other hours for planning and organizing the activities developed.



The monitor of this program is a recent graduate in Pedagogy from Faceli, has one year of experience working in technologies with Basic Education students and has a weekly workload of 20 hours of work.

Regarding the objectives of the Include Laboratory in the municipality of Linhares-ES, the facilitator replied that they are on the Include website (see secondary section 2.2). These data underline Include Lab's commitment to providing quality technology education, using modern and inclusive methods that not only teach but also inspire students to explore new possibilities and develop essential skills for the future. These objectives are in accordance with what the BNCC recommends on the development of competencies and skills related to the use of digital technologies, throughout basic education, as highlighted in general competence 5:

Understand, use and create digital information and communication technologies in a critical, meaningful, reflective and ethical way in the various social practices (including school ones) to communicate, access and disseminate information, produce knowledge, solve problems and exercise protagonism and authorship in personal and collective life (Brasil, 2017, p.9).

The BNCC contemplates that the use of digital technologies must be used in various social practices in a critical and responsible way. The development of these skills promotes access to and dissemination of information, the production of new knowledge and problem solving, allowing students to be protagonists in their social and collective life.

The facilitator also reported that the contents worked on in the Include Laboratory are: automatons⁴, basic electricity, algorithms, *online programming*, programming with arduino⁵, arduino with sensors and actuators. The use of these technologies demonstrates an alignment with modern educational trends and the search for innovative solutions for teaching.

According to the facilitator, the teaching methodology adopted to work on the aforementioned contents is based on 4 topics: context, concepts, hands-on and connections. This methodology, developed by the social institution responsible for the program, combines theory (context and concepts) with practice (hands-on) and promotes the connection between different areas of knowledge. The emphasis on *maker*⁶ culture and creative learning is also a differential (Cemim *et al.*, 2022).

⁴ According to Cemim *et al* (2022, p.13), "The first robots were called automata, machines built to imitate the actions of humans and animals. In Greek, the word 'automaton' means 'that which moves by itself.'"

⁵ "[...] Arduino is a small accessible computer, designed to interact with the environment around it" (Cemim *et al*, 2022, p.140).

⁶ Paula, Martins, and Oliveira (2021, p.2) state that "The maker culture is the action of getting your hands dirty, associated with the use of technological resources or other woodworking tools where the student has the autonomy to create, modify, or transform objects, being the main protagonist of their learning".



The facilitator stated that students are well engaged in the proposed activities and that the criteria used to select the technologies and tools are made available by Include itself. Among the strategies used to keep students motivated and engaged in activities, she uses dynamics, circle classes and practical activities. Asked if she needs, at some point, to adapt the activities to meet the different levels of knowledge of the students, the facilitator said that it is not necessary.

Regarding how the evaluation process on the performance of students in the program is carried out, if any type of record is made, the facilitator replied: "Students are not evaluated during the course. There is an obligation to deliver a final project that is done in a group".

About his role at the Include Laboratory in Linhares-ES, the monitor said that he helps with issues such as welcoming students, organizing the room, distributing materials and also acts as a right arm of the facilitator. According to the monitor, the facilitator is the one who teaches the class, working as the teacher in charge of the room.

Asked about how the Include Laboratory works on Faceli's premises, the monitor replied: "The laboratory works on the first floor of the college, in room 28 that was made available for the program. The activities began to be implemented in October 2023".

The monitor also stated that the target audience is children and adolescents aged 8 to 18 from the community, with a main focus on low-income black girls. If the vacancies are not filled by this group, the opportunity is given to low-income black boys. If there are still remaining vacancies, they are intended for low-income girls, regardless of race. Finally, if necessary, they are also considered low-income boys.

According to the monitor, the dissemination of the program is done through social networks and registration is carried out on the Include website, through a *link* that directs to registration. The process is simple and easy.

Regarding the number of classes and students served by the Include Laboratory program, the monitor said that, in Linhares, the program has already served 80 students and currently serves 80 more. Although there are some dropouts, each semester concludes with 80 students. There are two classes on Tuesday and two on Thursday, each with 20 students.

When asked how he evaluates the implementation of the Include Laboratory in Linhares-ES, the monitor's answer was:

The implementation of the Include Laboratory is a very nice initiative. It is impressive to see that many children and adolescents have never had contact with a computer. This makes us realize the importance of giving these young people the opportunity to have access to technological tools. This contact can awaken new dreams and



goals, such as attending college or IFES. As the project's *own slogan* says "opportunities change the world", the idea of the project is very well received by the community and has a significant positive impact.

The monitor highlights the relevance of the Include Laboratory by emphasizing how the initiative provides a first contact with digital technologies for many children and adolescents. The community's recognition demonstrates that the activities of the Include Laboratory are relevant, impacting the students' school education.

PERCEPTION OF THE STUDENTS ASSISTED BY THE INCLUDE LABORATORY

Five students who attended the program in the first semester of 2024 participated in the focus group: one 9 years old, another 10 years old, and three 13 years old. Two children (twins) make the journey from their home (which is in a neighboring neighborhood) to Faceli by bicycle, two other children (who are siblings) make this journey on foot because they live close to the college and another child uses a bus or car with his mother to get to the place, as he lives in a more distant neighborhood.

About how they describe their experiences in the Include Laboratory, the children answered that the experience is cool, one child highlighted "we discover new things that we think we already know, so when we really learn it's something else". This demonstrates that the laboratory environment offers a learning experience transforming students' initial understanding through a deeper and more practical understanding of some concepts.

Asked about what they liked most about the Include Laboratory and what they liked the least, the children said that they liked the projects they did by clearing their doubts. One child said he liked the *LED bulbs*. There were no complaints from any child, which makes it clear that they liked everything.

Regarding what new skills they learned in the Include Lab, the children answered that it was tinkering with technology (something they didn't know much about how it worked) and also with programming in the *scratch*⁷ app. Regarding how these skills have helped in school activities, the children said that it helps when they have to do some things on the computer. One child said it doesn't help much because he doesn't have much access to the computer outside the lab.

The students' reports demonstrate that the Include Lab is promoting more inclusive, practical, and relevant education by providing access to modern technologies and stimulating student interest in areas such as robotics and programming. Regarding students

⁷ "The Scratch programming language was developed especially for children, as it uses an easy graphical interface with no codes, just lego-like blocks" (Castro, 2017, p.6).

not having access to computers outside the laboratory, Ribeiro (2021) explains that this is one of the challenges for the effective use of digital technologies by the entire student population.

Asked if they have noticed any improvement in school performance since they started participating in the project, the children said yes. One child reported that "It helped me with content in the Science subject about electricity that I didn't know how to answer before", another child emphasized that it helped with the Mathematics content as well. Thus, it is perceived that some content they study in the laboratory is also required at school. So, it is easier for them to understand and get a good grade or even answer the activities proposed by the teachers.

The end of the program's activities, in the first semester of 2024, took place with a display of the work carried out by the students. The event was attended by the students' families who presented nine projects carried out throughout the course.

Figure 1 – Cardboard automatons made by the students enrolled in the project



Source: Survey data, 2024.

Figure 1 presents cardboard automata, a project carried out by the students participating in the Include Laboratory. Building automata, even with simple materials like cardboard, teaches students about the basic principles of mechanics and engineering. This type of activity illustrates how the program fosters creativity and practical understanding of the concepts of robotics and automation from a historical and functional perspective.

Figure 2 – Casa Include made by the students enrolled in the project



Source: Survey data, 2024.

"The Include house, with monitoring, is designed to maintain thermal comfort in the environment, With a temperature sensor installed, it will be possible to measure the temperature and inform it on the LCD display" (Cemim *et al.*, 2022, p. 316). The creation of a house monitored by temperature sensors exemplifies how students learn to deal with electronic components and programming to solve everyday problems.

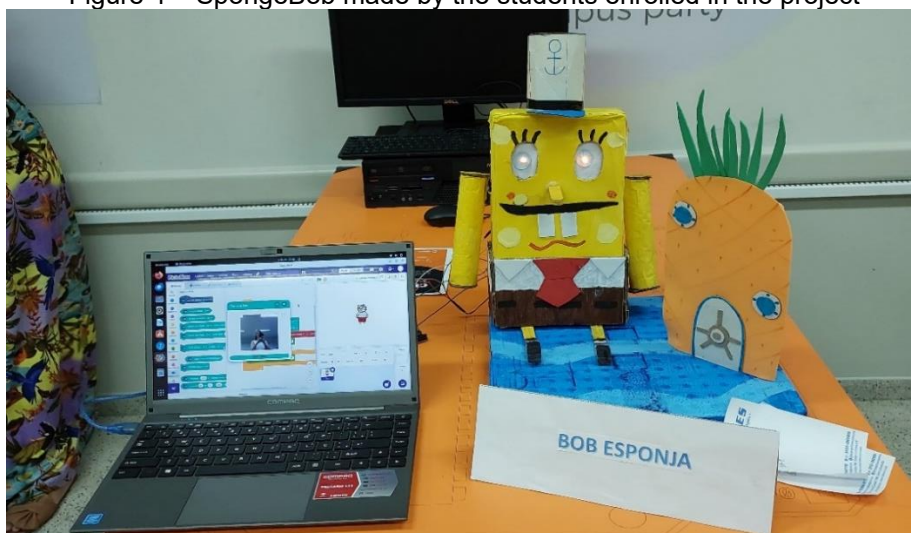
Figure 3 – Include parking made by the students enrolled in the project



Source: Survey data, 2024.

The Include parking incorporates an automatic gate and a parking sensor with audible warning, technologies common in modern parking systems (Cemim *et al.*, 2022). This project allows students to learn about sensors, actuators, and control systems, providing a practical understanding of how these components work together to create an efficient automated system.

Figure 4 – SpongeBob made by the students enrolled in the project



Source: Survey data, 2024.

According to the Include lab facilitator, SpongeBob's project uses artificial intelligence to detect poses and perform automated movements, transforming the iconic character into a fascinating combination of creativity and technology. Among the components of the project, the *LEDs* installed in the doll's eyes, which offer interactive and eye-catching lighting, and the servo motor, responsible for the precise movement of SpongeBob's arm, stand out. This motor allows the puppet to react in a coordinated manner to the detected poses, providing a more dynamic and realistic experience.

Although this study offers a solid basis for understanding the impact of the Include Laboratory on the education of students in the municipal school system of Linhares-ES, it has some limitations that should be considered. One of the main limitations of the study is the small sample size of the survey, consisting of a limited number of participants, space, and time. Given these limitations, future research may expand the scope of this study.

CONCLUSION

According to the data obtained, it can be stated that the Include Laboratory, by providing access to advanced technologies and active learning methodologies, has played an important role in the school education of students in the municipal network of Linhares-ES. The digital inclusion promoted by the laboratory has allowed students to develop essential skills to face the challenges of the future.

Regarding the methodology used in the Include Laboratory program, it was found that it favors the active participation of students in the proposed activities. The methodology used in the Include Laboratory program combines the theory of teaching robotics and



technology with practical activities. Maker culture and creative learning are important elements in this methodology.

Regarding the operation of the Include Laboratory on the premises of the Faculty of Higher Education of Linhares (Faceli), it was found that the course offered takes place twice a week with four classes of students each. The course is taught by the facilitator who has the support of the monitor.

Regarding the students' perception of the contributions of the Include Project, it can be seen that they really liked the course taken, since they acquired new learning and knowledge for their school education. In addition to learning related to the use of digital technologies, students appropriated content that is part of the school curriculum. It is interesting to note that one student reported that he does not use the skills acquired in the course much because he does not have access to computers outside the project.




REFERENCES

1. Araújo, S. P. de, et al. (2017). *Tecnologia na educação: contexto histórico, papel e diversidade*. IV Jornada de Didática, III Seminário de Pesquisa do CEMAD. Disponível em: <<https://www.uel.br/eventos/jornadadidatica/pages/arquivos/IV%20Jornada%20de%20Didatica%20Docencia%20na%20Contemporaneidade%20e%20III%20Seminario%20de%20Pesquisa%20do%20CEMAD/TECNOLOGIA%20NA%20EDUCACAO%20CONTEXTO%20HISTORICO%20PAPEL%20E%20DIVERSIDADE.pdf>>. Acesso em: 20 ago. 2024.
2. Brasil. Ministério da Educação. (2017). *Base Nacional Comum Curricular*. Brasília, DF: MEC. Disponível em: <<http://basenacionalcomum.mec.gov.br/>>. Acesso em: 22 maio 2024.
3. Brito, G. da S., & Purificação, I. da. (2007). *Educação e novas tecnologias: um repensar* (2. ed.). Curitiba: Ibpex.
4. Campus Party. (2021). *Include by Campus Party*. Disponível em: <<https://brasil.campus-party.org/include/>>. Acesso em: 5 ago. 2024.
5. Castro, A. de. (2017). *O uso da programação scratch para o desenvolvimento de habilidades em crianças do ensino fundamental*. Dissertação de Mestrado em Ensino de Ciência e Tecnologia. Universidade Tecnológica Federal do Paraná. Disponível em: <https://repositorio.utfpr.edu.br/jspui/bitstream/1/2462/1/PG_PPGET_M_Castro%20%20Adriane%20de_2017.pdf>. Acesso em: 19 ago. 2024.
6. Cemim, A., et al. (2022). *Matodologia Include* (2. ed.). Caxias do Sul: Centro Universitário UNIFTEC/Campus Party.
7. Flick, U. (2009). *Introdução à pesquisa qualitativa* (3. ed.). Porto Alegre: Artmed.
8. Faceli. (s.d.). *Perfil Institucional*. Disponível em: <<https://faceli.edu.br/apresentacao/>>. Acesso em: 23 maio 2024.
9. Fundação Faceli. (2023). *Fundação Faceli apresenta sua parceria com o Instituto Campus Party*. 31 de agosto. Disponível em: <<https://fundacaofaceli.edu.br/fundacao-faceli-apresenta-sua-parceria-com-o-instituto-campus-party/>>. Acesso em: 23 maio 2024.
10. Include by Campus Party. (2024). *Temos muito o que comemorar com mais uma inauguração do Programa Include, desta vez em Linhares (ES)!* 29 fev. Disponível em: <https://www.linkedin.com/posts/includebycampusparty_include-inauguraaexaetoinclude-transformaaexaetodigital-activity-7169427584252952576-AI_/?utm_source=share&utm_medium=member_desktop>. Acesso em: 5 ago. 2024.
11. Instituto Campus Party. (2024). *Include by Campus Party*. Disponível em: <<https://institutocampusparty.org.br/include/>>. Acesso em: 24 maio 2024.
12. Kenski, V. M. (2012). *Tecnologias e ensino presencial e a distância* (4. ed.). Campinas: Papyrus.



13. Moran, J. M. (1999). O uso das novas tecnologias da informação e da comunicação na EAD - uma leitura crítica dos meios. Palestra proferida pelo Professor José Manuel Moran no evento "Programa TV Escola-Capacitação de Gerentes", realizado pela COPEAD/SEED/MEC em Belo Horizonte e Fortaleza.
14. Moran, J. M. (2013). Ensino e aprendizagem inovadores com apoio de tecnologias. In J. M. Moran, M. T. Masetto, & M. A. Behrens (Eds.), *Novas tecnologias e mediação pedagógica* (21. ed.). Campinas, SP: Papirus.
15. Paula, B. B. de, Martins, C. B., & Oliveira, T. de. (2021). Análise da crescente influência da Cultura Maker na Educação: revisão sistemática da literatura no Brasil. *Revista de Estudos e Pesquisas sobre Ensino Tecnológico*, 7, e134921. Disponível em: <file:///C:/Users/ADM/Downloads/layde_queiroz,+1349-Trabalho+com+corre%C3%A7%C3%B5es+(ap%C3%B3s+Revis%C3%B5es+Requeridas)-8273-1-11-20210528.pdf>. Acesso em: 13 ago. 2024.
16. Ribeiro, R. M. da C. (2021). Educação fora da caixa: as tecnologias digitais como ferramentas para o ensino remoto emergencial. In T. E. Lacerda & R. Greco Junior (Orgs.), *Educação remota em tempos de pandemia: ensinar, aprender e ressignificar a educação*. Curitiba: Editora Bagai. Disponível em: <https://educapes.capes.gov.br/bitstream/capes/601699/2/Editora%20BAGAI%20-%20Educa%C3%A7%C3%A3o%20Remota%20em%20Tempos%20de%20Pandemia.pdf>. Acesso em: 18 ago. 2024.
17. Valente, J. A., & Almeida, M. E. B. (2020). Políticas de tecnologia na educação no Brasil: Visão histórica e lições aprendidas. *Arquivos Analíticos de Políticas Educativas*, 28(94). Disponível em: <file:///C:/Users/ADM/Downloads/pkpadmin,+4295+Valente-Almeida-Portugues+FNL.pdf>. Acesso em: 20 ago. 2024.
18. Valente, J. A., & Almeida, M. E. B. (2022). Tecnologias e educação: legado das experiências da pandemia COVID-19 para o futuro da escola. *Tecnologias digitais, tendências atuais e o futuro da educação*, Panorama Setorial da Internet, 2(14), junho. Disponível em: <https://cetic.br/media/docs/publicacoes/6/20220725145804/psi-ano-14-n-2-tecnologias-digitais-tendencias-atuais-futuro-educacao.pdf>. Acesso em: 25 ago. 2024.

LUHMANN'S SYSTEMS THEORY APPLIED TO DATA PROTECTION IN THE DIGITAL AGE: A MULTIPLE CASE STUDY IN TECHNOLOGY COMPANIES

 <https://doi.org/10.56238/sevened2024.029-014>

Tiago Henrique de Souza Echternacht¹ and João Paulo Allain Teixeira²

ABSTRACT

The present work aimed to analyze the application of Niklas Luhmann's Systems Theory in data protection in the digital age, identifying its contributions to the understanding and regulation of this field in technology organizations. It sought to present the concepts of Niklas Luhmann's Systems Theory, as well as the principles of data protection in the digital age and the intersection between these two areas. The methodology used was the documentary analysis and the study of multiple cases, carried out in documents available on the internet of technology organizations selected according to their relevance in the sector. Thus, the following organizations were chosen: Google, which makes its data protection measures available through documents such as Google *Privacy Policy*, Google *Safety Center*, and Google *Cloud Compliance*; Microsoft, with its data protection measures set forth in the Microsoft *Privacy Statement*, *Microsoft Purview Compliance Manager*, and *Microsoft 365 Guidance for Security & Compliance*; Netflix, which provides information on security and privacy best practices for data protection in its *Netflix Partner Help Center*; and Cisco, which, through the *Cisco Trust Center* and *Cisco Security*, provides documents related to data privacy. The research concluded that Luhmann's theory, with its concepts of autopoiesis, operational closure, self-referentiality, communication, structural coupling, interpenetrations, and allopoiesis, provides a robust framework for understanding how these companies manage and protect user data.

Keywords: Niklas Luhmann's Systems Theory. Data Protection. Digital. Multiple Case Studies. Organizations Technology.

¹ Doctor in Business Administration from the Pontifical Catholic University of Paraná - PUC-PR
Federal University of Paraíba – UFPB

E-mail: tiagoechternacht@gmail.com

ORCID: <https://orcid.org/0000-0002-6464-1929>

LATTES: <http://lattes.cnpq.br/0234458945877419>

² Doctor in Law from the Federal University of Pernambuco
Catholic University of Pernambuco – UNICAP (Brazil)

E-mail: jpallain@unicap.br

ORCID: <https://orcid.org/0000-0001-9467-6973>

LATTES: <http://lattes.cnpq.br/3719496592232660>



INTRODUCTION

The digital age has brought with it a number of challenges and opportunities in the field of personal data protection. With the exponential increase in the volume of data generated and shared on a daily basis, critical questions about privacy, security, and regulation arise. In this context, Niklas Luhmann's Systems Theory offers an innovative perspective to understand and address these questions. Developed in the twentieth century, Luhmann's Systems Theory proposes that social systems operate autopoietically, that is, they are capable of self-reproducing and maintaining their operations independently of their external environment, while interacting with it in a complex way.

The application of Systems Theory to digital law, specifically to data protection, allows for a deeper analysis of the internal mechanisms and interactions between different social and technological systems. According to Luhmann (1995), social systems are composed of communications that self-reproduce through connection with other communications. This focus on communication as the basic unit of social systems provides insights into understanding how data protection laws and regulations can be developed and implemented effectively.

In Luhmann's Systems Theory, communication is considered the fundamental operation of social systems. Unlike traditional approaches, Luhmann (1995) sees communication not as an act of transferring information between individuals, but as a self-referential process that produces and reproduces the social system itself. According to Luhmann (1995), communication is the operation that generates the social system by establishing connections between communications. This focus highlights the centrality of meaning, which is continuously produced and reproduced through communicative operations.

This work, therefore, seeks to deepen the understanding of these core concepts of Niklas Luhmann's Systems Theory and analyze their application in data protection in the digital age, with the following research problem: how can Luhmann's Systems Theory be applied to data protection in the digital age to create more effective and resilient protection systems in technology organizations? Although there are studies on data protection and Luhmann's Systems Theory separately, there is a lack of research that integrates these two fields, exploring how Luhmann's (1995) concepts can be applied to improve data protection. By understanding how social systems self-organize and communicate, it is possible to develop more effective approaches to the regulation and protection of personal data in an increasingly complex and interconnected digital environment.



Thus, the objective of this research is to analyze the application of Niklas Luhmann's Systems Theory in data protection in the digital age, identifying its contributions to the understanding and regulation of this field in technological organizations. This research is relevant because it addresses the urgent need to protect personal data in an increasingly digitized world, using an innovative theoretical approach that can offer new perspectives and solutions.

This article is organized as follows: section 2 presents the literature review; Section 3 describes the methodology used; Section 4 analyzes and discusses the results; and section 5 concludes with the main findings and implications of the research.

LITERATURE REVIEW

LUHMANN'S SYSTEMS THEORY

Definition and main concepts

Niklas Luhmann's Systems Theory proposes that society is composed of a series of autonomous systems that operate in a self-referential manner. These systems, such as legal, economic and scientific, are defined by their own operations and are operationally closed, which means that they can only be influenced internally and not directly by external events (LUHMANN, 1995). This approach allows systems to maintain their identity and stability, even in the face of external disruptions. Luhmann (1995) argues that this autopoiesis is essential for the survival and evolution of social systems.

Communication is central to Luhmann's theory and is seen as the basic operation that underpins social systems. For Luhmann, communication is not merely an exchange of information, but a process that builds and rebuilds social systems. He describes communication as a combination of three selections: information, expression and understanding, which together form an autonomous process that maintains the social system (LUHMANN, 1984). Language, while important, is only one part of this process, serving as a medium that facilitates complexity and differentiation within the system.

In addition, Luhmann (1997) introduces the concept of functional differentiation in which different social systems specialize in different functions, each operating according to its own internal logic. For example, the legal system works on the basis of the legal/illegal binary code, while the economic system operates on the basis of the pay/non-pay code (LUHMANN, 1997). This functional differentiation allows for greater complexity and efficiency within society, as each system can focus on its specific function without direct interference from other systems.



Niklas Luhmann's (1997) Systems Theory is a sociological approach that defines communication as the basic operation of social systems. Luhmann argues that communication is an autonomous process that creates and sustains these systems in which language plays a crucial role in the construction of meaning and internal differentiation (MAURER, 2010). Communication, according to Luhmann (1997), is essential to reduce the complexity of the social world, selecting and combining information in ways that make sense within the system. Thus, communication is not only a means of transmitting information, but a process that constitutes the social system itself.

Autopoiesis and Communication

A central concept in Luhmann's theory (1997) is autopoiesis, which refers to the ability of systems to reproduce and maintain themselves through their own operations. For social systems, this means that they are operationally closed, functioning on the basis of their own communications and not being directly influenced by external events. This operational closure allows the systems to maintain their identity and stability, even in the face of external disturbances (MAURER, 2010). Autopoiesis highlights the importance of self-reference and the autonomy of social systems.

In the context of ecological communication, Luhmann (1995) applies his theory to understand how social systems interact with the environment. Jacob A. Miller (2022), by integrating Luhmann's communication theory with J.D. Peters' concept of the "communication bottleneck", addresses the challenges in communicating about climate change mitigation. Miller (2022) argues that ecological communication should be demoralized, that is, addressed without the moral burden traditionally associated with environmental issues. This allows for a more objective and systematic analysis of societal responses to climate change.

Complexity and contingency are fundamental aspects of Luhmann's theory, emphasizing that communicative operations are always contingent and depend on the internal conditions of the systems. Miller (2022) applies this perspective to analyze the complexity of social responses to climate change, highlighting how different systems (scientific, political, and economic) respond according to their own internal logics. This approach helps to understand why communicating about climate change can be so challenging and fragmented.

Finally, the autonomy of systems is a crucial principle in Luhmann's theory. Each system operates autonomously, according to its own operations and internal logic. This autonomy is essential for understanding how social systems communicate and interact with



the environment and with each other (MAURER, 2010). Luhmann's theory offers a powerful tool for analyzing complex social phenomena, such as data protection in the digital age and climate change mitigation, providing a clear view of the interdependence and autonomy of social systems.

In the article "The Democratic Ideal vs. Luhmann's Autopoietic Systems in Adult Education" (2017), written by Jeffrey Zacharakis, the author uses the context of adult education to argue that autopoiesis implies that educational systems should be seen as autonomous entities that evolve according to their internal dynamics, without directly depending on external influences. Zacharakis (2017) compares this to democratic ideals, suggesting that while democracy strives for inclusion and direct participation, Luhmann's autopoietic approach emphasizes the need for continuous adaptation and self-referentiality to respond effectively to learners' needs.

Vessela Misheva, in "Luhmann's Systems Theory and the Question of the Mass Media" (2005), applies Luhmann's systems theory to the field of mass media, highlighting how communication serves as the basic operation that underpins social systems. According to Luhmann, communication is composed of three essential selections: information, expression and understanding. Misheva (2005) explores how mass media functions as an autopoietic system, producing and reproducing communications that are self-referential and operationally closed. This operational closure allows mass media to create and maintain a reality of their own, influencing public perception according to the internal dynamics of the media system, rather than being directly shaped by external factors.

David Seidl, in "Luhmann's Theory of Autopoietic Social Systems" (2004), provides a comprehensive overview of Luhmann's theory of autopoietic systems, with a special focus on autopoiesis and communication. Seidl (2004) explains that social systems are autopoietic to the extent that they are capable of producing and reproducing their own constituent elements through their internal operations. Communication, in this context, is the central operation that allows social systems to maintain their cohesion and continuity. Each communicative act, by selecting and combining information, expressions, and understandings, contributes to the stability and adaptability of the social system, allowing it to respond to a complex environment while maintaining its identity and functionality.

Communication, as defined by Luhmann, is not merely an exchange of information, but an emergent and dynamic process that constitutes and sustains social systems. Jeffrey Zacharakis (2017) argues that in adult education, this view of communication emphasizes the need for education systems to be able to continuously adapt to changes and the needs of learners while remaining self-referential and operationally closed. This is in contrast to



traditional democratic ideals, which often emphasize direct participation and inclusion, suggesting that an autopoietic approach can offer a more resilient and responsive form of educational management.

Finally, the application of Luhmann's theory to the field of mass media, as discussed by Vessela Misheva (2005), demonstrates how autopoietic communication can create a reality of its own within specific systems. Mass media, by operating in a self-referential manner, shapes public perception and social reality through its own communicative processes. This approach highlights the importance of autonomy and operational closure of social systems in maintaining their identity and managing environmental complexity, as explored by David Seidl (2004). These concepts are fundamental to understanding the dynamics of social systems in Luhmann's theory, offering valuable insights into autopoiesis and communication.

Application in Different Fields (e.g., Sociology, Law)

Niklas Luhmann's systems theory is applied in a significant way in the field of law and sustainability, as explored in the work "Hermeneutics of Sustainability from the Perspective of the Brazilian Federal Constitution" (SILVA et al., 2017). In this work, the theory is used to understand how the Brazilian Constitution can be seen as an autonomous system that responds to sustainability issues through its own legal structures and processes. Luhmann suggests that legal systems are autopoietic, that is, capable of self-reproducing and maintaining their internal operations. Legal communication is essential for the implementation and maintenance of sustainability policies, highlighting the interdependence between social and environmental systems, and how these legal systems adapt to incorporate new social demands.

In the field of legal and social philosophy in Argentina, "The Adoption of Niklas Luhmann's Systems Theory in Argentine Legal and Social Philosophy" (PRICE, 2014) discusses the adoption of Luhmann's systems theory to understand the complexity of legal and social systems. The theory is applied to show how legal systems function in a self-referential and autopoietic manner, operating independently of direct external influences, but still interacting with other social systems, such as economic and political ones. This work highlights the importance of the functional differentiation of systems, where each one fulfills its specific role in an interdependent but autonomous way, allowing for a more in-depth analysis of how laws and policies are formulated and implemented within the Argentine context.



Finally, in the field of legal semiotics, Claudius Messner, in "Luhmann's Judgment" (2013), and Kathrin Maurer, in "Communication and Language in Niklas Luhmann's Systems Theory" (2010), apply Luhmann's theory to explore how legal and communication systems operate. Messner (2013) focuses on how legal judgments are formed through autopoietic communicative operations, highlighting the autonomy of legal systems while responding to the demands of society. Maurer (2010), in turn, addresses how communication is the basic operation that sustains social systems, with language facilitating the complexity and internal differentiation of these systems. These works demonstrate the versatility of Luhmann's theory, applying its principles to understand the autonomy, interdependence, and functionality of social systems in different contexts.

DATA PROTECTION IN THE DIGITAL AGE

Evolution of data protection legislation

The General Data Protection Regulation (GDPR) was proposed by the European Commission on January 25, 2012 as part of a comprehensive reform of the European Union's data protection rules. The aim was to harmonize data protection laws across the EU, give citizens more control over their personal data, and modernize regulation to reflect technological changes and globalization. The need to reform the 1995 Data Protection Directive (Directive 95/46/EC) arose due to the rapid transformations in the digital landscape and the growing importance of personal data in the digital economy. After intense negotiations between the European Parliament, the Council of the European Union, and the European Commission, the GDPR was officially adopted on April 27, 2016. The Regulation entered into force on 24 May 2016, with a transition period of two years, and will be fully applicable from 25 May 2018.

The GDPR, as it is usually written in acronym, replaced the 1995 Directive and established a single set of rules applicable to all companies operating in the EU, regardless of their geographical location, as long as they handle personal data of EU residents. The regulation introduced several key innovations, including the principle of "explicit consent" for the processing of personal data, the right of individuals to access and correct their data, the right to be forgotten, and the obligation to notify data protection authorities and affected individuals in the event of a data breach. In addition, the GDPR has significantly increased penalties for non-compliance, providing for fines of up to €20 million or 4% of the company's global annual revenue, whichever is greater.

The impact of the GDPR has been global, influencing data protection legislation in several other regions and countries, which have gone on to adopt similar regulations to



protect the privacy of their citizens. The implementation of the GDPR marked an important milestone in the protection of personal data, setting high standards that aim to ensure security and privacy in the digital age.

In addition to the General Data Protection Regulation (GDPR) in the European Union, many countries have implemented their own robust data protection laws. In the United States, for example, the California Consumer Privacy Act (CCPA) establishes privacy rights similar to those in the GDPR for California residents. In Brazil, the General Data Protection Law (LGPD) came into force in 2020, creating a comprehensive framework for the protection of personal data in the country. Other examples include the Personal Information Protection Act (PIPA) in South Korea, Singapore's Personal Data Protection Act (PDPA), and Australia's Data Privacy Act (1988). These legislations share common principles, such as the need for explicit consent for data processing, the right of individuals to access and correct their information, and the obligation of companies to protect data from unauthorized access and breaches. The differences between these laws reflect cultural and legal variations, but they all have the common goal of protecting the privacy of individuals and ensuring that personal data is handled ethically and securely.

Niklas Luhmann's systems theory is central to understanding the complexity involved in data protection in the digital age. In the book "The General Data Protection Regulation: A Law for the Digital Age?" (2017), L. Mitrou explores GDPR as a robust legal response to the new demands of the digital age. The GDPR is seen as an effort to regulate communication and the flow of information in an interconnected environment. Mitrou (2017) highlights fundamental principles, such as transparency, consent, and the right to be forgotten, which are essential to ensure the privacy of individuals' data. These principles reflect Luhmann's view of the need for autonomous, self-referential legal systems that can manage complexity and ensure regulatory efficiency.

Mikael Knutsson, in "Compliance with the General Data Protection Regulation: An Exploratory Case Study on Business Systems' Adaptation" (2017), addresses how companies are adapting their systems to comply with the GDPR. The book highlights the importance of robust information systems and internal compliance procedures, emphasizing the need for autopoiesis — the ability of business systems to self-organize and evolve to maintain regulatory compliance. Knutsson (2017) argues that adapting to the GDPR is not just a matter of implementing new technologies, but also of creating an organizational culture that values data privacy and security. This perspective is in line with Luhmann's theory, which sees social systems as autonomous and self-referential, capable of continuously adapting to changes in the regulatory environment.



Eleni Tzoulia, in "Targeted Advertising in the Digital Era: Modern Challenges to Consumer Privacy and Economic Freedom" (2020), analyzes the challenges of targeted advertising in the digital age and its implications for consumers' privacy. The work discusses how the massive collection of personal data for personalized advertising can compromise individual privacy. Tzoulia (2020) examines the European Union's legal responses, including the GDPR, which aims to ensure that data collection and processing are transparent and based on informed consent. The application of Luhmann's theory in this context highlights how legal and economic systems interact and adapt to new technological realities, maintaining their autonomy and functionality. This illustrates the importance of regulation to protect privacy while enabling cost-effective innovation.

Tuz (2023), in "Data Privacy and Security: Legal Obligations for Businesses in the Digital Age," explores the legal obligations of businesses regarding data privacy and security in the digital age. Tuz (2023) emphasizes the need for companies to implement robust security measures to protect personal data from cyber threats and comply with data protection laws, such as GDPR. The autopoietic approach suggests that companies should develop and maintain internal systems that ensure ongoing compliance. This aligns with Luhmann's view of the self-referentiality of social systems, where each system must be able to adapt and evolve independently, maintaining its internal cohesion while responding to external demands.

Finally, Christian Mattheis, in "The System Theory of Niklas Luhmann and the Constitutionalization of World Society" (2012), discusses the application of Luhmann's theory in the context of the constitutionalization of global society. Mattheis (2012) suggests that the principles of Luhmann's theory, such as autopoiesis and operational closure, can be applied to understand the formation of a global regulatory order, such as the one established by the GDPR. This perspective suggests that global legal systems operate in an autonomous and self-referential manner, creating regulatory frameworks that adapt and respond to global data protection needs, while maintaining their own cohesion and identity. The application of Luhmann's theory provides a robust theoretical framework for analyzing how regulatory systems can evolve to meet the challenges of the digital age, ensuring the protection of personal data in an increasingly interconnected world.

Caixia Zou and Fanyu Zhang (2022) discuss the importance of the right to interpretation of algorithms as a key step towards algorithmic governance. The work highlights how the transparency and interpretability of algorithms are crucial to protect personal data and ensure the accountability of automated decisions. The application of Luhmann's theory suggests that regulatory systems should be able to self-organize to



include norms that govern the use of algorithms, while maintaining transparency and protection of personal data.

These works provide a comprehensive overview of how Luhmann's systems theory can be applied to understand and manage data protection in the digital age, highlighting the importance of autopoiesis, communication, and the autonomy of legal and organizational systems in the digital age.

INTERSECTION BETWEEN SYSTEMS THEORY AND DATA PROTECTION

Existing approaches that integrate systemic theories with data protection

Yishi Wu, in "Balancing Data Protection and Data Utilization: Global Perspectives and Trends" (2024), explores the balance between data protection and utilization from a global perspective. Wu (2024) applies Luhmann's theory to argue that social systems — such as legal, economic, and technological — operate in an autonomous and self-referential manner, but are interdependent in managing the complexity associated with data protection. The autopoiesis of legal systems is crucial to create norms that guarantee the protection of data while allowing its use for innovation and economic development. This balance is necessary to maintain the functionality of systems in an ever-evolving digital environment.

Selita Facts, in "Justice in the Genomic and Digital Era: A 'Different World' Requiring 'Different Law'" (2020), addresses the legal and ethical challenges in the genomic and digital age, highlighting the need for new legal approaches. Selita (2020) uses Luhmann's systems theory to explain how legal systems must evolve autopoietically to deal with the new challenges presented by digitalization and genomics. Luhmann's theory offers a framework for understanding how legal systems can maintain their autonomy and functionality while incorporating new norms and regulations that respond to technological and societal changes while adapting to the complexities of a rapidly changing world.

Emerson Palmieri, in "The Media and the Social Order in Niklas Luhmann" (2020), explores the role of media in maintaining social order through the lens of Luhmann's systems theory. Palmieri (2020) argues that the media, as an autopoietic social system, influences public perception and the formation of social norms, including those related to data protection. The media plays a crucial role in communicating and disseminating information about data protection, shaping public opinion, and influencing policies and regulations. Luhmann's theory helps to understand how the media operates in a self-referential manner, maintaining its autonomy while interacting with other social systems, such as the legal and technological systems.

The study "The Implementation of the Integrated System of Archival Description (ZoSIA) at the State Archives in Katowice and the Data Protection" (LASKOWSKA and HAJEWSKI, 2019) addresses the implementation of the Integrated Archival Description System (ZoSIA) and its implications for data protection. Luhmann's theory is applied to understand the management of archival data in an institutional context, where the implementation of ZoSIA is analyzed as an autopoietic process. This archiving system adapts and evolves to ensure data protection while maintaining the integrity and accessibility of information. Luhmann's theory provides a framework for analyzing how archival systems operate autonomously, but need to interact with legal and technological systems to comply with data protection requirements.

These works demonstrate how Luhmann's systems theory can be applied to understand the intersection between data protection and various social fields in the digital age, highlighting the importance of autopoiesis, autonomy, and interdependence of social systems.

Potentialities and limitations of this intersection

Niklas Luhmann's Systems Theory offers a powerful framework for understanding the complexity and dynamics of social systems in the digital age. Angela Valeo and Kathryn Underwood, in "Analysis of Special Education Tribunal Outcomes Using Luhmann's Systems Theory" (2015), use Luhmann's theory to analyze outcomes of special education tribunals, demonstrating how education systems can adapt and evolve through autopoietic processes. This approach is relevant to data protection, in which legal and technological systems need to constantly adjust to new regulations and technological innovations, maintaining their internal cohesion and responsiveness to external challenges.

Arun Teja Polcumpally, in "Artificial Intelligence and Global Power Structure: Understanding Through Luhmann's Systems Theory" (2022), applies Luhmann's theory to understand the global power structure in relation to artificial intelligence. Luhmann's theory highlights the ability of social systems to self-organize and adapt to the increasing complexity brought about by artificial intelligence and *big data*. In the context of data protection, this perspective helps to identify how legal, economic, and technological systems can interact and adapt to protect personal data, while also taking advantage of the benefits of artificial intelligence. The construction of second-order observations makes it easier to understand the complex interactions between these systems.

Jacob A. Miller, in "Demoralizing: Integrating J.D. Peters' Communication "Chasm" with Niklas Luhmann's (1989) Ecological Communication to Analyze Climate Change



Mitigation Inaction" (2022), discusses how Luhmann's theory can be applied to understand ecological communication and inaction in relation to climate change mitigation. This approach can be transferred to data protection, highlighting the importance of communication and transparency between systems to address global challenges. Luhmann's theory can help identify gaps in communication and promote greater collaboration between social systems to improve data protection and privacy, encouraging a more integrated and effective approach.

However, despite its potential, Luhmann's Systems Theory has some limitations when applied to data protection in the digital age. The analysis of Angela Valeo and Kathryn Underwood (2015) points out the difficulty of translating complex theoretical concepts into effective and concrete practices. In the field of data protection, this means that the theory may not provide clear guidelines for implementing privacy and security policies. In addition, Luhmann's emphasis on the autonomy and self-referentiality of social systems, as highlighted by Arun Teja Polcumpally (2022), can lead to underestimation of the influence of external and intersystemic factors. Finally, Jacob A. Miller (2022) notes that the demoralization of communication, a feature of Luhmann's theory, can be problematic in data protection, where ethical and moral considerations are essential for formulating policies that protect the rights of individuals.

METHODOLOGY

In this session, the typologies used to carry out the research, the collection, analysis and treatment of data, the delimitation of the study, population and sample and the methodological procedures for the application of the case study will be described.

TYOLOGY OF RESEARCH

This work is an empirical research, characterized as descriptive, because, according to Gil (2009), the main objective of this type of research is to describe characteristics of a given population or phenomenon. The present research seeks to demonstrate the organizations that have implemented robust data protection measures, in the theoretical light of Luhmann's principles.

Regarding the typology characterized as a case study, Silva (2006, p. 57) states that "it is a study that analyzes one or a few facts in depth". The initial ideas for the case study arise, first, with the scope of the study, which is configured as an empirical investigation. According to Yin (2010, p. 39), the case study "investigates a contemporary phenomenon in depth and in its real-life context, especially when the boundaries between the phenomenon



and the context are not clearly evident". In other words, the case study seeks to deepen the knowledge about a certain phenomenon; In this case, the research deepens the knowledge about information security.

The type of case selected was the multiple case study, considering:

- 1) Technology Sector Organizations;
- 2) Four main units of analysis: selected companies from among the world's largest technology companies.

For the selection of companies, the following criteria were applied: (i) leading companies in the technology sector; (ii) companies from developing or emerging countries; (iii) availability and completeness of data protection information for the purposes of the comparative analysis made available on its websites. According to Yin (2010), multiple case studies are more convincing than single case studies, due to the logic of replication of the object of analysis in different contexts.

The approach to the problem is considered qualitative, because, in this type of study, according to Sampieri et al. (2013, p. 376), it seeks to "understand and deepen the phenomena, which are explored from the perspective of the participants in a natural environment and in relation to the context". These same authors characterize the qualitative approach as understanding, describing and interpreting the phenomena, through the conceptions and meanings obtained by the experiences of the participants, aiming to understand the experiences, points of view and opinions of the individuals in the face of the phenomenon studied.

As for the procedures, the research will be conducted through a multiple case study. As mentioned by Collis and Hussey (2005, p. 73), citing the work of Scapens (1990), entitled "Researching Management Accounting Practice: The Role of Case Study Methods", the author lists the types of studies and cites: descriptive, illustrative, experimental and, finally, explanatory case studies, in which the existing theory — in this study, Niklas Luhmann's theory of systems — is used to understand and explain data protection in the digital age, identifying their contributions to the understanding and regulation of this field in technology organizations.

METHODOLOGICAL PROCEDURES

The cases were selected on the internet with the criterion that they were technology organizations that made documents and data protection implementation measures available on their websites, allowing an analysis according to Niklas Luhmann's Systems Theory. Methodologically, the samples were non-probabilistic, which, according to Sampieri



et al. (2013, p. 405-406), are known as "guided by one or several purposes". This same author classifies the types of samples, and the sample of specialists was chosen, with the participation of a specialist in the area of public management and accounting of the public sector.

To provide greater consistency and reliability in the information collected, some criteria were used for the selection of the respondent, among which were documents implementing data protection measures that contained: encryption and security; privacy policies; control tools; compliance; and other additional information that could be analyzed according to the theory.

DATA COLLECTION AND ANALYSIS

Data collection was carried out in two moments. In the first stage, a search was carried out for articles in the semanticscholar.org with the keywords: data protection, digital age and Luhmann's theory, filtering by the category "Law". More than 89 articles were selected, which were transferred to Zotero so that those could be chosen that, after the analysis of their abstracts, would support the literature review. The inclusion criteria were articles seminal to the study of systems theory and the keywords requested. As an exclusion criterion, articles published before the 2000s were disregarded, due to the non-dissemination of the internet, which occurred only in later years.

In the second moment of this research, the technique of document data analysis was used. According to Caulley (1981 apud LÜDKE and ANDRÉ, 1986, p. 38), [...] documentary analysis seeks to identify factual information in documents based on issues or hypotheses of interest. Thus, it was possible to analyze the application of Niklas Luhmann's Systems Theory in data protection in the digital age, identifying its contributions to the understanding and regulation of this field in technology organizations. The option for this relationship between the documents and the literature review allowed the establishment of a fruitful dialogue between the digital protection policies of the chosen organizations and Luhmann's theory of systems, showing the dynamics and evolution of concepts and discussions about data protection, which were transformed into policies within the organizations, with the intention of disseminating a digital organizational culture.

ANALYSIS AND DISCUSSION OF THE RESULTS

This section of the article consists of demonstrating the results obtained and data analysis, which were structured as follows: Presentation of the selected organizations and subsequently, analyze and correlate aspects of the application of Niklas Luhmann's



Systems Theory in data protection in the digital age in these organizations such as: Autopoiesis; Operational Closure; Self-referentiality; communication; structural coupling and Alopoiesis.

GOOGLE

Google was founded in September 1998 by Larry Page and Sergey Brin while they were doctoral students at Stanford University. The initial goal was to develop a more efficient search engine, which resulted in the creation of one of the most widely used search engines in the world. Over the years, Google has expanded its operations to include a vast array of products and services, such as Android, YouTube, Google Maps, and Google Cloud.

The company has become one of the most valuable in the world, with a market value that often exceeds a trillion dollars. Google's customers range from individual users who use its free services to large corporations who rely on its cloud and digital advertising solutions to operate efficiently. Alphabet Inc. (GOOGL), the parent company of Google, has an estimated market value of approximately \$2.16 trillion, with an enterprise value of about \$2.05 trillion, according to the Stock Analysis website.

The first case of an organization to be analyzed regarding the implementation of robust data protection measures, under the lens of Luhmann's Theory, is Google. In the document available on its website, entitled "Google Privacy Policy", updated and effective as of March 28, 2024, all information about the data collection carried out by the organization is available.

In the first context used by Luhmann's theory, one of the most important concepts is autopoiesis. In this context, Google's privacy policy details how the company collects, uses, and protects user data, demonstrating its ability to create and maintain its own operations in a self-sustaining manner. This system is designed to continuously adapt to changes in the regulatory and technological environment, reflecting autopoiesis, where the system organizes and evolves based on its own internal dynamics.

As for the operational closure, it can be seen that Google's data protection practices are defined internally, with little direct influence from external factors, except with regard to regulatory compliance. This operational closure allows Google to maintain control over its data protection operations, ensuring that they are consistent and aligned with its own policies and procedures, insulated from direct external influences (MICROSOFT, 2024a).

Two other important issues are self-referentiality and communication from the Luhmannian perspective. In the first aspect, Google often refers to its own policies and



procedures to justify its data protection practices. This self-referentiality is crucial for maintaining the internal consistency and credibility of the system, as it provides a clear and stable basis on which data protection operations are carried out, as well as ensuring that practices are continuously aligned with the company's internal principles and standards.

In the second aspect, communication is a central element in Google's privacy policies, where the company uses clear and transparent language to inform users about its data collection and use practices. Tools like Google Dashboard and My Account allow users to control their privacy settings, fostering a continuous cycle of feedback and adaptation. This reinforces trust and transparency, essential elements for the sustainability of the data protection system (MICROSOFT, 2024b).

In the theory presented, structural coupling can be observed at Google when adapting to data protection regulations and compliance best practices, using the latest ISO/IEC certificates, SOC reports, and self-assessments. This allows the company to more securely utilize Google Cloud or Google Workspace, demonstrating how the system adjusts to external influences while maintaining its own identity. These Google compliance policies also reflect the interpenetrations by integrating data protection practices with other systems, such as legal and technological, ensuring a holistic approach to data privacy and security (MICROSOFT, 2024c).

Allopoiesis, although Google focuses on autopoiesis, can be seen in its interaction with external regulations. This interaction is seen as allopoiesis, where external adaptations are incorporated to maintain the system's compliance and functionality. For example, the judiciary, through a judicial decision, determines that the organization complies quickly, invoking a law or decree established in the country.

MICROSOFT

Microsoft Corporation was founded in 1975 by Bill Gates and Paul Allen, initially developing software for personal computers, including the famous MS-DOS operating system. With the launch of Windows in 1985, the company revolutionized the PC market, becoming one of the largest and most influential players in the technology industry. Over the years, Microsoft has diversified its products and services, including Microsoft Office, Azure (cloud platform), Xbox (game console), and LinkedIn (professional social network), in addition to acquiring GitHub (software development platform). In 2023, Microsoft's market cap is estimated to be approximately 2.5 trillion dollars, making it stand out as one of the most valuable companies in the world. Microsoft's customer base is extensive and varied, ranging from individual consumers to large corporations and government institutions,



cementing its position as a global leader in technology, according to the Stock Analysis website.

As for Microsoft's documents from the perspective of Luhmann's Systems Theory, autopoiesis can be seen in the company's privacy statements, including the *Microsoft Privacy Statement*, which highlights the information contained in the privacy reports, as well as cross-country strengthening commitments on data protection. Also noteworthy are *Microsoft 365 Guidance for Security & Compliance* and *Microsoft Purview Compliance Manager*, which demonstrate the company's ability to build and maintain a self-sustaining data protection system. This system continuously adapts to regulatory and technological changes, showing how Microsoft organizes its operations internally to ensure the protection of user data.

Operational Closure and Self-Referentiality are concepts that can be analyzed in the light of theory. The first refers to Microsoft's data protection practices, which are defined internally and operate in isolation from direct external influences. This ensures that Microsoft's lockbox maintains its internal coherence and functionality. The company establishes its standards and procedures to manage data securely and efficiently, minimizing external interference, except for regulatory compliance issues.

In the second case, Microsoft often refers to its own policies and procedures to justify and guide its data protection practices. This self-referentiality is crucial to maintain the consistency and credibility of the system, as the company uses its policies as a constant reference, ensuring that all actions and decisions related to data privacy and security are aligned with its internal guidelines.

Communication is a core element of Microsoft's privacy statements. The company uses clear and accessible language to inform users about its data collection, use, and protection practices. Tools like the *Microsoft Privacy Dashboard* (<https://privacy.microsoft.com>) allow users to control their privacy settings, fostering a continuous feedback loop and adaptation. This reinforces trust and transparency, which are essential elements for the sustainability of the data protection system.

Microsoft demonstrates structural coupling by adapting its data protection practices to comply with regulations such as GDPR. The company adjusts its system to meet external influences while maintaining its identity and functionality. This is visible in the compliance practices described in the *Microsoft Trust Center* (<https://www.microsoft.com/en-us/trustcenter>), which detail how the company handles legal and regulatory requirements.

Microsoft's data protection practices reflect interpenetrations by integrating aspects of legal and technological systems. The interaction between these systems allows the



company to maintain robust and comprehensive data protection practices, meeting multiple requirements and expectations. This includes the implementation of international safety standards, such as ISO/IEC 27018. While Microsoft focuses primarily on autopoiesis, the need to adapt to external regulations can be seen as an example of allopoiesis, where external adaptations are incorporated to maintain compliance and system functionality. The ability to integrate external requirements demonstrates the flexibility and resilience of the company's data protection system.

NETFLIX

Netflix is an American online streaming service, launched in 2010 and available in more than 190 countries. It is operated by the over-the-top media company of the same name, whose headquarters are located in Los Gatos, California. Founded in 1997, the company initially offered a DVD delivery service by mail. With the expansion of streaming in the United States from 2007, Netflix adapted and started to invest in this area of the digital environment. His first successful original web series was *House of Cards*, which was released in 2013. In March 2023, Netflix surpassed the 232 million subscriber mark globally, making it one of the most successful streaming service companies in the world.

Currently, Netflix has a market cap of approximately \$272 billion, making it the 37th most valuable company in the world in terms of market capitalization. This amount is a measure of the total outstanding shares multiplied by the current share price. In recent years, Netflix has experienced significant growth in its market value, increasing by about 70% in the last year, according to the *Stock Analysis website*.

To analyze the Netflix documents available on the Netflix Partner Help Center in light of Niklas Luhmann's Systems Theory, it is necessary to apply the key concepts of the theory, such as autopoiesis, operational closure, self-referentiality, communication, structural coupling, interpenetrations, and allopoiesis. Autopoiesis refers to the capacity of the system to self-produce and maintain its internal organization, as reported on another occasion.

In the context of Netflix's privacy policy, this is observed in the data protection practices that are designed to maintain the integrity of the system. Operational closure, in turn, implies that the system operates based on its own rules and internal logic. Netflix's privacy policy describes how data is collected, used, and protected internally, demonstrating a closed system that operates based on processes defined by the company itself.

Self-referentiality, in Luhmann's theory, indicates that a system refers to itself in its operations and decisions. Netflix, through its compliance documents and security practices,



frequently refers to its own policies and procedures to justify and explain its actions. Communication is an essential element in this context, as Netflix uses clear and accessible language to inform users about its privacy and security practices. This is crucial for maintaining transparency and building trust with users, a key aspect in personal data management.

Structural coupling occurs when two systems influence each other, while maintaining their distinct identities. Netflix's compliance with regulations such as the GDPR (General Data Protection Regulation) is a clear example of structural coupling. The company adapts its practices to comply with external laws, but continues to operate according to its own rules and structure. Interpenetrations refer to the interactions between systems that result in mutual influences. Netflix's interaction with regulatory authorities and its own users exemplifies these interpenetrations, where adaptation to legal norms influences internal data protection practices.

Allopoiesis, which is the production of external elements for system maintenance, can be seen in the way Netflix integrates external technologies and practices to improve its data security. The use of advanced technologies for fraud detection and prevention, as well as external compliance audits, are examples of this.

CISCO SYSTEMS

Cisco Systems was founded in 1984 by Leonard Bosack and Sandy Lerner, two computer scientists at Stanford University. Initially, the company developed network routers to facilitate communication between different computer systems. Over the years, Cisco has significantly expanded its operations, becoming a global leader in networking and communications solutions, ranging from network infrastructure to cybersecurity and cloud services. As of 2024, Cisco Systems has a market cap of approximately 191.05 billion USD (Stock Analysis). The company serves a wide range of customers, including large corporations, small and medium-sized businesses, government and educational institutions, offering solutions that are fundamental to the functioning of the internet and enterprise networks around the world.

The documents available in the Cisco Trust Center and Cisco Security were essential to analyze Luhmann's Systems Theory in the organization. One concept found was that of autopoiesis, where systems establish their own limits and internal functions to maintain their operability. Cisco implements privacy and compliance policies that work in a self-sufficient manner, ensuring that all operations are aligned with its internal data protection guidelines. As for operational closure, this is evidenced by the way Cisco treats



user data in isolation, protecting it from external interference and maintaining the consistency of its privacy policies.

Self-referentiality at Cisco is noticeable in compliance and privacy practices that constantly refer to the company's own established procedures and standards. Communication plays a crucial role as Cisco utilizes multiple channels to inform its customers about how data is collected, utilized, and protected. Effective communication, both internal and external, is essential to maintain customer trust and ensure regulatory compliance, highlighting how the system self-refers to validate its practices.

The concept of structural coupling is evident in Cisco's interactions with other entities, such as regulators and trading partners, where there is mutual adaptation without loss of autonomy. The compliance and security policies show how Cisco structurally couples with external regulations, adjusting its practices to comply with legal requirements while maintaining its autonomous operations. Interpenetrations are observable in information exchanges and collaboration with other organizations to improve security and data protection, enabling a flow of knowledge without compromising system integrity.

While Cisco, as an autopoietic system, focuses on self-maintaining, it also exhibits allopoietic characteristics when influencing and being influenced by other external systems. The company adopts compliance and security practices that affect the external environment, shaping industry standards and regulatory practices.

CONCLUSION

Analysis of the data protection practices of Google, Microsoft, Netflix, and Cisco Systems in light of Niklas Luhmann's Systems Theory reveals the effectiveness of this approach in the digital age. Luhmann's theory, with its concepts of autopoiesis, operational closure, self-referentiality, communication, structural coupling, interpenetrations, and allopoiesis, provides a robust framework for understanding how these companies manage and protect user data.

Autopoiesis, or the ability of a system to self-produce and maintain its internal organization, is evident in the data protection practices of all the companies analyzed. Google, for example, continuously adapts its privacy and data protection policies according to regulatory and technological changes, demonstrating robust self-sustainability. Similarly, Microsoft operates with an operational closure, internally defining its rules and procedures to ensure the protection of user data, minimizing external interference.

Self-referentiality manifests itself when companies refer to their own policies and procedures to justify their data protection practices. Google often uses its internal policies to



guide its actions and decisions, maintaining the consistency and credibility of the system. Communication, essential for transparency and trust of users, is carried out in a clear and accessible way by both Microsoft and Netflix. Tools like Google Dashboard and Microsoft Privacy Dashboard allow users to control their privacy settings, fostering a continuous loop of feedback and adaptation.

Structural coupling is observed in the adaptation of companies to external regulations, such as the GDPR, without losing their distinct identities. Microsoft and Cisco Systems exemplify this adaptation by adjusting their data protection practices to comply with legal requirements, while maintaining their autonomous operations. The interpenetrations are visible in these companies' interactions with legal and technological systems, allowing them to maintain robust and comprehensive data protection practices that meet multiple requirements and expectations.

While autopoiesis is a primary focus, allopoietic characteristics are also evident when these companies integrate external practices and technologies to improve data security. Netflix's interaction with advanced fraud prevention technologies and Cisco's external audits demonstrate how external adaptations are incorporated to maintain system functionality and compliance. These practices reflect the flexibility and resilience of companies' data protection systems, which are able to integrate external requirements without compromising their identity.

Niklas Luhmann's Systems Theory offers a comprehensive and adaptive framework for data protection management in the digital age. The data protection practices of Google, Microsoft, Netflix, and Cisco Systems exemplify how the concepts of autopoiesis, operational closure, self-referentiality, communication, structural coupling, interpenetrations, and allopoiesis can be applied effectively to create data protection systems that are both self-sustaining and adaptable to external changes.

This holistic approach not only ensures regulatory compliance but also strengthens users' trust and security in an increasingly complex and interconnected digital environment. By applying these concepts, businesses can develop resilient and effective data protection systems, ensuring the privacy and security of user data while navigating the complexities of the digital age.

SUGGESTIONS FOR FUTURE RESEARCH

For future research, it is suggested to apply the analysis in other sectors and with companies from different countries, in order to verify if there are divergences and how they have managed to adapt to the new data protection legislation in this digital age.



REFERENCES

1. Caulley, D. N. (1981). *Document analysis in program evaluation*. Paper and report series of the Research on Evaluation Program, n. 60. Portland, OR: Northwest Regional Educational Laboratory.
2. Collis, J., & Hussey, R. (2005). *Pesquisa em administração* (2ª ed.). São Paulo: Bookman.
3. Price, J. E. D. (2014). The adoption of Niklas Luhmann's systems theory in Argentine legal and social philosophy. *Problema. Anuario de Filosofía y Teoría del Derecho*, n. 8, 95-124.
4. Gil, A. C. (2009). *Como elaborar projetos de pesquisa* (4ª ed.). São Paulo: Atlas.
5. Knutsson, M. (2017). *Compliance with the General Data Protection Regulation: an exploratory case study on business systems' adaptation* (Trabalho de conclusão de curso, Mestrado em Ciência da Computação e Engenharia). KTH, Stockholm.
6. Lüke, M., & André, M. E. D. A. (1986). *Pesquisa em educação: Abordagens Qualitativas*. São Paulo, SP: EPU.
7. Luhmann, N. (1995). *Social systems*. Stanford: Stanford University Press.
8. Luhmann, N. (1997). *Law as a social system*. Oxford: Oxford University Press.
9. Luhmann, N. (1984). *The differentiation of society*. New York: Columbia University Press.
10. Mattheis, C. (2012). The system theory of Niklas Luhmann and the constitutionalization of the world society. *Goettingen Journal of International Law*, 4(2).
11. Maurer, K. (2010). Communication and language in Niklas Luhmann's systems-theory. *Pandaemonium Germanicum*, São Paulo, Brasil, n. 16, 1-21.
12. Messner, C. (2013). Luhmann's judgment. *International Journal for the Semiotics of Law - Revue internationale de Sémiotique juridique*, 27(2), 239-253.
13. Microsoft. (2024a). Microsoft 365 guidance for security & compliance. Disponível em: <https://learn.microsoft.com/en-us/office365/servicedescriptions/microsoft-365-service-descriptions/microsoft-365-tenantlevel-services-licensing-guidance/microsoft-365-security-compliance-licensing-guidance>. Acesso em: 12 jun. 2024.
14. Microsoft. (2024b). Microsoft privacy statement policy. Disponível em: <https://privacy.microsoft.com/en-us/privacystatement>. Acesso em: 12 jun. 2024.
15. Microsoft. (2024c). Microsoft Purview compliance manager. Disponível em: <https://learn.microsoft.com/en-us/purview/compliance-manager>. Acesso em: 12 jun. 2024.
16. Miller, J. A. (2022). Demoralizing: integrating J.D. Peters' communication 'chasm' with Niklas Luhmann's (1989) ecological communication to analyze climate change mitigation. *Kybernetes*, 51(5), 1443-1456.




17. Misheva, V. (2005). Luhmann's systems theory and the question of the mass media. **Cybernetics & Human Knowing**, 12(4), 23-50.
18. Mitrou, L. (2017). The general data protection regulation: A law for the digital age? In T. E. Synodinou, P. Jougoux, C. Markou, & T. Prastitou (Eds.), **EU Internet Law** (pp. 19-45). Cham: Springer.
19. Palmieri, E. (2020). The media and the social order in Niklas Luhmann. **World Complexity Science Academy**, 1(2).
20. Polcumpally, A. T. (2022). Artificial intelligence and global power structure: Understanding through Luhmann's systems theory: Constructing Luhmann's second order observations using triple helix model. **AI & Society**, 37(4), 1487-1503.
21. Sampieri, R., Collado, C., & Lucio, M. (2013). **Definições dos enfoques quantitativo e qualitativo, suas semelhanças e diferenças**. Porto Alegre, RS: Penso.
22. Scapens, R. W. (1990). Researching management accounting practice: The role of case study methods. **The British Accounting Review**, 22(3), 259-281.
23. Seidl, D. (2004). *Luhmann's theory of autopoietic social systems*. University of Zurich.
24. Selita, F. (2020). Justice in the genomic and digital era: A 'different world' requiring 'different law'. **Legal Issues Journal**, 8(1).
25. Silva, A. C. R. (2006). **Metodologia da pesquisa aplicada à contabilidade** (2ª ed.). São Paulo: Atlas.
26. Silva, J., Pedro Filho, F. S., Freitas, A., Xavier, D., & Sui-Qui, T. (2017). Hermeneutics of sustainability from the perspective of Brazilian Federal Constitution. **IJASOS - International E-journal of Advances in Social Sciences**, 3(10), 318-328.
27. Stock Analysis. (2024). Disponível em: <https://stockanalysis.com/>. Acesso em: 12 jun. 2024.
28. Tuz, A. (2023). Data privacy and security: Legal obligations for businesses in the digital age. **Juridical Scientific and Electronic Journal**.
29. Tzoulia, E. (2019). Targeted advertising in the digital era: Modern challenges to consumer privacy and economic freedom. The responses of the EU legal order. In **Regulation and enforcement in the digital age** (pp. 56-78). Nicosia: University of Cyprus & European University Cyprus.
30. Valeo, A., & Underwood, K. (2015). Analysis of special education tribunal outcomes using Luhmann's systems theory. **International Journal of Special Education**, 30(1), 4-14.
31. Wu, Y. (2024). Balancing data protection and data utilization: Global perspectives and trends. **Lecture Notes in Education Psychology and Public Media**, 44, 134-140.
32. Yin, R. K. (2010). **Estudo de caso: Planejamento e métodos** (4ª ed.). Porto Alegre: Bookman.



33. Zacharakis, J. (2017). The democratic ideal vs. Luhmann's autopoietic systems in adult education. In *Adult Education Research Conference* (pp. 13-25).
34. Zou, C., & Zhang, F. (2022). Algorithm interpretation right: The first step to algorithmic governance. *Beijing Law Review*, 13, 227-246.

EVALUATION OF LOSSES IN COTTON HARVEST AT DIFFERENT HARVESTER SPEEDS

 <https://doi.org/10.56238/sevened2024.029-015>

Adailton Nogueira da Silva Júnior¹, Wellington Gonzaga do Vale², Valfran José Santos Andrade³, Adilson Machado Enes⁴, Patricia Azevedo Castelo Branco Vale⁵ and Thiago Martins Machado⁶

ABSTRACT

The losses generated during the harvest of agricultural products are common, being due to the most varied problems, among them the speed of movement of the harvester. Thus, the objective of this work was to diagnose the losses in the cotton harvest as a function of the harvester's travel speed, seeking to relate them to phenological factors directly linked to the operation and that can contribute to the improvement of the harvest quality. The data were analyzed through sampling and for their presentation, descriptive statistics were used, seeking measures of central tendency and the occurrence of variability to represent the results. By the simple random sampling technique, the confidence intervals for the mean were obtained. Two travel speeds were used, 5.0 and 6.6 km h⁻¹. It was sought to evaluate, before the passage of the harvester, maximum productivity and the pre-harvest loss, manually collecting all the cotton from the sample area, and immediately after the passage of the harvester, the total loss was collected. It was observed that the pre-harvest loss of cotton is relatively low and close to the values found in the literature for the State of Mato Grosso. The average total loss found remained within the limit considered acceptable.

Keywords: Quantitative Losses. Speed. Harvester.

¹ Agricultural and Environmental Engineer
Institution: Federal University of Mato Grosso
E-mail: adailton_mt@hotmail.com

² Doctor in Plant Production
Institution: Federal University of Sergipe
E-mail: valewg@gmail.com

³ Master in Water Resources
Institution: Federal University of Sergipe
E-mail: valfranjose40@gmail.com

⁴ Doctor in Agricultural Engineering
Institution: Federal University of Sergipe
E-mail: adilsonenes@gmail.com

⁵ Doctor in Animal Science
Institution: Federal University of Sergipe
E-mail: patriciavale78@gmail.com

⁶ Doctor in Agricultural Mechanization
Institution: Federal University of Mato Grosso
E-mail: thiago.machado@ufmt.br

INTRODUCTION

The cotton crop (*Gossypium hirsutum* L.) is widely cultivated in more than 60 countries, with China, India, the United States, Pakistan and Brazil as the main producers. Brazil stands out as the second largest exporter in the world and leads in rainfed cotton productivity. In addition, the domestic market is promising, with the country being the fifth largest global consumer of cotton (ABRAPA, 2023).

The state of Mato Grosso leads cotton production in Brazil, accounting for 72.2% of seed cotton production in the 2023/24 harvest. Most producers in the region choose to plant second-crop cotton, due to the high volume of rainfall during the sowing period of first-crop cotton (CONAB, 2024).

Cotton has indeterminate growth, and its architecture can be adjusted to facilitate harvesting and increase productivity, depending on environmental and management conditions (OOSTERHUIS, 1999). In addition, factors such as ripening point, adjustment and speed of machines, plant size, soil type and variety influence harvest losses. According to Vieira *et al.* (2001), acceptable losses during the cotton harvest should be between 6% and 8%, with 10% being the maximum value tolerated.

Losses during the cotton harvest need to be monitored to identify possible flaws in the process and allow their correction. Examples of quantitative losses include: cotton that falls to the ground, cotton that remains in the cotton plant after the harvester passes, and weight loss caused by delayed harvesting (FERRONATO *et al.*, 2003).

According to Embrapa (2006), during the mechanized harvest of cotton, the quantitative losses vary between 15% and 17%, while in the manual harvest these losses do not exceed, on average, 5%. Regarding qualitative losses, mechanized harvesting can reach up to 35%, while manual harvesting registers only 5%.

The modernization of cotton farming, driven by large commercial plantations and the shortage of labor in rural areas, favored the intensive use of mechanization in cultivation. Harvesting by means of self-propelled harvesters has become one of the main factors to enable the exploitation of this crop in extensive areas. Mechanized harvesting has several advantages compared to manual harvesting, such as reduced operating costs, faster process, lower impurity content, reduced contaminants, and labor savings in the stages of receiving, weighing, and using bags. These factors make mechanization essential in large areas of cultivation (EMBRAPA, 2003).

Most of the machinery used in the cotton harvest in Mato Grosso is imported from the United States, where this technology was originally developed. However, adaptations are necessary for cotton grown in Brazil, since the plants here are larger in size compared

to the American standard. To reduce crop losses, many growers have adjusted machine settings, which has resulted in an increase in the rate of impurities. This generated several complaints from the industry due to the presence of pieces of cotton stem bark, caused by the friction of the harvesting spindles with the stems of the plants (BELOT *et al.*, 2002).

There are two main types of machines used in cotton harvesting: the picker harvester, which removes only the seed cotton, and the stripper harvester, equipped with a pulley system that removes both the whole bolls and the wrappers (EMBRAPA, 2006).

Most of the cotton harvested in Mato Grosso uses picker harvesters. However, according to Spurlock *et al.* (1991) and Faulkner *et al.* (2011), the stripper harvester has several advantages over the picker, including a significantly lower purchase price, fewer moving parts in the line units, which results in lower fuel consumption and maintenance. On the other hand, researchers such as Columbus *et al.* (2001), Willcutt and Columbus (2002) and Brashears and Baker (2000) highlight that the picker harvester collects less foreign material, such as leaves and branches, better preserving the quality of the fiber and being able to operate at higher speeds (Faulkner *et al.* 2011).

The cotton picker is a complex and delicate machine that must be handled by a skilled and responsible operator. Proper regulation of the harvester is essential to ensure the good performance of the process. The operator must consider several aspects, such as the harvesting speed, the moisture of the plume at the time of harvesting, the cleanliness of the machine, the adjustment of the distance between spindles, brushes and shredders, as well as the percentage and amount of water and detergent applied to the spindles. The pressure plates also need to be correctly regulated to maximize the removal of the plume, avoiding the removal of branches and bark from the stem (BRUNETTA, 2005).

Due to the scarcity of studies on cotton harvest losses, SILVA *et al.* (2007) suggest the realization of a parallel between the losses in this crop and in other agricultural crops. Although they have distinct phenological characteristics, these crops share some similarities, such as the reduced time for harvest, the influence of adverse climatic factors, and the lack of proper management of machinery, among others.

Silva *et al.* (2011), when evaluating the losses in the cotton harvest in the municipality of Ipameri-GO, observed that, in the properties studied, the losses in the soil were higher than the losses in the plant, representing about 59% of the total losses. These results are in line with the studies by Khalilian *et al.* (1999) and Ferreira (2013), who also identified greater losses in the soil during the cotton harvest.

According to Ferronato *et al.* (2003), the climate can influence losses during the cotton harvest. When comparing the total losses of the same cultivar in different

municipalities, significant differences were observed. As these municipalities are located in regions with altitude variations, it is reasonable to assume that agroclimatic conditions have interfered with the results. In addition, other factors such as management and harvest speed cannot be disregarded, which can also impact losses.

During the harvest, the person in charge must carefully monitor the losses, which include the cotton that falls to the ground and the remnants on the plants. Normally, this evaluation is carried out daily, with the collection and weighing of cotton from 5 rows of 5 meters each (BELOT and VILELA, 2006). In the conditions of the Brazilian cerrado, losses during harvest vary between 9.4% and 12.5% (FREIRE, 2011).

When assessing the losses in mechanical cotton harvesting in the municipality of Juscimeira-MT, Ferreira *et al.* (2013) observed that the travel speed of 7.2 km h⁻¹ resulted in the highest total losses, reaching 14.1%.

Rangel *et al.* (2003) state that losses during mechanized cotton harvesting can vary from 5% to 15%. However, these losses can be reduced to less than 5% when machines are well regulated and operators are trained.

According to Eleutério (2001), the transformations in Brazilian agriculture were significant, especially in cotton cultivation, which quickly evolved from a family activity, which demanded a lot of labor, to large-scale production with large capital investments and high technology, especially in the cerrados of the Midwest region. Harvesting is a crucial step in the cotton production process, and when carried out inadequately, it can result in both quantitative and qualitative losses in the final product.

Cotton harvesting is a critical stage for producers, as the cost associated with this phase represents a significant portion of the total cost of production. Factors such as the higher cost of production, the agricultural calendar, and the harvesting method can substantially impact both crop quality and productivity.

The objective of this study was to diagnose cotton harvest losses as a function of displacement speed, seeking to relate them to phenological factors directly linked to the operation and that can contribute to the improvement of harvest quality.

THEORETICAL FRAMEWORK

The experiment was carried out in the production field of Mutum Farm, located in the municipality of Nova Mutum-MT. The municipality of Nova Mutum is located at the following geographic coordinates: 13°05'04" south latitude and 56°05'16" west longitude, with an average altitude of 450 meters. The Köppen classification for the region is an Aw-type climate, tropical savannah, proper, with summer rainfall and dry winter, characterized by

average temperatures of 24°C, with average annual rainfall of 2,200 mm.

The data were analyzed through sampling and for their presentation, descriptive statistics were used, seeking measures of central tendency and the occurrence of variability to represent the results. By the simple randomized sampling technique, the confidence intervals for the mean (VALE *et al.*, 2008, VALE *et al.*, 2009, VALE *et al.*, 2010). Two travel speeds were used, 5.0 and 6.6 km h⁻¹, and a total of 48 samples were performed. The sampling points were chosen at random, and the total area used in the experiment was 29,412.20 m² (2.94 ha).

The John Deere cotton picker, model 7760, with 394.96 kW (537 hp) of engine power, platform with 6 rows of harvesting unit, year of manufacture 2012 and using the picker harvesting system, was used. The variety cultivated on this property was FMT 705, sown with row spacing of 0.76 meters.

The FMT 705 cultivar, belongs to the Mato Grosso Foundation and is recommended for cultivation throughout Brazil, with a late cycle, is pointed out as an alternative for opening planting. It has RX technology, which is tolerant to nematodes and confers resistance to the disease caused by *Ramularia areola* (FUNDAÇÃO MATO GROSSO, 2013).

For the phenological characterization of the crop, plant height (AP), height of the first boll in relation to the soil (APCS), number of bolls per plant (NCP), final population (PF), actual yield (PR) and maximum yield (PM) were determined.

To estimate the variables (AP, APCS, NCP, PF, PR and PM) a template of 0.5 meters wide and 3.8 meters long (1.9 m²) was used. On the property, a plot was selected that represents the property as a whole, in this plot was carried out the sampling of plants contained within the template, at five random points.

Plant height was performed by obtaining the average of the measurement between the soil level and the apex of the plant in all plants contained within the template.

The height of the first boll in relation to the ground was obtained by averaging the distance between the ground level and the height of the first boll in all plants contained within the template.

The number of bolls per plant was obtained by the average of the bolls in all plants contained within the template.

The sampling to survey the losses was divided into two stages, the first consisted of the collection of data regarding the estimate of Pre-Harvest Losses (PPC), before the mechanized harvest, and the second stage was carried out after the mechanized harvest through the collection of data from the estimates of Total Losses (TP).

To determine the pre-harvest losses, all the material that was fallen on the ground inside the template was manually collected. To determine the total losses, all the material that was within the same template used to determine the pre-harvest losses and that remained in the soil and in the plant after the passage of the harvester was manually collected.

The final plant population was determined by counting the number of plants at the time of harvest, contained within the template.

To determine the yield, all bolls present in all plants contained in the space delimited by the template were manually collected, before the passage of the harvester, that is, without post-harvest losses, thus representing the maximum yield.

The material properly identified upon arrival at the laboratory underwent a cleaning process, was weighed and the humidity of the samples was determined. The humidity was determined by the gravimetric method, and the samples taken for this purpose were weighed moist, and dried in a forced air oven, at 70° C, until constant weight (FERRONATO *et al.*, 2003).

The results obtained for the phenological characterization of the crop were analyzed by means of descriptive statistics to identify behavior and variability. Measures of central tendency (arithmetic mean and median) and dispersion (coefficients of variation, asymmetry and kurtosis) were calculated using the statistical application SAEG 9.0 (RIBEIRO JÚNIOR, 2001).

The results of the losses obtained were submitted to analysis of variance with applications of the "F" test and the means were compared by Tukey's test at the significance level of 5% probability, using the statistical application SAEG 9.0 (RIBEIRO JÚNIOR, 2001).

METHODOLOGY

The experiment was carried out in the production field of Mutum Farm, located in the municipality of Nova Mutum-MT. The municipality of Nova Mutum is located at the following geographic coordinates: 13°05'04" south latitude and 56°05'16" west longitude, with an average altitude of 450 meters. The Köppen classification for the region is an Aw-type climate, tropical savannah, proper, with summer rainfall and dry winter, characterized by average temperatures of 24°C, with average annual rainfall of 2,200 mm.

The data were analyzed through sampling and for their presentation, descriptive statistics were used, seeking measures of central tendency and the occurrence of variability to represent the results. By the simple randomized sampling technique, the confidence

intervals for the mean (VALE *et al.*, 2008, VALE *et al.*, 2009, VALE *et al.*, 2010). Two travel speeds were used, 5.0 and 6.6 km h⁻¹, and a total of 48 samples were performed. The sampling points were chosen at random, and the total area used in the experiment was 29,412.20 m² (2.94 ha).

The John Deere cotton picker, model 7760, with 394.96 kW (537 hp) of engine power, platform with 6 rows of harvesting unit, year of manufacture 2012 and using the picker harvesting system, was used. The variety cultivated on this property was FMT 705, sown with row spacing of 0.76 meters.

The FMT 705 cultivar, belongs to the Mato Grosso Foundation and is recommended for cultivation throughout Brazil, with a late cycle, is pointed out as an alternative for opening planting. It has RX technology, which is tolerant to nematodes and confers resistance to the disease caused by *Ramularia areola* (FUNDAÇÃO MATO GROSSO, 2013).

For the phenological characterization of the crop, plant height (AP), height of the first boll in relation to the soil (APCS), number of bolls per plant (NCP), final population (PF), actual yield (PR) and maximum yield (PM) were determined.

To estimate the variables (AP, APCS, NCP, PF, PR and PM) a template of 0.5 meters wide and 3.8 meters long (1.9 m²) was used. On the property, a plot was selected that represents the property as a whole, in this plot was carried out the sampling of plants contained within the template, at five random points.

Plant height was performed by obtaining the average of the measurement between the soil level and the apex of the plant in all plants contained within the template.

The height of the first boll in relation to the ground was obtained by averaging the distance between the ground level and the height of the first boll in all plants contained within the template.

The number of bolls per plant was obtained by the average of the bolls in all plants contained within the template.

The sampling to survey the losses was divided into two stages, the first consisted of the collection of data regarding the estimate of Pre-Harvest Losses (PPC), before the mechanized harvest, and the second stage was carried out after the mechanized harvest through the collection of data from the estimates of Total Losses (TP).

To determine the pre-harvest losses, all the material that was fallen on the ground inside the template was manually collected. To determine the total losses, all the material that was within the same template used to determine the pre-harvest losses and that remained in the soil and in the plant after the passage of the harvester was manually

collected.

The final plant population was determined by counting the number of plants at the time of harvest, contained within the template.

To determine the yield, all bolls present in all plants contained in the space delimited by the template were manually collected, before the passage of the harvester, that is, without post-harvest losses, thus representing the maximum yield.

The material properly identified upon arrival at the laboratory underwent a cleaning process, was weighed and the humidity of the samples was determined. The humidity was determined by the gravimetric method, and the samples taken for this purpose were weighed moist, and dried in a forced air oven, at 70° C, until constant weight (FERRONATO *et al.*, 2003).

The results obtained for the phenological characterization of the crop were analyzed by means of descriptive statistics to identify behavior and variability. Measures of central tendency (arithmetic mean and median) and dispersion (coefficients of variation, asymmetry and kurtosis) were calculated using the statistical application SAEG 9.0 (RIBEIRO JÚNIOR, 2001).

The results of the losses obtained were submitted to analysis of variance with applications of the "F" test and the means were compared by Tukey's test at the significance level of 5% probability, using the statistical application SAEG 9.0 (RIBEIRO JÚNIOR, 2001).

RESULTS AND DISCUSSIONS

Table 1 presents the values of the descriptive statistics parameters containing the mean, median, amplitude, standard deviation, coefficients of variation, asymmetry and kurtosis related to the phenological characteristics of the cotton plant.

Table 1. Phenological data of cotton plants

Factors	Average	Median	Amplitude	Standard deviation	CV (%)	Ck	Cs
AP (m)	1,09	1,09	0,07	0,03	2,48	1,60	+0,51
APCS (m)	0,61	0,61	0,11	0,04	6,37	1,60	-0,52
NC	7,16	7,16	3,08	1,11	15,51	1,60	+0,37
PF (^{ha} -1 plants)	152.631	152.021	26.315	9.846	6,45	1,60	-0,55

Coefficient of Variation. Cs: Asymmetry coefficient. Ck: Kurtosis Coefficient

Initially, it is observed that the mean and median values (Table 1) are equal or very close, for the variables plant height (AP), height of the first boll in relation to the ground (APCS) and number of bolls per plant (NC), they are equal. This is an indication that the

values are symmetrically distributed around the mean and the median and that these measures can be considered as typical values of the set of observations, that is, the observed results can be summarized by one of these measures.

For the AP, APCS and PF variables, it is observed that the amplitude (Table 1) of variation in the data is not very pronounced, when compared to the respective mean and median values. In other words, the data are not far from these measures of central tendency, which reinforces the hypotheses of less dispersion between the data and the symmetry of the distributions. For the final population (NC) variable, the total amplitude is higher, indicating that there is relatively greater variation between the observed values, which may influence their symmetry around the measures of central tendency.

The observation is confirmed by the coefficient of variation values (Table 1), which can be considered low, especially for the AP, APCS and PF variables. The NC variable, on the other hand, has a coefficient of variation of medium variation. The variables of the present study can be classified, according to Warrick and Nielsen (1980), as low and medium variation, since these authors established an interval in which they classified as low variation – $CV < 12\%$; of medium variation – $12\% \leq CV \leq 52\%$; and high variation – $CV > 52\%$. Ferreira (2013) reported coefficients of variation of 7.3, 9.9 and 11.2% for the AP, NC and PF variables, respectively, most of them are above those found in this study, while for the APCS variable, no report was found.

According to Rosolem (2001), the maximum height of cotton plants should not exceed 1.5 times the spacing between rows of the crop, to avoid self-shading. The average height of plants was 1.09 m (Table 1), considering that the row spacing was 0.76 meters for the property. Ferreira *et al.* (2013) observed plant heights of 0.92 m, a value close to that found in this study. The average height value fits within the quality standards indicated by Rosolem (2001). Anselmo *et al.* (2011) points out that plant height is a genetic characteristic that varies according to the cultivar, and the heights obtained by each cultivar vary according to the application of growth control regulators.

Like plant height, the height of the first boll in relation to the ground (APCS) is a characteristic that varies depending on the cultivar and the management of the cotton plant. The APCS remained between 0.55 m and 0.66 m (Table 1). This height, as well as the distribution of bolls in the plant, is directly related to the working height of the harvester platform, and, therefore, the greater the amplitude of these values, the greater the losses in the plant, since the platform has a fixed height, and it is possible to regulate it only in relation to the height of the first boll (FERREIRA, 2007).

The number of bolls per plant and per area is the most important component of

cotton crop production, since the number of bolls and mass are directly related to productivity (MOREIRA, 2008).

The NC observed in this property was 7.83 bolls per plant (Table 1), this value corroborates that found by Ferreira *et al.* (2013).

According to Embrapa (2001), the ideal number of plants should be between 80,000 and 120,000 plants per hectare, with row spacing between 0.80 and 0.90 meters. However, the result obtained from the final population was higher in the analyzed property due to the smaller row spacing, consistent with the work carried out by Jost and Cothren (2000), who found that the reduction of the row spacing generates an increase in the final population.

Regarding the symmetry of the distribution of the observed values, it can be seen from the distortion value (Table 1) that the AP and NC variables present asymmetry to the right ($0.15 < Cs < 1.0$). On the other hand, the APCS and PF variables present asymmetry on the left ($-0.15 < Cs < -1.0$), however, as the mean is practically equal to the median, this asymmetry can be considered moderate, according to the classification given by Góes (1980), cited by Mesquita *et al.*, 2003.

The kurtosis coefficients (Table 1) show that the variables AP, APCS, NC and PF can be considered leptocurtic ($Ck > 0$), indicating that the values are extreme in relation to the mean.

The pre-harvest losses found at Mutum Farm are in agreement with the results found by Belot *et al.* (2002) for the state of Mato Grosso, which is between 0.50% and 4.79% (Table 2).

Table 2. Pre-harvest loss data from mechanized cotton harvesting

Factors	Average	Median	CV (%)	Ck	Cs
PPC (P_{k-1})	101,05	82,9	34,46	2,46	+0,66
PPC ($@^{A-1}$)	6,73	5,53			
PPC (%)	2,01		36,15		

PPC: pre-harvest loss. CV: Coefficient of Variation. Cs: Asymmetry coefficient. Ck: Kurtosis Coefficient

It is observed that the mean and median values (Table 2) for the PPC variable are not close. This is an indication that the values are not symmetrically distributed around the mean and the median and that these measures cannot be considered as typical values of the set of observations, that is, the observed results cannot be summarized by one of these measures.

The observation is confirmed by the value of the coefficient of variation (Table 2), which was 34.46%, which was considered to be of medium variation ($12\% \leq CV \leq 52\%$).

Regarding the symmetry of the distribution, the observed value (Table 2) shows

moderate asymmetry on the right ($0.15 < Cs < 1.0$).

From the kurtosis coefficient (Table 2), it can be seen that the PPC variable can be considered leptocurtic ($Ck > 0$), indicating that the value is extreme in relation to the mean.

The high rates of pre-harvest losses at the Mutum Farm were probably inherent to the delay in the harvest. Because, according to Belot *et al.* (2010) a one-month delay in the harvest can generate pre-harvest losses of around 4%, and at the Mutum Farm the start was delayed by 10 days.

Due to the existence of few studies on losses in the cotton harvest, Silva *et al.* (2007) suggest that in order to explain the losses found in the cotton harvest, a parallel should be drawn with the losses of other crops, because despite the distinct phenological characteristics, with regard to the harvesting process there are several similarities. Mesquita *et al.* (2001) explain that in order to avoid losses in the soybean harvest, a series of precautions must be taken, including the monitoring of the harvester's work speed.

Ferreira *et al.* (2013) evaluating the losses in the mechanized cotton harvest in different cultivars (FMT 701 and FMT 705) and travel speeds (3.6 and 7.2 km h⁻¹), in the production field of Fazenda Mirandópolis (near Rondonópolis-MT), observed that the speed of 7.2 km h⁻¹ caused the highest total losses (14.1%).

At the Mutum Farm, the values of total losses were below the maximum acceptable value of losses in the cotton harvest (Table 3).

Table 3. Average results of the survey of total losses as a function of velocities

Speeds (km h ⁻¹)	PT (kg ha ⁻¹)	PT (@ ha ⁻¹)	PT (%)
5,0	344,2 a	22,95 a	6,85 a
6,6	352,2 a	23,48 a	7,01 a
CV (%)	28,61	25,01	

total loss. Means followed by the same letter in the column did not differ from each other by Tukey's test ($p \leq 0.05$)

However, the results did not differ significantly between the two speeds studied, with an increase in total losses with the increase in the harvester's working speed.

Correlating this study of losses at the Mutum Farm to that of Mesquita *et al.* (2001) who studied the influence of the speed of movement of the harvester on quantitative losses in the soybean harvest, it is possible to verify an agreement in the results. In the study by Mesquita *et al.* (2001), with the increase in the speed of movement of the harvester, there is a significant increase in soybean losses; Ferreira *et al.* (2013) observed that with an increase in speed from 3.6 to 7.2 km h⁻¹, total losses increased from 10.6% to 14.1%. These results corroborate those found in this property.

The values of total losses evaluated in this property are close to the values found by

Ferronato *et al.* (2003) in the cotton harvest in the Southeast region of the state of Mato Grosso, which are between 5.4% and 9.4%. These values obtained are below the values of total losses found in the cotton harvest under cerrado conditions, which are between 9.4% (NOGUEIRA and SILVA, 1993) and 12.5% (FREIRE *et al.*, 1995). And below the value cited by Vieira *et al.* (2001) as acceptable, whose maximum rate is 10% of losses.

The result of maximum yield of seed cotton was obtained from the manual harvesting of each template, before the passage of the harvester. The average water content in seed cotton at the time of harvest was 5.7%.

The value of the actual productivity was obtained by subtracting the value of the pre-harvest loss from the value of the maximum productivity.

Table 4 presents the values of the descriptive statistics parameters containing the mean, median, amplitude, standard deviation, coefficients of variation, asymmetry and kurtosis related to the maximum and actual yield of cotton.

Table 1. Data on the average of maximum and actual yields of cotton

Factors	Average	Median	Amplitude	Standard deviation	CV (%)	Ck	Cs
PM (kg ha ⁻¹)	5.021,72	5.021,72	1.953,32	690,87	12,58	1,60	-0,06
PM (@ ^{A-1})	334,78	334,78	130,22	46,06			
PR (kg ha ⁻¹)	4.572,47	4.575,60	481,98	124,17	11,20	2,31	-022
PR (@ ^{a-1})	304,83	305,00	32,13	8,28			

PM: Maximum productivity. PR: Real productivity. CV: Coefficient of Variation. Cs: Asymmetry coefficient. Ck: Kurtosis Coefficient

It is observed that the mean and median values (Table 4) are the same. This is an indication that the values are symmetrically distributed around the mean and the median and that these measures can be considered as typical values of the set of observations, that is, the observed results can be summarized by one of these measures.

The range of variation of the data is not very pronounced, when compared to the respective mean and median values. In other words, the data are not far from these measures of central tendency, which reinforces the hypotheses of less dispersion between the data and the symmetry of the distributions.

The coefficient of variation found in this study for the PM was 13.76% (Table 4), this value is considered to be of medium variation ($12\% \leq CV \leq 52\%$). Ferreira *et al.* (2013) evaluating the same cultivar (FMT 705) reported a coefficient of variation of 15.20% for the maximum yield.

Regarding the symmetry of the distribution the observed value (Table 4), it can be seen, by the value of the distortion, that the variable PM presents asymmetry to the left ($-0.15 < Cs < -1.0$), however, as the mean is equal to the median, this asymmetry can be



considered moderate, according to the classification given by Góes (1980 apud Mesquita *et al.*, 2003).

CONCLUSION

The speed of movement did not have a significant influence on the losses in the cotton harvest. And the total losses found in this study are within the limit considered acceptable for the cotton harvest.

REFERENCES


1. ABRAPA – Associação Brasileira dos Produtores de Algodão. (2023). *Relatório Cotton Brazil 2023*. Brasília: ABRAPA. Disponível em: <https://abrapa.com.br/wp-content/uploads/2024/05/Relatorio-Cotton-Brazil-2023-2.pdf>. Acesso em: 7 set. 2024.
2. Banzatto, D. A., & Kronka, S. E. (1995). *Experimentação agrícola* (3ª ed.). Jaboticabal: FUNEP.
3. Belot, J. L., Farias, F. J. C., & Vilela, P. M. C. (2010). Cultivares de algodoeiro herbáceo para sistema de cultivo adensado. In *O Sistema de Cultivo do Algodoeiro Adensado em Mato Grosso* (pp. 1-390). Cuiabá: Defanti.
4. Belot, J. L., Vilela, P. M. C. A., Rousseau, D., Marques, A. P., Aguiar, P., & Siqueira, F. V. (2002). Otimização da colheita mecanizada das principais cultivares comerciais de Mato Grosso e de linhas da Coodetec/Unicotton, Fundação MT e IPA: Safra de 2001-2002. In *Relatório Final FACUAL* (pp. 1-72). [S.l.: s.n.].
5. Belot, J. L., & Vilela, P. M. C. A. (2006). Colheita de algodão. In *FACUAL - Fundo de Apoio a Pesquisa do Algodão. Algodão – Pesquisas e Resultados para o Campo* (pp. 1-390). Cuiabá: FACUAL.
6. Brashears, A. D., & Baker, R. V. (2000). Comparison of finger strippers, brush roll strippers and spindle harvesters on the Texas High Plains. In *Proc. Beltwide Cotton Conf.*, San Antonio, TX (pp. 452-453). Natl. Cotton Counc. Am., Memphis, TN.
7. Brunetta, E. (2005). Estratégias de colheita e beneficiamento para fibra de alta qualidade. In *Congresso Brasileiro do Algodão, 5*. Disponível em: http://www.cnpa.embrapa.br/produtos/algodao/publicacoes/trabalhos_cba5/316.pdf. Acesso em: 8 maio 2014.
8. Columbus, E. P., Willcutt, M. H., & Valco, T. D. (2001). Ginning comparisons of ultra narrow row cotton with commercial and micro gin. In *Beltwide Cotton Conference, 2001, Anaheim* (pp. 1365-1369). Memphis: National Cotton Council.
9. CONAB – Companhia Nacional de Abastecimento. (2024). *Acompanhamento de safra brasileira: Grãos safra 2023/24, sétimo levantamento, abril 2014*. Brasília: CONAB.
10. Eleutério, J. R. (2001). Colheita mecânica: Avaliação das perdas e otimização. In *Congresso Brasileiro de Algodão, 3*. Campo Grande. Anais... Campina Grande: EMBRAPA/CNPA, pp. 11-14.
11. EMBRAPA – Empresa Brasileira de Pesquisa Agropecuária. (2003). *Cultura do Algodão no Cerrado*. Embrapa Algodão. Disponível em: <http://sistemasdeproducao.cnptia.embrapa.br/FontesHTML/Algodao/AlgodaoCerrado/colheita.htm>. Acesso em: 12 junho 2013.
12. EMBRAPA – Empresa Brasileira de Pesquisa Agropecuária. (2006). *Padrões Universais para Classificação do Algodão*. Disponível em: <http://www.infoteca.cnptia.embrapa.br/bitstream/CNPA/18321/1/DOC151.pdf>. Acesso em: 2 janeiro 2013.

13. EMBRAPA – Empresa Brasileira de Pesquisa Agropecuária. (2001). *Algodão: Tecnologia de produção*. Dourados: Embrapa Agropecuária Oeste/Embrapa Algodão.
14. Faulkner, W. B., Wanjura, J. D., Boman, R. K., Shaw, B. W., & Parnell Jr., C. B. (2011). Evaluation of modern cotton harvest systems on irrigated cotton: Harvester performance. *American Society of Agricultural and Biological Engineers*, 27(4), 497-506.
15. Ferreira, F. M. (2013). Perdas na colheita e qualidade da fibra de cultivares de algodão adensado em função de sistemas de colheita. Dissertação (Mestrado em Agronomia) – Faculdade de Ciências Agrônômicas, Universidade Estadual Paulista, Botucatu.
16. Ferreira, F. M., Silva, A. R. B., Silva, P. R. A., Benez, S. H., Kroth, B. E., & Ormond, A. T. (2014). Pluma perdida. *Cultivar Máquinas*, 137, 34-37.
17. Ferreira, I. C. (2007). Diagnóstico da colheita e beneficiamento de sementes de algodão na região sul de Goiás. Dissertação (Mestrado em Agronomia) – Faculdade de Ciências Agrárias e Veterinárias de Jaboticabal, Universidade Estadual Paulista, Jaboticabal.
18. Ferronato, A., Pereira, L. C., Júnior, L. D. S., Bezerra, E. L., Bassan, R. C., & Borges, D. C. (2003). Avaliação e análise de perdas na colheita da cultura do algodão na região sudeste do estado de Mato Grosso. In *Congresso Brasileiro de Algodão, 4*. Disponível em:
http://www.cnpa.embrapa.br/produtos/algodao/publicacoes/trabalhos_cba4/200.pdf. Acesso em: 17 junho 2013.
19. Freire, E. C. (2011). *Algodão no cerrado do Brasil*. Aparecida de Goiânia: Associação Brasileira dos Produtores de Algodão – ABRAPA. Mundial Gráfica, 2ª ed., 1082 p.
20. Freire, E. C., Boldt, A. F., Oliveira, L. C., & Andrade, F. P. (1995). Perdas na colheita do algodão em Mato Grosso. In *VII Reunião Nacional do Algodão*, Londrina: IAPAR.
21. Fundação Mato Grosso. (2008). Cultivares convencionais: 705. Disponível em: <http://www.fundacaomt.com.br/algodao/?cult=705>. Acesso em: 10 dez 2013.
22. Gomes, F. P., & Garcia, C. H. (2002). *Estatística aplicada a experimentos agrônômicos e florestais: Exposição com exemplos e orientações para uso de aplicativos*. Piracicaba: FEALQ.
23. Jost, P. H., & Cothren, J. T. (2001). Growth and yield comparisons of cotton planted in conventional and ultra-narrow row spacings. *Crop Science*, 40(2), 430-435.
24. Khalilian, A., Sullivan, M. J., & Mueller, J. D. (1999). Increasing picker efficiency by using a boll saver attachment. *The Journal of Cotton Science*, 3, 122-125.
25. Mesquita, C. M., Pereira, J. E., Maurina, A. C., & Andrade, J. G. (2001). Perfil da colheita mecânica da soja no Brasil: Perdas e qualidades físicas do grão relacionadas às características operacionais. In *Congresso Brasileiro de Engenharia Agrícola, 30*, Foz do Iguaçu, Brasil.
26. Mesquita, M. G. B. F., Moraes, O., & Corrente, J. E. (2003). Caracterização estatística de variáveis físicas do solo. *Acta Scientiarum. Agronomy*, 25(1), 35-44.

27. Moreira, R. C. (2008). Espaçamentos e densidades populacionais em cultivares de algodoeiro com diferentes arquiteturas de plantas. Tese (Doutorado em Agronomia) – Escola Superior de Agricultura “Luiz de Queiroz”, Universidade de São Paulo, Piracicaba.
28. Nogueira, L. S., & Silva, V. R. (1993). Avaliação de perdas na colheita mecanizada do algodoeiro no Mato Grosso. In *Reunião Nacional do Algodão*. Cuiabá: EMPAER-MT/EMBRAPA-CNPA, 199 p.
29. Oosterhuis, D. M. (1999). Growth and development of a cotton plant. In E. CIA, E. C. Freire, & W. J. dos Santos (Eds.), *Cultura do Algodoeiro* (pp. 35-55). Piracicaba: Potafós.
30. Rangel, L. E. P., Silva, O. R., & Menezes, V. L. (2003). Avaliação de perdas na colheita mecânica em dez variedades de algodão. In *Congresso Brasileiro do Algodão, 4*. Disponível em: http://www.cnpa.embrapa.br/produtos/algodao/publicacoes/trabalhos_cba4/200.pdf. Acessado em: 6 maio 2014.
31. Ribeiro Júnior, J. I. (2001). *Análises Estatísticas no Saeg* (1ª ed.). Viçosa: UFV.
32. Rosolem, C. A. (2001). Ecofisiologia e manejo da cultura do algodoeiro. Rondonópolis: Fundação MT, p. 147-160. (Fundação T. Boletim, 4).
33. Silva, R. P., Ferreira, I. C., & Cassia, M. T. (2011). Perdas na colheita mecanizada de algodão. *Scientia Agropecuaria*, 7-12.
34. Silva, R. P., Souza, F. G., Cortez, J. W., Furlani, C. E. A., & Vigna, G. P. (2007). Variabilidade espacial e controle estatístico do processo de perdas na colheita mecanizada do algodoeiro. *Engenharia Agrícola*, 27, 724-752.
35. Spurlock, S. R., Parvin Jr., D. W., & Cooke Jr., F. T. (1991). Impacts of scrapping on harvest costs. In *Proc. Beltwide Cotton Conf.*, San Antonio, TX (6-10 Jan. 1991, pp. 417-419). Memphis: Natl. Cotton Counc. Am.
36. Vale, W. G., Garcia, R. F., Thiebaut, J. T. L., Amim, R. T., & Tourino, C. C. (2008). Desempenho e dimensionamento amostral para avaliação de uma semeadora-adubadora em plantio direto e convencional. *Acta Scientiarum Agronomy*, 30(4), 441-448.
37. Vale, W. G., Garcia, R. F., Thiebaut, J. T. L., & Gravina, G. A. (2009). Caracterização estatística de variáveis usadas para ensaiar uma semeadora-adubadora em semeadura direta e convencional. *Acta Scientiarum. Agronomy (Online)*, 31, 559-567.
38. Vale, W. G., Garcia, R. F., Vasconcelos Júnior, J. F. S., Fernandes, P. G., Azevedo, E. B., & Klaver, P. P. (2010). Desempenho de conjunto trator e semeadora-adubadora na semeadura direta de *Crotalaria juncea*. *Global Science and Technology*, 3(2), 78-86.
39. Vieira, C. P., Cunha, L. J. C., & Zóf oli, R. C. (2001). Colheita. In *Algodão: Tecnologia de Produção* (pp. 273-276). Dourados: Embrapa Agropecuária Oeste.
40. Warrick, A. W., & Nielsen, D. R. (1980). Spatial variability of soil physical properties in the field. New York: Academic Press.



41. Willcutt, M. H., & Columbus, E. (2002). Cotton lint qualities as affected by harvester type in 10 and 30-inch production systems. In *Beltwide Cotton Conferences* (pp. 8-12). Atlanta, GA: Memphis: National Cotton Council of America.

THE IMPORTANCE OF DEVELOPING A GROWTH MINDSET <https://doi.org/10.56238/sevened2024.029-016>**Ricardo Noboru Katsumata¹ and Sylvana Lima Teixeira²****ABSTRACT**

The concept of growth mindset is based on the premise that skills and intelligence can be improved through effort and dedication, promoting personal and professional development. Individuals who adopt this perspective tend to face challenges as learning opportunities and show a greater ability to adapt to change, an essential differential in corporate environments that require innovation and teamwork. In contrast, the fixed mindset can restrict progress by considering skills as unalterable, resulting in stagnation. In this context, emotional intelligence plays a crucial role, empowering people to manage their emotions constructively and maintain healthy relationships in the workplace. The methodology used in this analysis was based on a bibliographic research, supported by books and academic articles. The relationship between growth mindset, emotional intelligence, and leadership strengthens innovation and resilience, qualities that are indispensable for success, both individually and organizationally, in a scenario of constant transformation.

Keywords: Growth. Emotional. Intelligence. Mentality.

¹ Master's student in Business Administration at MUST University. Specialist in Industrial Administration from USP and Teaching in Professional and Technical Education from Anhanguera. Degree in Mechanical Engineering from UMC.

E-mail: rkengenheiro@gmail.com

ORCID: 0009-0000-1424-4573

LATTES: <https://lattes.cnpq.br/2691945006188577>

² Doctoral student in Business Administration at Absoulute Christian University – ACU. Master in Business Administration from MUST University. Master's degree in Conflict Resolution and Mediation from Universidad Leon. Professor at the Center for Mediators and MUST University.

E-mail: sylvana@centrodemediadores.com

ORCID: 0000-0003-2409-8711

LATTES: <http://lattes.cnpq.br/6712937965405086>



INTRODUCTION

The concept of growth mindset is widely discussed by Dweck (2017), who states that skills and intelligences can be improved through effort, learning, and dedication. Individuals with this mindset see challenges as opportunities for growth and are not afraid of failure, which favors both personal and professional development. In organizational environments, this mindset creates a climate of innovation, collaboration, and overcoming, crucial factors to face the rapid changes in the market.

De Sousa (2021) reinforces that the growth mindset is essential for personal and professional success, as those who adopt it believe in the continuous improvement of their skills. In the corporate context, leaders play a key role in creating environments that encourage learning and constructive feedback, thus facilitating the adaptation and resilience of teams in the face of challenges.

In contrast, the fixed mindset, according to Dweck (2017), is based on the belief that skills and intelligence are immutable. People with this view tend to avoid challenges for fear of failure, which limits their growth. Júnior (2023) points out that this resistance to learning leads to stagnation, which can be especially harmful in corporate environments that require constant adaptation and innovation. Individuals with a fixed mindset are more likely to interpret feedback as personal criticism, making it difficult to develop new skills and pursue innovations.

The concept of worthiness is also central to the growth mindset. Alves (2021) argues that success does not depend only on innate talent, but on effort and the ability to adapt in the face of difficulties. For people with this mindset, deserving is the result of dedication and resilience. Júnior (2023) complements by stating that this vision strengthens the willingness to face challenges and pursue more ambitious goals, which fosters a meritocratic culture in organizational environments.

Another crucial factor in developing a growth mindset is emotional intelligence. Alves (2021) highlights that emotional intelligence allows individuals to manage their emotions constructively, which is essential for facing criticism and failure. In organizations, emotional intelligence promotes a positive environment and facilitates the creation of healthy relationships, which are fundamental for collaborative success. Goleman (2015) states that the ability to identify and control one's own emotions, as well as those of others, is vital for both leaders and their teams, promoting balanced decisions and effective conflict resolution. The combination of growth mindset and emotional intelligence results in greater resilience and flexibility in the face of change.

In general, in the context of leadership and management, the growth mindset is considered an essential tool for effective leaders, because, as highlighted by Alves (2021), they are able to create environments that encourage continuous learning and team development, promoting psychological safety, in which mistakes are perceived as opportunities for growth, and not as definitive failures. In this way, the integration between the growth mindset, emotional intelligence, and effective leadership become fundamental for personal and organizational development, favoring innovation, adaptation, and strengthening of a collaborative culture, allowing both individuals and organizations to thrive in scenarios of constant change.

METHODOLOGY

This research, with a qualitative approach, used a literature review between 2020 and 2024, including direct consultations with books by authors such as Dweck (2017) and Goleman (2015), and recent scientific articles on growth mindset, emotional intelligence, and leadership. The selection of articles, obtained from databases such as *Scielo* and Google Scholar, prioritized current and relevant publications on the topic, with works prior to 2020 referenced only when cited in more recent studies. The analysis focused on the intersection between these concepts in organizational contexts, aiming to understand how the growth mindset, combined with emotional intelligence, can influence innovation, adaptation, and resilience in work teams.

TECHNICAL RATIONALE

The theoretical foundation of this study covers the essential concepts for the analysis of mentalities in the organizational environment.

Growth Mindset

The concept of growth mindset refers to the belief that skills and intelligences can be improved through effort, learning, and dedication. As observed by Dweck (2017), individuals who adopt this mindset tend to stand out in the face of challenges, seeing failure not as an indicator of their limitations, but rather as a chance for learning. This mental approach has a significant impact on both personal and professional life, creating an environment conducive to innovation and the continuous search for knowledge. In the organizational context, the growth mindset encourages collaboration and the permanent development of teams, favoring a culture of overcoming and constant improvement.



As pointed out by De Sousa (2021), cultivating a growth mindset is essential to achieve a more satisfying life and to success in the personal and professional spheres. Individuals who adopt this perspective recognize that effort and dedication are essential to achieve their goals, believing in the possibility of continuous improvement of intelligence and skills. In the corporate environment, the role of the leader is to facilitate this development, promoting a climate of constant learning where constructive feedback and the exchange of knowledge are recognized as important. People who embrace this mindset tend to be more receptive to challenges and change, being able to adapt more easily to new situations and face adversity more effectively. Taleb (2020 apud Júnior, 2023, p. 608) adds to this perspective by stating that the growth mindset is in line with the concept of antifragility.³ This means that individuals and systems that take this approach not only adapt to chaos and transformations, but also take advantage of those experiences, emerging stronger and more resilient.

Research carried out by Yeager et al. (2014 apud De Andrade, 2024, p. 170) demonstrates that children and adolescents with a growth mindset are more resilient in the face of challenges and have a higher academic performance, regardless of their socioeconomic context. In the professional environment, employees who cultivate this mindset are more innovative and open to change, which results in significant contributions to the adaptation and evolution of the organization in response to market demands⁴.

Thus, the growth mindset transcends the mere acquisition of new skills, as it represents a philosophy of life that fosters continuous and lasting development. By adopting this perspective, it is possible to transform challenges into opportunities and boost both personal and professional progress, which is positively reflected in various areas of life (Dweck, 2017).

Fixed Mindset

The fixed mindset is defined by the belief that abilities and intellects are innate and unchanging characteristics. According to Dweck (2017), people who adopt this view tend to avoid challenges and prefer to stay in their comfort zones, prioritizing the demonstration of their skills rather than seeking the development of new skills. The search for self-affirmation leads them to avoid situations that may expose their limitations, which, in turn, inhibits

³ Taleb (2020 apud Júnior, 2023, p. 608) argues that the growth mindset is aligned with the concept of antifragility, where individuals thrive in the midst of adversity.

⁴ Yeager et al. (2014 apud De Andrade, 2024, p. 170) indicate that children and adolescents with a growth mindset demonstrate greater resilience and academic performance, also reflecting in innovations in the professional environment.

learning and makes it difficult to adapt to new realities, restricting both personal and professional growth.

Júnior (2023) points out that resistance to facing challenges and fear of failure are striking traits of this fixed mentality, resulting in a state of stagnation. People with this perspective cling to what they have already mastered and shy away from experiences that might generate discomfort or reveal their weaknesses. This type of behavior is detrimental in organizational environments that require agility and adaptation, where these qualities are crucial to achieving success.

In the corporate context, the presence of a fixed mindset compromises the ability to innovate and the acceptance of change. Employees who adopt this type of mindset often react to feedback as if it were personal criticism, which makes it difficult to overcome obstacles and search for innovative solutions, negatively impacting organizational performance in the long term (Bower & Kowerski, 2017 apud De Andrade, 2024, p. 171).⁵ In addition, people with this perspective tend to limit their actions to a narrow scope, guided by social norms and the pursuit of minimal effort, believing they do not have the capacity to deal with new demands or challenges (Dos Reis et al., 2023).

Yeager et al. (2014 apud De Andrade, 2024, p. 169) state that, in the educational environment, children with a fixed mindset have negative reactions to difficulties, which results in greater stress and lower academic performance. In work environments, employees with this mindset tend to avoid the search for new knowledge, thus compromising their professional growth and the organization's potential for innovation and development.⁶

In the transition trajectory from a fixed mindset to one of growth, self-awareness becomes key. Brackett (2021 apud Júnior, 2023, p. 605) emphasizes that personal reflection and the willingness to challenge restrictive beliefs are vital steps on this path. By recognizing limiting thoughts, the person can realize that mistakes and difficulties are not signs of a permanent disability, but, on the contrary, are part of the learning process.⁷

Finally, it is essential to understand the limitations of the fixed mindset and adopt strategies to overcome them, aiming at both personal and professional evolution. This change in perspective allows for better use of opportunities and favors the creation of a

⁵ Bower & Kowerski (2017 apud De Andrade, 2024, p. 171) discuss the relationship between fixed mindset and organizational performance.

⁶ Yeager et al. (2014 apud De Andrade, 2024, p. 169) highlight that children with a fixed mindset face stress and low academic performance, and this mindset in professionals hinders organizational growth and innovation.

⁷ Brackett (2021 apud Júnior, 2023, p. 605) emphasizes the importance of self-awareness and personal reflection in the transition from a fixed mindset to a growth mindset, highlighting that recognizing limiting thoughts is crucial for learning and overcoming difficulties.



healthier organizational environment, which fosters sustainable growth and lasting success (De Sousa, 2021).

Worthiness

According to Alves (2021), the idea of worthiness transcends simple innate talent, being built through constant dedication, effort, and the ability to adapt to difficulties. For people with a growth mindset, success is seen as the result of hard work and resilience, rather than something taken for granted or inherited. With this, deserving becomes an achievement that arises from commitment and overcoming obstacles, promoting the exit from the comfort zone and the willingness to face challenges.

To achieve a successful life, it is essential to adopt practices that favor the production of hormones linked to well-being, such as setting clear goals and cultivating healthy habits for both body and mind. The feeling of worthiness, combined with unwavering faith and constant effort, is crucial to promote behavior change and the search for personal growth, thus getting closer to the realization of dreams and goals (Dos Reis et al., 2023).

Júnior (2023) reinforces this idea by linking deserving to the development of a growth-oriented mindset. He points out that the belief that continuous effort brings rewards stimulates the willingness to face challenges and the pursuit of more audacious goals. When this perception is integrated into the organizational culture, an environment is formed that recognizes and rewards achievements, contributing to the strengthening of a meritocratic culture.

De Sousa (2021) complements by stating that, by adopting a growth mindset, people perceive themselves as deserving of the success they achieve, as they understand that their achievements are the result of their dedication and commitment to continuous learning. They understand that merit is not attributed arbitrarily, but rather built over time, reflecting their commitment and choices. Thus, the concept of worthiness, within a growth mindset, strengthens the belief that success is accessible to everyone who is dedicated to overcoming obstacles and developing their skills, promoting a positive and dynamic view of human potential.

Emotional Intelligence

Emotional Intelligence is intrinsically linked to the cultivation of a growth mindset, as it encompasses the ability to manage one's emotions and face challenges constructively. According to Alves (2021), emotional intelligence enables the individual to maintain resilience and concentration on long-term goals, even when faced with criticism and

failures. Individuals with high emotional intelligence tend to adapt more easily to change, taking advantage of their emotional responses as opportunities for learning and evolution.

In the organizational environment, emotional intelligence is essential for the formation of healthy relationships and the creation of a positive climate. Goleman (2015) points out that emotional intelligence implies the ability to identify and understand both one's own emotions and those of others, managing them to establish more empathetic and effective interactions. Leaders and colleagues with high emotional intelligence are generally better able to resolve conflicts, make thoughtful decisions, and foster an organizational environment that favors development.

Goleman (2015) argues that emotional self-awareness is essential for effective leaders and for cultivating a growth mindset. By identifying and controlling their own emotions, individuals become more resilient and less prone to impulsive reactions, which makes it easier to overcome obstacles and favors a collaborative environment. The combination of the growth mindset and emotional intelligence results in individuals who are more resilient and able to adapt to change more easily.

Thus, emotional intelligence is an essential component of sustaining a growth mindset, as it helps individuals manage negative emotions and maintain motivation even in the face of difficulties (De Sousa, 2021).

Leadership and Management

In the organizational context, cultivating a growth mindset is essential for effectiveness in leadership and management. Leaders who embrace this philosophy foster a culture of relentless learning, encouraging their teams to face challenges with a positive attitude and strive for improvement. According to Alves (2021), leaders with this mindset are able to increase employee engagement, promoting the search for improvements and overcoming barriers.

The relationship between effective leadership and the growth mindset goes beyond mere technical knowledge, also involving the ability to motivate teams to adopt a resilient and adaptable posture. These leaders create an environment of psychological safety, where employees feel comfortable taking risks, learning from mistakes, and exploring new ideas (Alves, 2021).

According to Júnior (2023), managers who adopt this perspective are able to motivate their teams to act in the same way, creating an environment that favors innovation and collaboration. These leaders recognize the importance of effort and continuous learning, ensuring a healthy and stimulating workspace.

Brown (2019 apud Júnior, 2023, p. 607) points out that vulnerability and courage are fundamental for genuine leadership. Leaders who possess emotional intelligence and resilience not only deal with crises effectively, but also convert obstacles into chances for growth.⁸

Sinek (2018 apud Júnior, 2023, p. 607) complements by stating that leaders with a well-defined purpose are able to maintain team motivation and direct their actions towards sustainable success, even in periods of uncertainty. This strategy offers a significant competitive advantage in a market that is dynamic and unpredictable.⁹

In summary, the development of leadership and management skills based on the growth mindset raises the level of collaboration and innovation within organizations, allowing leaders to better adapt to change and promote an environment conducive to continuous development.

RESULTS

The results of this research demonstrate that the adoption of a growth mindset, as highlighted by Dweck (2017), positively impacts the organizational environment, promoting innovation and adaptation in changing scenarios. Through a literature search, it was observed that individuals with this mindset are more resilient, motivated, and willing to face challenges, while those with a fixed mindset tend to avoid risks and resist constructive feedback.

In addition, emotional intelligence has been found to complement the growth mindset. Individuals who possess both characteristics are better able to manage their emotions and respond constructively to challenging situations, promoting a collaborative and continuous learning environment (Goleman, 2015). In the context of leadership, Alves (2021) highlights that leaders with this mindset create environments of psychological safety, where mistakes are seen as opportunities for growth, rather than as outright failures.

The study also reveals that the concept of worthiness, addressed by Alves (2021), is closely linked to effort and resilience. Individuals with a growth mindset value success as the result of dedication and overcoming difficulties, promoting a meritocratic and motivational environment. These results reinforce that the combination of growth mindset, emotional intelligence, and effective leadership contributes to organizational development

⁸ Brown (2019, cited by Júnior, 2023, p. 607) highlights that vulnerability and courage are fundamental for genuine leadership, emphasizing that emotionally intelligent and resilient leaders transform crises into opportunities for growth.

⁹ Sinek (2018, cited by Júnior, 2023, p. 607) states that leaders with a clear purpose are able to maintain team motivation, ensuring a competitive advantage and sustainable success, even in uncertain markets.

and overcoming barriers, essential elements for success in dynamic and competitive environments (De Sousa, 2021).

DISCUSSION

The discussion of the results confirms that the growth mindset is decisive for individual and organizational success. Dweck (2017) argues that this mindset promotes a positive attitude towards challenges, while the fixed mindset, which sees skills as innate and unchanging, limits development.

The integration of emotional intelligence, as evidenced by Goleman (2015), enhances the benefits of the growth mindset by allowing individuals to manage their emotions constructively and better deal with stress and criticism. Research shows that the combination of these traits increases resilience and adaptability, making teams more cohesive and motivated (Alves, 2021).

In the field of leadership, the growth mindset emerges as a crucial tool for managers who want to create high-performance and engaging environments. Leaders who adopt this approach foster a culture of learning and innovation, where mistakes are opportunities for improvement. In this way, leadership based on this mindset aligns organizational and personal goals, fostering a culture of overcoming and adapting (Alves, 2021; Júnior, 2023).

Thus, the growth mindset, coupled with emotional intelligence and effective leadership, not only drives personal and organizational development but also creates an environment conducive to sustainable growth and continuous innovation (De Sousa, 2021; Júnior, 2023).

CONCLUSION

Adopting a growth mindset is critical for success in challenging and ever-changing environments. Individuals and teams that incorporate this approach see challenges as opportunities to learn and overcome, creating a virtuous cycle of continuous improvement. This mindset fosters a greater willingness to innovate, collaborate, and an organizational culture that values development and effort. The creation of spaces of psychological safety, where learning is constant and mistakes are seen as opportunities, is essential for leaders to promote this environment.

The combination of growth mindset and emotional intelligence is crucial to strengthen adaptation to change and emotional resilience in pressure situations. Professionals who develop these skills not only face adversity more effectively, but also inspire their teams to follow the same path. Therefore, investing in the development of a




growth mindset is indispensable to achieve superior results and create a healthy and motivating work environment. Organizations that promote this mindset are more likely to thrive, turning challenges into opportunities and employees into agents of change.



REFERENCES

1. Alves, I. R. (2021). A importância da mentalidade de crescimento para o alcance de objetivos. **Revista Ibero-Americana de Humanidades, Ciências e Educação, 7*(12), 386-391. <https://doi.org/10.51891/rease.v7i12.3391>*
2. Bower, M., & Konwerski, P. (2017). A mindset for career curiosity: Emerging leaders working in the digital space. **New Directions for Student Leadership, 2017*(153), 89-101.*
3. Brackett, M. (2021). **Permissão para sentir: como compreender nossas emoções e usá-las com sabedoria para viver com equilíbrio e bem-estar*. Sextante.*
4. Brown, B. (2019). **A coragem para liderar* (13ª ed.). Rio de Janeiro: Editora Bestseller.*
5. De Andrade, M., et al. (2024). A importância do desenvolvimento de uma mentalidade de crescimento para obter uma vida mais feliz e próspera. **Editora Manual*. <https://doi.org/10.29327/5396137>*
6. De Sousa, N. B. (2021). A necessidade de desenvolvimento de uma mentalidade de crescimento para uma vida mais feliz e para o alcance de objetivos. Disponível em: <https://repositorio.pgsscogna.com.br/bitstream/123456789/58897/1/O%20impacto%20econ%C3%B4mico%20-%20artigo.pdf>. Acesso em: 29 out. 2024.
7. Dos Reis, B. D., Da Silva, C. G. L., & Martins, G. (2023). A importância de uma mentalidade de crescimento para uma vida mais feliz e para o alcance de objetivos. **Revista Científica Multidisciplinar Viabile*. <https://doi.org/10.56876/revistaviabile.v2n3.11>*
8. Dweck, C. (2017). **Mindset: a nova psicologia do sucesso*. Objetiva.*
9. Goleman, D. (2015). **Liderança: A inteligência emocional na formação de líderes de sucesso* (1ª ed.). Rio de Janeiro: Objetiva.*
10. Júnior, T. A. F. (2023). O PODER DA MENTALIDADE DE CRESCIMENTO E A ANTIFRAGILIDADE. **Revista Ibero-Americana de Humanidades, Ciências e Educação, 9*(9), 604-609. <https://doi.org/10.51891/rease.v9i9.11190>*
11. Sinek, S. (2018). **Comece pelo porquê: como grandes líderes inspiram pessoas e equipes a agir*. Sextante.*
12. Taleb, N. N. (2020). **Antifragil (Nova edição): Coisas que se beneficiam com o caos*. Objetiva.*
13. Yeager, D. S., et al. (2014). The far-reaching effects of believing people can change: Implicit theories of personality shape stress, health, and achievement during adolescence. **Journal of Personality and Social Psychology, 106*(6), 867.*

**SYSTEMIC PRACTICE IN ACTION: TRANSFORMING THE COMMUNITY
MANAGEMENT OF ARTISANAL FISHING IN CAMETÁ**

 <https://doi.org/10.56238/sevened2024.029-017>

Jean Louchard Ferreira Soares¹, Aquiles Simões² and Maria do Socorro Almeida Flores³

ABSTRACT

The municipality of Cametá has a thriving economy based on artisanal fishing and açai extractivism. On the other hand, several social, economic and ecological problems are reported and experienced by residents. Among the main causes of these problems is the proximity to two major economic projects (Tucuruí Hydroelectric Power Plant and the Albras-Alunorte Complex). They are also about to suffer from the impacts of the implementation of the Tocantins-Araguaia Waterway, with the implosion of the Pedral do Lourenço and dredging of the Tocantins River. Conflicts are also issues present within the fishing territory of Espírito Santo and have been gaining prominence in recent decades, they refer to the struggles of traditional communities for the realization and recognition of their rights. In this context, with a state of crisis in the use of fishing resources and as a strategy for permanence in their spaces, communities are developing a new way of thinking, adapting to the new socio-environmental conditions imposed. The fisheries agreement appears to be one of the central elements in reducing the pressures on local fisheries resources. In order to understand that the community-based management of artisanal fisheries behaves as a complex and interconnected system, it is necessary to consider a systemic approach, based on the study and understanding of the interactions that occur between the different local social actors. To this end, the work seeks to understand how the fishing agreement can drive the systematic transformation in the community management of artisanal fishing in the municipality of Cametá to resist contemporary pressures and uncertainties and boost local development. As a result, it seeks to understand the current paradigm of governance, in order to define actions, for a systemic transformation, in favor of the development of a new systemically desirable, culturally viable and ethically defensible paradigm for the community management of artisanal fishing in the municipality of Cametá in the State of Pará.

Keywords: Systemic governance. Fisheries management. Fishing resources.

¹ Master's degree, EBTT Professor of Fisheries Engineering at IFPA – Cametá Campus, Doctoral student of the Graduate Program in Natural Resources Management and Local Development in the Amazon of the Environment Center at the Federal University of Pará - PPGEDAM/NUMA/UFPA
E-mail: jean.soares@ifpa.edu.br

² Doctor, Professor of the Graduate Program in Natural Resources Management and Local Development in the Amazon of the Environment Center at the Federal University of Pará - PPGEDAM/NUMA/UFPA
E-mail: moinayunah@gmail.com

³ Doctor, Professor of the Graduate Program in Natural Resources Management and Local Development in the Amazon of the Environment Center at the Federal University of Pará - PPGEDAM/NUMA/UFPA
E-mail: saflores@ufpa.br



INTRODUCTION

The municipality of Cametá-PA suffers the impacts of the large economic projects of the Tucuruí Hydroelectric Power Plant - HPP, in the Municipality of Tucuruí, and the Albras-Alunorte Complex, in the Municipality of Barcarena. It is also about to suffer the impacts generated by the implementation of the Tocantins-Araguaia Waterway, with the implosion of the Pedral do Lourenço and dredging of the Tocantins River.

Thus, serious problems are reported by fishermen: the significant disappearance of fish; predatory fishing and overfishing; excessive vessel traffic; excessive luminosity in the coastal region; pollution of water resources, among others (Maurício *et al.*, 2020).

In this context, Marrul Filho (2003) exposes that there is a state of crisis in the use of fishing resources. Numerous fisheries are overexploited and with great losses both to the environment and to the economy of several regions and entire countries.

So, as strategies for permanence in their spaces, fishing communities are developing a new way of thinking and managing their resources, adapting to the new socio-environmental conditions. The central element of this new strategy is the community-based management of fisheries through the fisheries agreement, which has been consolidated in several communities. For Bassols (2007), the agreement is a form of participatory management of natural resources and aims to reduce the pressures on them, but mainly on fishing, with the intention of increasing fishing productivity in the long term, ensuring the use and conservation of fish for future generations.

Thus, Ostrom (1990) states that the agents involved in a certain activity have no interest in the scarcity of their resources. In this way, bringing it to the riverside reality of Cameta, the agents involved with artisanal fishing would act cooperatively to avoid the depletion of this resource. Therefore, the riverside communities, through their own organization, would be more apt to produce a model of management of their territory and resources, based on respect for local culture and traditions.

To this end, community fisheries agreements seek to define rules whose main objective is to reduce fishing effort by limiting access and forms of use. Limiting access means restricting places where certain types of fishing practices cannot be carried out. The objective of these norms is to ensure the maintenance of the river's productivity (Almeida, 2006).

It is noteworthy that, in relation to aquatic resources and fisheries management, fishing agreements have been formalized since 1970 in the State of Pará, and there is a history of non-formal agreements or "mouth" agreements, as they do not have a formal apparatus and are validated by the word of the individuals involved (D'Almeida, 2006).

Thus, with the intention of offering legal support to fishing agreements, the Brazilian Institute of the Environment - IBAMA, in 2002, published Normative Instruction No. 29, legitimizing the agreements as a fishing planning device, which defined criteria for regulating them at the national level (Brasil, 2002).

In 2021, through State Decree No. 1,686, the criteria for the formalization of agreements in fishing communities within the State of Pará are established (Brasil, 2021). In 2024, the Cametaense fishing agreement was approved by the State Secretariat for the Environment and Sustainability – SEMAS, through SEMAS Ordinance No. 288/2024.

In the lower Tocantins region, there are many successful experiences with community management of artisanal fishing through fishing agreements (Holanda *et al.*, 2021). Experiences were reported on the island of Saracá, in the municipality of Limoeiro do Ajurú (Netherlands; Simões, 2007; Rodrigues; Carvalho, 2021) and on the islands of Jaracuera Grande (Simões; Dias, 2013), Jacaré Xingú (Simões *et al.*, 2014) and in the riverside community of Pacuí de Baixo (Tavares; Dias, 2014) in the municipality of Cametá.

The Z-16 fishing colony, in Cametá, cites the existence of 22 agreements in operation (Santana *et al.*, 2014). Vilhena (2017) points to a total of 76 agreements. However, the State Secretariat for the Environment and Sustainability recognized, through SEMAS Ordinance No. 288/2024, more than 60 signatory fishing communities in a territory with about 670 km² of coverage. Even so, this amount does not seem to meet the 522 communities distributed in 116 islands, which have fishing as a source of income and food.

Returning, it is essential to consider that the community management of artisanal fishing must be understood as a complex system and that there are multiple social and ecosystem interactions in it (Pasquotto; Miguel, 2004). Therefore, socio-ecological systems are heuristic and integrated systems of human beings with nature, which form sets that are impossible to separate and are characterized as complex and adaptive systems, in which different elements: cultural; political; social; economical; ecological and technological are interconnected (FARHAD, 2012).

In this context, the key characteristic for a socio-ecological system is the ability to cope with uncertainties, changes, and surprises through adaptation, learning, and self-organization (Buschbacher, 2014).

In this sense, resilience is the ability of the system to maintain its essential characteristics of structure and function, even after a collapse and reorganization. In a way, resilience is a synthesis between stability and dynamics, integrating the ideas of change and limits. Resilience is linked to responses and ways of coping with adverse situations (Folke *et al.*, 2005; Buschbacher, 2014; 2016).

In this way, those socio-ecological systems that develop the ability to adapt in the midst of unfavorable situations are resilient. Adaptive strategies developed as a thermometer of their resilience (Tompkins; Adger, 2004). Therefore, changes are also necessary events for transformations to occur in systems. Thus, switching to an alternative system means leaving an uncomfortable state, to changing oneself in order to act in different ways (Walker *et al.*, 2010).

For this reason, several authors have drawn attention to the fact that there is a growing awareness that traditional economic and ecological models and concepts are no longer satisfactory for dealing with complex problems (Hecht, 1989; Morin, 1997; Norgaard, 1989; Costa, 2000).

Therefore, systemic governance, also called adaptive governance (Folke *et al.*, 2005; Resilience Alliance, 2010), emerges as a new strategy for the transformations of the Anthropocene, characterized by the impact of man on the earth, and that this implies the urgent need to transform the way we think and act in relation to the governance of relations between humans and the environment.

The community-based management of artisanal fisheries through the fisheries agreement incorporates learning and change in the face of uncertainties, since, whether intentional or not, human activities produce effects that encompass varying degrees of organization or disorganization, control or lack of control, and certainty or uncertainty. Thus, for systemic governance, the question is to reach where the loss of control does not lead to fear, but to social learning and innovation (Ison; Grant; Bawden, 2014).

Thus, this work aims to identify how the fishing agreement can drive a systematic transformation in the community management of artisanal fishing in the municipality of Cametá to resist contemporary pressures and uncertainties and boost local development.

METHODOLOGY

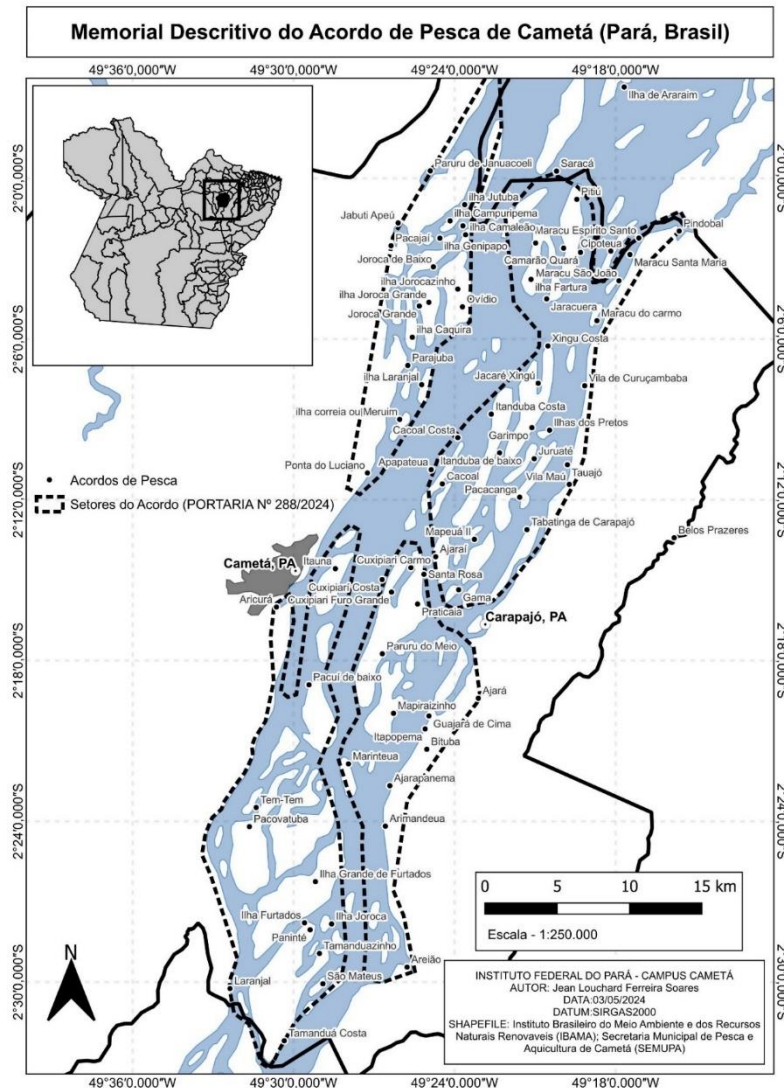
CHARACTERIZATION OF THE STUDY AREA

The municipality of Cametá is located in the northeast region of the State of Pará, in the Tocantins River Basin, in the lower Tocantins region. It has an area of 3,081km², equivalent to 0.03% of the national territory and 0.25% of the territory of Pará, has a current population of 134,184 inhabitants, corresponding to 0.06% of the national population and 1.65% of the population of the State of Pará. With a demographic density of 43.55 inhabitants/km² (IBGE, 2022).

The State of Pará, through SEMAS Ordinance No. 288, of February 28, 2024, recognizes the Fishing Agreement, delimits its coverage area and establishes rules for

fishing practices in the municipality of Cametá. The agreement is divided into four sectors of the Tocantins River extension (see Figure 1).

Figure 1: Descriptive memorial of the Cametá Fishing Agreement (Pará, Brazil).



Source: Organized by the authors (2023) in cooperation with the Laboratory of Environmental Analysis and Cartographic Representation (LARC), at the Federal University of Pará (UFPA).

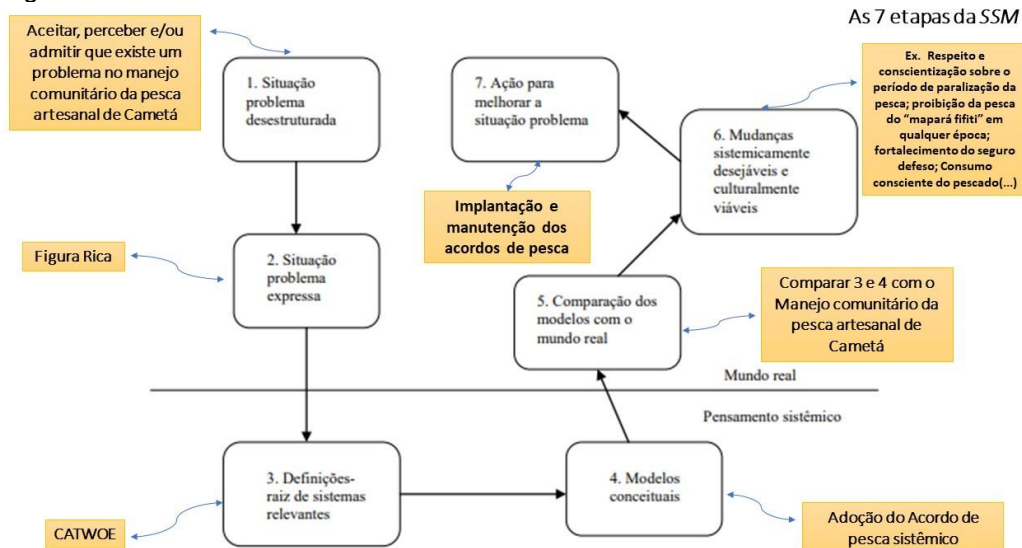
SOFT SYSTEM METHODOLOGY FOR THE COMMUNITY MANAGEMENT OF THE ARTISANAL FISH OF CAMETÁ

It is intended to facilitate an effective process of participation of local actors (*stakeholders*) in the identification of relationships and elements of the structural linkage between socio-ecological systems that need to be considered for adaptive governance.

In this case, the *Soft System Methodology - SSM* will be worked on, which consists of working with the environment and learning to analyze complex problems. It emphasizes the real world, in which people live and relate. Through debates with a group, they establish

which changes are possible and achievable (Checkland, 1981). SSM is a process consisting of seven stages (see Figure 2).

Figure 2: The seven stages of the Soft System Methodology - SSM for the community management of artisanal fishing in Cametá.



Source: Adapted from Gonçalves (2006) based on Checkland (1981, 1999, 2001).

This methodology was used to facilitate "interested and influential" stakeholders in appreciating and reflecting on the current governance situation in the community management of artisanal fisheries, with the intention of acting on it with a view to transforming it systemically.

RESULTS AND DISCUSSION

APPLICATION OF THE SEVEN STEPS OF THE SSM METHODOLOGY

Collection of information

To apply the seven steps of the methodology, the interactions of local social actors, interested in strengthening the Cametá fishing agreement, recorded at the I Cametá Fisheries and Aquaculture Forum, which took place on February 28, 2024, in the auditorium of IFPA – Cametá Campus; at the 1st Meeting of the Cooperation Network of the Cametá Fishing Agreement, which took place on March 7, 2024, at UFPA – Cametá Campus; and at the Meeting organized by the ECOGEO Research Group at UFPA, which took place on August 31, 2024 at the Rio Verde/Guajará restaurant.

Unstructured problematic situation

It was identified that there are problems in the community management of artisanal fishing in the municipality of Cametá. These problems involve the relations of fisheries

production at different levels, scales and permeate aspects of the social, economic and biophysical subsystems, especially the relationships that link the systemic elements to each other. Apparently there is no communication between the different social actors involved in the local fishing activity.

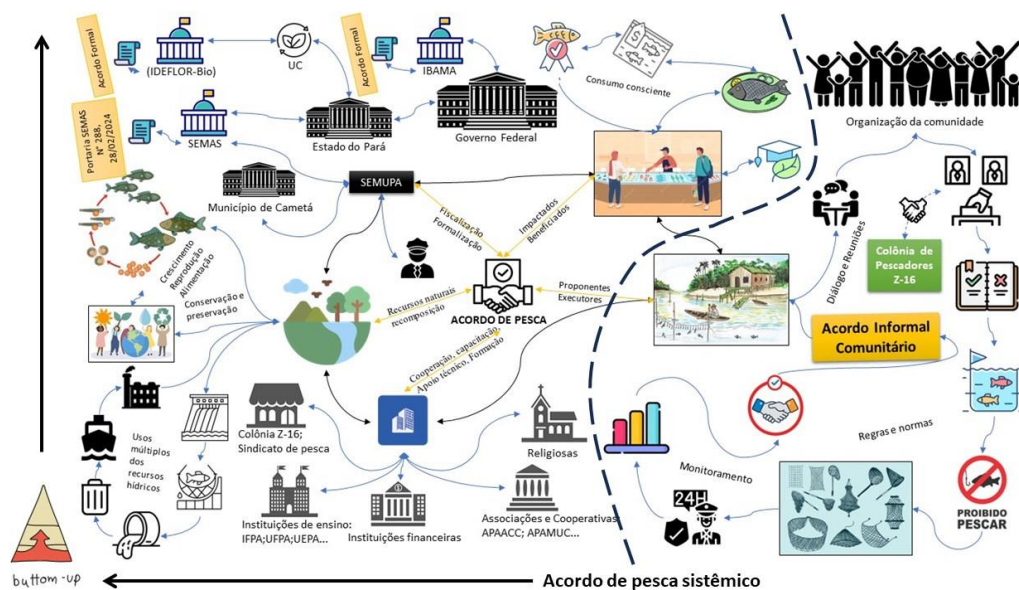
Rich figure: problem situation explained

In the rich figure (see Figure 3), the yellow arrows represent the participation of each compartment, the black arrows represent the continuous link between the compartments and the blue arrows represent the activities performed within each compartment for the elaboration of the Fisheries Agreement.

In this sense, local social actors are self-organized around the fisheries agreement, presenting decentralized and polycentric decision-making centers. However, the decisions arise from detailed information on the community management of artisanal fishing, acquired from the organization of community bases.

For Ostrom (2010), polycentric systems are characterized by multiple authorities governing at different scales. Thus, different units within the system can make norms and rules within their own specific domain (from families, communities, institutions, companies, governments and/or networks). An important aspect for polycentric analyses is their broad capacity to incorporate a variety of formal and/or informal aspects and state and/or non-state actors whose different power to decide and produce results varies in relation to different modes of governance.

Figure 3: Rich figure - problem-situation of the Cameté fishing agreement (Pará, Brazil).



Source: Prepared by the authors (2024).

CATWOE: formulation of the essential definitions in the system.

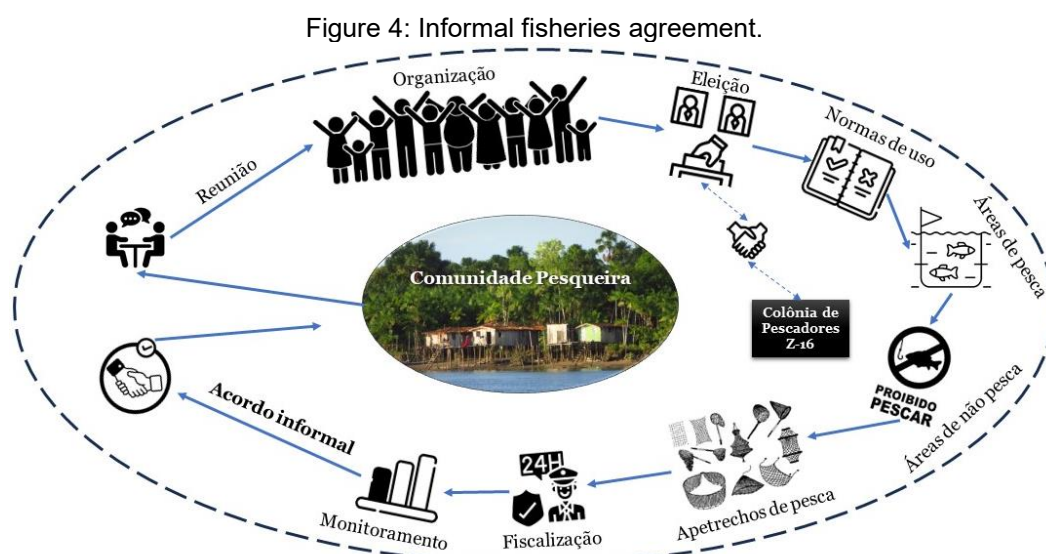
Checkland (1981, 1999, 2001) realized that the use of the CATWOE mnemonic could be useful in the definition and construction of the relevant models, in addition to verifying that the definitions are well formulated. CATWOE represents: customers, *actors*, transformations, worldviews, owners, and the *environment*.

Customers: fish consumers and the Cametaense community in general; Actors: local fishermen and fisherwomen; Transformations: transformations at the social, ecological, economic, political, cultural level, among others; Worldviews: it may intervene in social organization, conflicts, agitations, disturbances, infractions and even environmental crimes; Owners: State Secretariat for the Environment and Sustainability - SEMAS, Municipal Secretariat for Fisheries Aquaculture of Cametá - SEMUPA; Environment: it will serve to reduce the pressures on fishing resources and will help to recompose them in the face of new socio-ecological conditions.

Conceptual models

The first conceptual model (see Figure 4) presents the informal fishing agreement, often carried out by mouth, validated by the word of the individuals involved. Agreements of this type were and still are carried out by local community leaders with the aim of mediating conflicts and reducing pressures on fishing resources.

- 1st conceptual model - Informal fisheries agreement



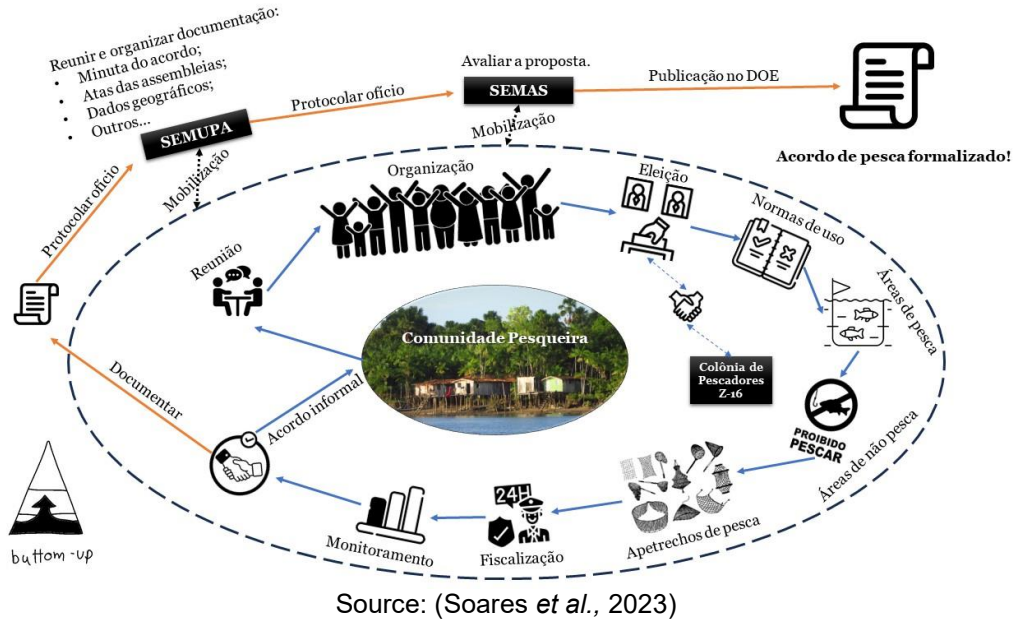
Source: Prepared by the authors (2024).

On the other hand, the second conceptual model addresses the process of formalizing the fishing agreement through State Decree No. 1,686/2021. In 2024, the

Cametaense fishing agreement was formalized by the State Secretariat for the Environment and Sustainability – SEMAS, through SEMAS Ordinance No. 288/2024 (see Figure 5).

- 2nd conceptual model - Formal fisheries agreement

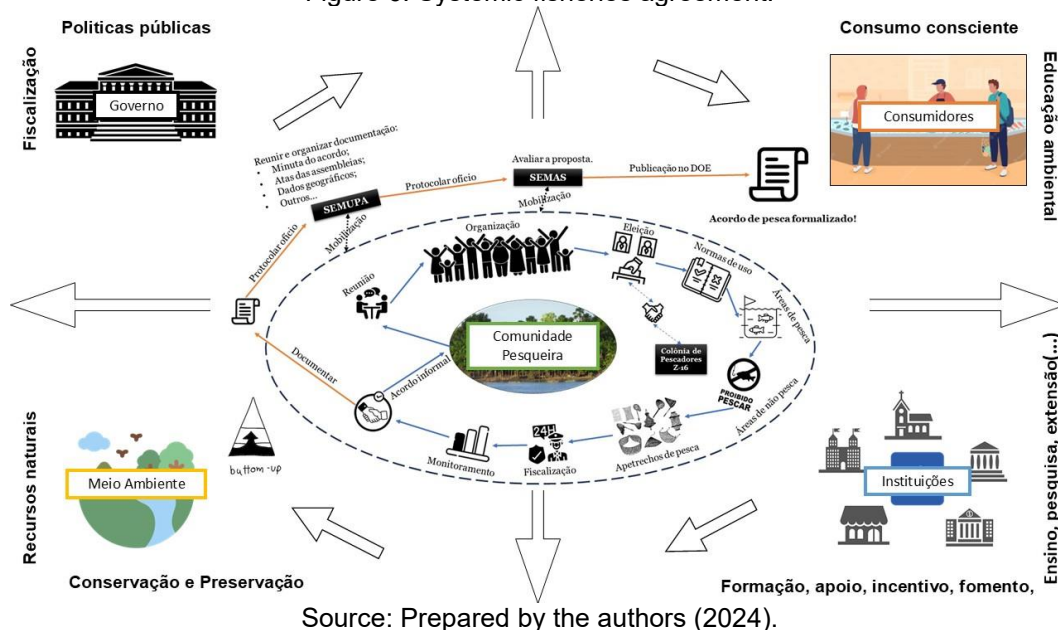
Figure 5: Procedures for formalizing the fisheries agreement (Decree No. 1,686/2021).



Finally, noting that community fisheries management should be considered as a complex system, in which there are multiple social and ecosystem interactions (Pasquotto; Miguel, 2004). The third conceptual model is presented, which encompasses the desirable systemic transformation for the fisheries agreement (see Figure 6).

- 3rd conceptual model - Systemic fisheries agreement

Figure 6: Systemic fisheries agreement.



Comparison of stages 4 and 2: conceptual vs. real

The community management of artisanal fishing in the municipality of Cametá is in a process of systematic transformation that aims to move from a reductionist, isolated and individualistic paradigm to a systemic, collective and collaborative paradigm. A detailed description of systemic investigation can be found in Ison (2017).

Systematically desirable and culturally feasible changes

It is believed that the Cametaense fishing agreement will be able to provide social, ecological, economic, political, cultural changes, among others to the users of the system. It will also be able to intervene in conflicts, agitations, disturbances, infractions, environmental crimes that cause damage to the system. Finally, the agreement will serve to reduce the pressures on fishing resources and will help to recompose them in the face of the new socio-ecological conditions.

Actions to improve the "problem situation"

Below is evidence of which actions should be implemented, in accordance with the discussions, to strengthen the Cametá fishing agreement (see Table 1).

Table 1 – Summary of actions to strengthen the Cametá fishing agreement.

What action should be implemented?	Who participates in the action?	What actions will be necessary?	Where will it take place?	When will it take place?
Strengthen the cooperation network of the Cametá fishing agreement	All stakeholders	Meetings, assemblies and public hearings	Municipality of Cametá	Quarterly
Strengthen the Municipal Forum and/or Conference on Fisheries and Aquaculture	Municipal Secretariat of Fisheries and Aquaculture of Cametá - SEMUPA	Forum	Municipality of Cametá	Annual
Create the observatory of the Cametá fisheries agreement	Federal Institute of Pará – IFPA Campus Cametá and other educational institutions	Teaching, Research, Extension, Education, Training	IFPA Campus Cametá Fisheries Laboratory	Intriguedly
Formalize and update the Cametá fishing agreement.	Organized local communities/Municipal Secretariat of Fisheries and Aquaculture of Cametá - SEMUPA/ State Secretariat of Environment and	Formalization and updating	Municipality of Cametá	Triennial

	Sustainability - SEMAS			
Monitor the actions of the Cametá fishing agreement	Cooperation network	Environmental education and conflict mediation	Municipality of Cametá	Intriguedly
To supervise and carry out the police power	Municipal Department of the Environment of Cametá - SEMMA/ Municipal Department of Fisheries and Aquaculture of Cametá SEMUPA/ Environmental Police Battalion - BPA	Inspect	State of Pará/Municipality of Cametá	Intriguedly
Monitor the area covered by the Cametá fishing agreement	Organized local community	Monitor	Local community	Intriguedly
Conduct an environmental education program	Cooperation network	Environmental education	Municipality of Cametá	Intriguedly

Source: Prepared by the authors (2024).

After the implementation of SSM, Checkland suggests the application of the methodology again so that a new problem-situation can be diagnosed, that is, it is believed that the value of this methodology is not in the result, but in the process to achieve it (GONÇALVES, 2006).

FINAL CONSIDERATIONS

The activities of this investigation do not constitute a recipe for how to engage, improve or promote the fisheries agreement, but rather characterize an intuitive process to facilitate the participants of this investigation to recognize their own situation to discover ways of managing it.

ACKNOWLEDGMENT


To the Federal Institute of Pará - Cametá Campus; To the Study Group on Socio-Agro-Environmental Diversity in the Amazon (GEDAF); To the Research Group for the Protection of Environmental Resources in the Amazon; To the Laboratory of Geographical Representation and Geoprocessing (LARC).

REFERENCES

1. Almeida, O. T. (2006). **Manejo de pesca na Amazônia brasileira**. São Paulo: Editora Peirópolis.
2. Bassols, R. (2007). **Monitoramento participativo dos acordos de pesca: como avaliar a captura do pescado**. Manaus-AM: ProVárzea/IBAMA.
3. Brasil. (2021). Decreto Estadual do Pará nº 1.686, de 29 de junho de 2021. Estabelece os critérios para a formalização dos acordos de pesca em comunidades pesqueiras no âmbito do Estado do Pará. Disponível em: <https://www.semas.pa.gov.br/legislacao/files/pdf/70077.pdf>. Acesso em: 20 jun. 2021.
4. Brasil. (2002). Instrução Normativa nº 29 de 31 de dezembro de 2002. Estabelece os critérios para a regulamentação, pelo IBAMA, de acordos de pesca definidos no âmbito de uma determinada comunidade pesqueira. Disponível em: <http://www.ibama.gov.br/sophia/cnia/legislacao/IBAMA/IN0029-311202.PDF>. Acesso em: 20 set. 2021.
5. Buschbacher, R. (2014). A teoria da resiliência e os sistemas socioecológicos: como se preparar para um futuro imprevisível? **Ipea - Boletim Regional, Urbano e Ambiental**.
6. Buschbacher, R. J. (2016). Avaliação da resiliência como ferramenta para entender a fronteira amazônica como um sistema socioecológico. **Sustentabilidade em Debate, 7*(2), 36-52*.
7. Checkland, P. B. (1981). **Systems thinking, systems practice**. Chichester-UK: Wiley.
8. Checkland, P. (2001). Soft systems methodology. In J. Rosenhead & J. Mingers (Orgs.), **Rational analysis for a problematic world revisited** (pp. 61-89). Chichester-UK: John Wiley & Sons, Ltd.
9. Checkland, P. (1999). **Soft systems methodology: a 30-year retrospective**. Chichester-UK: John Wiley & Sons, Ltd.
10. Costa, F. A. (2000). **Formação agropecuária da Amazônia: os desafios do desenvolvimento sustentável**. Belém: NAEA/UFPA.
11. D'Almeida, B. G. (2006). Os acordos de pesca na Amazônia: uma perspectiva diferenciada de gestão das águas. In **Encontro preparatório do conselho nacional de pesquisa e pós-graduação em direito - Recife**. Recife: Anais do CONPEDI.
12. Farhad, S. (2012). Los sistemas socio-ecológicos: una aproximación conceptual y metodológica. In **XIII Jornada de Economía Crítica** (pp. 265-280). Sevilla: Universidad Complutense de Madrid.
13. Folke, C., Hahn, T., Olsson, P., & Norberg, J. (2005). Adaptive governance of social-ecological systems. **Annual Review of Environment and Resources, 30**, 441-473.
14. Gonçalves, P. M. (2006). Metodologia de sistemas flexíveis (Soft Systems Methodology – SSM). In D. P. Martinelli & C. A. A. Ventura (Orgs.), **Visão sistêmica e administração: conceitos, metodologias e aplicações** (pp. 161-172). São Paulo: Saraiva.

15. Hecht, S. B. (1989). A evolução do pensamento agroecológico. In M. A. Altieri (Org.), **Agroecologia: as bases científicas da agricultura alternativa** (pp. xx-xx). Rio de Janeiro: FASE.
16. Holanda, B. S., Magalhães, S. B., Martins, P. F. S., & Simões, A. V. (2021). Conflictos socioambientales en la pesca del mapará (*Hypophthalmus marginatus*): efectos de la represa Tucuruí. **Revista de Estudios Brasileños, 7*(15), 179-193*. Disponível em: <https://www.revistas.usp.br/reb/article/view/189803>. Acesso em: 17 mar. 2023.
17. Holanda, B. S., & Simões, A. (2007). Estudo do acordo de pesca da ilha Saracá, Limoeiro do Ajurú Pará. In A. Simões & M. Benassuly (Orgs.), **Na várzea e na terra firme: transformações socioambientais e reinvenções camponesas** (pp. 251-287). Belém: NUMA/UFPA/GEDAF. Disponível em: <https://www.numa.ufpa.br/index.php/livros/item/79-na-varzea-e-na-terra-firme-transformacoes-socioambientais-e-reinvencoes-camponesas>. Acesso em: 17 mar. 2023.
18. IBGE – Instituto Brasileiro de Geografia e Estatística. (2023). **Censo 2022 - Panorama**. Disponível em: <https://censo2022.ibge.gov.br/panorama/>. Acesso em: 28 jun. 2023.
19. Ison, R. (2017). **Systems practice: how to act in situations of uncertainty and complexity in a climate-change world**. London: Springer: The Open University.
20. Ison, R., Grant, A., & Bawden, R. (2014). Scenario praxis for systemic governance: a critical framework. **Environment and Planning C: Government and Policy, 32*(4), 623-640*.
21. Marrul Filho, S. (2003). **Crise e sustentabilidade no uso dos recursos pesqueiros**. Brasília: Ibama.
22. Maurício, V. do S. P., Rodrigues, P. G., Ramos, F. M., & Soares, J. L. F. (2020). A redução dos recursos pesqueiros da microrregião de Cametá sob a ótica dos Ribeirinhos (Cuxipiarí Carmo e Parurú de cima). **Brazilian Journal of Development, 6*(1), 3956-3963*. Disponível em: <https://ojs.brazilianjournals.com.br/ojs/index.php/BRJD/article/view/6369>. Acesso em: 17 mar. 2023.
23. Morin, E. (1997). Por um pensamento ecologizado. In E. Castro & F. Pinton (Orgs.), **Fases do Trópico Úmido**. Belém: CEJUP.
24. Norgaard, R. B. (1989). A base epistemológica da agroecologia. In M. A. Altieri (Org.), **Agroecologia: as bases científicas da agricultura alternativa** (pp. xx-xx). Rio de Janeiro: FASE.
25. Ostrom, E. (2010). Polycentric systems for coping with collective action and global environmental change. **Global Environmental Change, 20*(4), 550-557*.
26. Ostrom, E. (1990). **Governing the commons: The evolution of institutions for collective action**. Cambridge: Cambridge University Press.
27. Pasquotto, V. F., & Miguel, L. A. (2004). Pesca artesanal e enfoque sistêmico: uma atualização necessária. In **Anais do Encontro da Sociedade Brasileira de Sistemas de Produção, Aracaju: 6.SBSP**.

28. Resilience Alliance. (2010). *Assessing resilience in social-ecological systems: workbook for practitioners*. Revised Version 2.0. Resilience Alliance. Disponível em: https://www.resalliance.org/files/ResilienceAssessmentV2_2.pdf. Acesso em: 14 ago. 2018.
29. Rodrigues, S. C. M., & Carvalho, A. C. (2021). Acordos de pesca como instituição social de governança de territórios pesqueiros: o caso de Limoeiro do Ajuru-PA. Belém-PA: UFPA/GAPTA. Disponível em: <http://repositorio.ufpa.br:8080/jspui/handle/2011/13472>. Acesso em: 17 mar. 2023.
30. Santana, A. C. D., Bentes, E. D. S., Homma, A. K. O., Oliveira, F. D. A., & Oliveira, C. M. D. (2014). Influência da barragem de Tucuruí no desempenho da pesca artesanal, estado do Pará. *Revista de Economia e Sociologia Rural, 52*, 249-266.
31. Simões, A. V., Dias, S. C., Almeida, O. T. D., & Rivero, S. L. D. M. (2014). Gestão dos recursos naturais na região do baixo Tocantins através de acordos de pesca. *Amazônica - Revista de Antropologia*. Disponível em: <https://periodicos.ufpa.br/index.php/amazonica/article/view/1748>. Acesso em: 01 jun. 2022.
32. Simões, A., & Dias, S. C. (2013). A construção social da ação pública: o acordo de pesca jaracuera grande, Cametá (PA). *Terceira Margem Amazônia, 1*(3). Disponível em: https://www.academia.edu/27679754/A_CONSTRUÇÃO_SOCIAL_DA_AÇÃO_PÚBLICA_O_ACORDO_DE_PESCA_DE_JARACUERA_GRANDE_CAMETÁ_PA_. Acesso em: 01 jun. 2022.
33. Soares, J. L. F., Simões, A., & Flores, M. do S. A. F. (2023). Legislação pesqueira como apoio aos acordos de pesca do baixo Tocantins (Pará, Brasil). *Revista Igapó, 17*(2).
34. Tavares, F. B., & Dias, S. C. (2014). Conflitos em torno da emergência de inovações sócio-organizacionais: o caso do acordo de pesca na comunidade ribeirinha de Pacuí de baixo (Cametá-PA). *Agricultura Familiar: Pesquisa, Formação e Desenvolvimento, 10*, 87-100.
35. Tompkins, E. L., & Adger, W. N. (2004). Does adaptive management of natural resources enhance resilience to climate change? *Ecology and Society, 9*(2).
36. Vilhena, J. R. (2017). Acordos de pesca na Amazônia: uma análise das experiências de manejo comunitário dos municípios do Baixo Tocantins no estado do Pará. *Anais do IX Encontro Nacional da Sociedade Brasileira de Economia Ecológica*. Uberlândia-MG.
37. Walker, B., Sayer, J., Andrew, N. L., & Campbell, B. (2010). Should enhanced resilience be an objective of natural resource management research for developing countries? *Crop Science, 50*, 10-19.

GENETIC DIVERSITY AMONG SOYBEAN GENOTYPES CULTIVATED UNDER TROPICAL CONDITIONS <https://doi.org/10.56238/sevened2024.029-018>

Ubirajara Santana Assunção¹, José Ribamar de Assunção Filho², Camila Campêlo de Sousa³, Carlos Humberto Aires Matos Filho⁴, José Baldin Pinheiro⁵, Regina Lucia Ferreira Gomes⁶, Jardel Oliveira Santos⁷ and Ângela Celis de Almeida Lopes⁸

ABSTRACT

Abstract—The edaphic and climatic conditions of the tropical regions of the world constitute a limiting factor for soybean growing, especially through aspects related to the specific photoperiod of the plants. Thus, the aim of this study was to estimate the genetic diversity among 16 Brazilian soybean cultivars [*Glycine max* (L.) Merrill and 76 plant introductions-PIs based on variables related to production and yield components. The multivariate analyses of Mean Euclidean Distance, Principal Component Analysis, and the UPGMA method summarized the traits evaluated in a dataset with smaller dimensions to facilitate identification of superior genotypes. The 16 Brazilian cultivars and 76 PIs were structured in six diversity panels that were consistent and without duplicates. The Brazilian soybean cultivars Sambaíba and 203404 and the PIs 165524, 407744, 205912, 381660, 203400, and 281911 show potential for providing genes related to tolerance to stress from temperatures greater than 30°C and latitudes below 10°S.

Keywords: *Glycine max*. Exotic germplasm. Multivariate analyses.

¹ MSc., Centro de Educação Aberta e a Distância-CEAD, Universidade Federal do Piauí, UFPI;
E-mail: ubirajara.uapi@ufpi.edu.br

² Dr., Campus Corrente, Instituto Federal do Piauí – IFPI
E-mail: ribamarfh@hotmail.com

³ Dra., Centro de Ciências de Codó – CCCO, Universidade Federal do Maranhão – UFMA;
E-mail: camila.campelo@ufma.br

⁴ Dr., Departamento de Fitotecnia, Centro de Ciências Agrárias, Universidade Federal do Piauí, UFPI;
E-mail: carloshumberto@ufpi.edu.br

⁵ Dr., Departamento de Genética, Escola Superior de Agricultura Luiz de Queiroz -Esalq/USP;
E-mail: jbaladin@usp.br

⁶ Dra., Departamento de Fitotecnia, Centro de Ciências Agrárias, Universidade Federal do Piauí, UFPI;
E-mail: rlfgomes@ufpi.edu.br

⁷ Dr., Departamento de Biologia, Centro de Ciências da Natureza – CCN, UFPI;
E-mail: jardel_santos@ufpi.edu.br

⁸ Dra., Departamento de Fitotecnia, Centro de Ciências Agrárias, Universidade Federal do Piauí, UFPI;
E-mail: acalopes@ufpi.edu.br

INTRODUCTION

Soybean, *Glycine max* (L.) Merrill, has high potential and importance through versatility of uses and applications in nutritional and industrial fields. Its grain may be used as food for humans directly or through its by-products (oil and protein), in animal consumption, in formulation of soybean meal-based feeds, and even in production of biofuels, however, extreme climate variations can impact drastically impact production of this legume (GOMES et al., 2014; PANGENI et al., 2017, Pham et al., 2023).

A large part of the surplus in the economic balance of Brazilian agribusiness arises from exports that involve the soybean complex, a situation recurring over decades in Brazil (FIESP, 2020). In the 2023/2024 harvest, Brazil contributed to the production of 147.38 million tons of soybeans from a planted area of 79.82 thousand hectares, an increase of 1.6% or 1.27 million hectares over 2022/2023 (CONAB, 2024). Even though it is the second largest crop to be harvested in the historical series, the average productivity of the crops showed a reduction of 8.2%, going from 4,072 kilos per hectare in the last season to 3,739 kilos per hectare in the current cycle.

Soybean is the main product of the Brazilian grain harvest and the product with the greatest export volume. However, production is affected by the hot and dry climate in various regions of Brazil. In the Northeast region of low latitude and predominantly low altitudes, heat concentration in the air and capacity for retaining heat radiated from the land are greater, and consequently, temperature is higher by the nearness of heated surfaces through predominance of coastal plains, tablelands, and lowland backcountry (STEINKE, 2012).

Advancement of the soybean crop in the Cerrado (Brazilian tropical savanna) and low latitude regions of Brazil is due to incorporation of genes that delay flowering, even under conditions of a photoperiod that induces flowering, thus conferring a long juvenile period trait to soybean cultivars released after the 1990s (SPEHAR, 1994). However, the older cultivars only expressed satisfactory yield performance when grown under temperatures oscillating between 20 and 30°C (FARIAS; NEPOMUCENO; NEUMAIER, 2007). This approach within soybean breeding programs made it possible to develop cultivars with high stability and adaptability for desirable agronomic traits and especially cultivars with tolerance to abiotic stresses, resistance to herbicides, and high grain yield (PRIOLLI et al., 2004).

Nevertheless, the yield levels of Brazilian soybean cultivars may decline in the long term, because they have a narrow genetic base (WYSMIERSKI; VELLO, 2013). The incorporation of exotic germplasm may be a viable alternative to broaden the genetic base

of the modern cultivars that are at risk of genetic erosion. Studies of this nature have already occurred for maize and papaya crops (OLIVEIRA et al., 2015, DAMASCENO JUNIOR et al., 2015).

Evaluation of genetic diversity is important in breeding programs through allowing identification of parents suitable for generating a segregating population with genetic variability and possibilities of giving rise to transgressive segregant populations (CRUZ; REGAZZI; CARNEIRO, 2012). Thus, the agromorphological traits can be subjected to multivariate biometric techniques that consider the correlations that exist among numerous variables simultaneously and allow the importance of each trait to be determined (Al-HAD et al., 2017; PERREIRA et al., 2017).

Considering the importance of soybean and the perspective of incorporation of new genotypes in plant breeding programs, Principal Component Analysis was applied, seeking to filter the information considered relevant contained in the original set of variables into datasets of smaller dimensions. Thus, the aim of this study was to estimate the genetic diversity among 16 Brazilian cultivars of soybean [*Glycine max* (L.) Merrill] and 76 plant introductions (PIs) through variables related to production and yield components.

MATERIAL AND METHODS

SOYBEAN GENOTYPES AND GROWTH CONDITIONS

The experiment was conducted from February to May 2014 in the experimental area of the Colégio Técnico de Teresina at the Universidade Federal do Piauí – UFPI (lat 05°02'39.95" S; long 42°47'03.70" W, alt 72 masl). A total of 93 genotypes were used, including Brazilian cultivars and 76 PIs coming from the Soybean Breeding Program of the Genetics Department of the Escola Superior de Agricultura "Luiz de Queiroz" - USP/ESALQ (Table 1).

Table 1. Name/registration number and location of origin of the 76 PIs¹ and 16 Brazilian cultivars² of soybean [*Glycine max* (L.) Merrill] evaluated under conditions of low latitude and high temperatures. Teresina, PI, Brazil, 2014

GENOTYPE	ORIGIN	GENOTYPE	ORIGIN	GENOTYPE	ORIGIN
212606 ¹	Afghanistan	407744 ¹	China-Center	341264 ¹	Liberia
148260 ¹	South Africa	407764 ¹	China-South	281898 ¹	Malaysia
159097 ¹	South Africa	265497 ¹	Colombia	284816 ¹	Malaysia
170889 ¹	South Africa	84910 ¹	North Korea	281907 ¹	Malaysia
322695 ¹	Angola	438301 ¹	North Korea	200832 ¹	Myanmar
222550 ¹	Argentina	90251 ¹	South Korea	210352 ¹	Mozambique
222546 ¹	Argentina	398493 ¹	South Korea	166141 ¹	Nepal
IAC100 ²	Brazil	153681 ¹	El Salvador	209839 ¹	Nepal
Paranagoiana ²	Brazil	315701 ¹	USA	259540 ¹	Nigeria
A7002 ²	Brazil	Dowling ¹	USA	222397 ¹	Pakistan
CD215 ²	Brazil	Bignam ¹	USA	159927 ¹	Peru
Conquista ²	Brazil	417581 ¹	USA – S	265491 ¹	Peru
Pintado ²	Brazil	417582 ¹	USA – S	159922 ¹	Peru
Sambaíba ²	Brazil	240665 ¹	The Philippines	297550 ¹	Russia
VMáx ²	Brazil	281911 ¹	The Philippines	341254 ¹	Sudan
Potência ²	Brazil	203400 ¹	France	204333 ¹	Suriname
Jab00-056/763d ²	Brazil	164885 ¹	Guatemala	204340 ¹	Suriname
Jab00-02-2/2j3d ²	Brazil	189402 ¹	Guatemala	205912 ¹	Thailand
LQ 1050 ²	Brazil	165524 ¹	India	239237 ¹	Thailand
LQ 1505 ²	Brazil	133226 ¹	Indonesia	210178 ¹	Taiwan
LQ 1421 ²	Brazil	148259 ¹	Indonesia	283327 ¹	Taiwan
LQ 1413 ²	Brazil	Orba(PI471904) ¹	Indonesia	306702 ¹	Tanzania
203404 ²	Brazil	215692 ¹	Israel	306712 ¹	Tanzania
36906 ¹	China	229358 ¹	Japan	172902 ¹	Turkey
79861 ¹	China	274454-A ¹	Japan	381660 ¹	Uganda
171437 ¹	China	274454-B ¹	Japan	381680 ¹	Uganda
253664 ¹	China	360851 ¹	Japan	285095 ¹	Venezuela
274507 ¹	China	416828 ¹	Japan	331793 ¹	Vietnam
377573 ¹	China	Kinoshita(PI200487) ¹	Japan	331795 ¹	Vietnam
90577 ¹	China – NE	227687 ¹	Japan	417563 ¹	Vietnam
427276 ¹	China – S	171451 ¹	Japan	145079 ¹	Zimbabwe

The soil used for conducting the experiment was classified as an *Argissolo Vermelho-Amarelo distrófico*, on flat topography. The seeds were inoculated with bacteria of the *Bradyrhizobium japonicum* species for the purpose of promoting N₂ fixation, and they were treated with fungicide (MAXIM XL, 100 ml/100 kg of seed). Base fertilization was performed with NPK (nitrogen, phosphorus, potassium) with the formulation 5-30-15, according to recommendation from soil analysis for the crop. A fixed sprinkler irrigation system was used, with a 12 × 12 m spacing between sprinkler heads and application rate of 5mm/h. Other management practices followed the conventional growing approach for the soybean crop.

HEAT TOLERANCE SCREENING

Mean annual rainfall where the experiment was conducted was 1.377mm, with more intense rain in March and April, which corresponded to the R1 to R6 development stages. The region has mean annual potential evapotranspiration of 2.973mm, mean annual

relative humidity of 69.9%, total annual insolation of 2.625 horas, mean annual temperature of 28°C, temperature amplitude of 11.5°C, mean annual photoperiod of 12 hours and 19 min/day, with a minimum of 11 hours and 46 min/day and maximum of 12 hours and 29 min/day (MEDEIROS, 2006).

During the period in which the experiment was conducted, the mean temperature was 26.09°C (min–29°C and max - 34.3°C). Mean relative humidity was 83.9%. Daily rainfall amounts ranged from 0 to 77.2 mm (mean accumulated total of 832.5 mm). Insolation ranged from 116 to 2218.5 hours (Total = 728.3 hours, mean 184.58 hour/month) (INMET, 2014).

STATISTICAL ANALYSIS OF THE DATA

An incomplete block experimental design was used, with three replications. Each plot consisted of one 5.0-m length row; between-row distance was 0.50 m.

Twelve (12) descriptors were used for agromorphological characterization: number of days to flowering (NDF), number of days to maturity (NDM), plant height at maturity (PHM), first pod height (FPH), seed-fill period (SFP), pod length (PL), number of pods per plant (NPP), pod weight (PW) in grams, 100-seed weight (100SW) in grams, lodging (LG), agronomic value (AV), and grain yield (GY), according to recommendations made in instructions for carrying out trials for distinction, homogeneity, and stability of soybean cultivars from the Brazilian Ministry of Agriculture (Ministério da Agricultura e Agropecuária - MAPA, 2015). The agronomic value and lodging traits were transformed to $\sqrt{x + 1}$.

Principal component analysis was performed on the data, based on the original matrix of the means of the 93 genotypes evaluated for the twelve quantitative descriptors. For selection of the components that most contributed to variability, the criterion proposed by Kaiser (1960) was adopted, and the relative importance of the traits for genetic divergence was determined according to the method proposed by Singh (1981). Statistical-genetic analyses were performed using the Genes program (CRUZ, 2013).

RESULTS AND DISCUSSION

Principal component analysis allowed genetic diversity among the 93 soybean genotypes to be studied from 69.34% of the total variance accumulated by the first three eigenvalues (Table 2). Considering absence of redundancy between the contribution of the traits of greatest discriminatory power for structuring the orthogonal axes of the principal components (PC1, PC2 and PC3) and variance values greater than 1, the other principal components were not considered (Table 2).

Table 2. Principal Component Analysis based on twelve traits related to production and yield components evaluated in 76 PIs and 16 Brazilian soybean cultivars [*Glycine max* (L.) Merrill]. Teresina, PI, Brazil, 2014, UFPI

Parameters	Eigenvalues		
	λ_1	λ_2	λ_3
Variance	5.31	1.9	1.11
Eigenvalues (%)	44.25	15.84	9.25
Accumulated	44.25	60.09	69.34
Traits	Eigenvectors Principal Components		
	PC1	PC2	PC3
Number of days to flowering - NDF	0.33	-0.02	0.37
First pod height - FPH	0.22	0.15	0.21
Number of pods per plant - NPP	0.30	-0.08	-0.31
Seed-fill period - SFP	0.38	-0.09	0.28
Number of days to maturity - NDM	0.31	0.07	0.43
Plant height at maturity - PHM	0.37	0.12	0.03
Agronomic value - AV	0.32	0.25	-0.45
Lodging - LG	0.34	-0.12	-0.02
100-seed weight - 100SW	-0.06	0.57	0.21
Grain yield - GY	0.32	0.21	-0.46
Pod length - PL	-0.23	0.37	0.07
Pod weight - PW	-0.04	0.60	0.01

Using at least 80% of the total variation from the first principal components, the genetic diversity among a group of genotypes can be satisfactorily studied (CRUZ; REGAZZI; CARNEIRO, 2012). Nevertheless, considering what the criterion proposed by Kaiser (1960) advocates, even with values of total accumulated variation below 80%, estimates of genetic diversity have been efficient. Al-Hadi et al. (2017) clearly and concisely estimated the genetic diversity among 80 soybean genotypes evaluated under middle latitudes (24°5' N and 90°16' E) with a total accumulated variation of 75.6% of principal components resulting from morpho agronomic information.

The need for specific photoperiods is a factor that contributed to narrowing the genetic base of soybean, because most cultivars released in Brazil and in the world have a genealogy formed by parents in common or related parents (FERREIRA JÚNIOR et al., 2015). Thus, the criteria for studies on genetic diversity of a dataset with lower genetic dissimilarity can be flexibilized and adapted since there is lower gene complexity or lower variability of alleles than in the general pattern of agricultural crops (Table 2).

According to Agarwal et al. (2013), breeding studies have been conducted on the soybean crop for more than six decades and have led to yield increases in the order of 60% from approximately 4000 cultivars released throughout the world. However, even with the different approaches and the support of areas related to plant breeding that have led to advances and will yet make new advances for the soybean crop possible, such as genetic mapping, QTL analysis, genome sequencing, and development of transgenic plants, the

genetic base in the soybean crop has gradually narrowed (RODRIGUES et al., 2010; LIN et al., 2016; HACISALIHOGU et al., 2017).

The grain production and yield components of the 77 PIs and 16 Brazilian soybean cultivars established direct correlation among the traits of greatest discriminatory effect for the principal components PC1, PC2, and PC3. Selection of genotypes near the axes of these components increases the possibilities for selection of genes whose expression allows expansion of tolerance to abiotic factors. This results in maximization of yields for the soybean crop under high temperature and low latitude conditions (Table 2). Anderson et al. (2016) studied the genetic base of the *ex situ* collection of *Glycine soja* of the USDA with 32,416 SNPs, aiming to identify the population structure and test associations with bioclimatic variables to identify loci with associations with the variations of abiotic factors. Nevertheless, even with identification of genes for tolerance to abiotic factors, it is necessary to know the underlying molecular and physiological mechanisms that are still little known, for example, the role of plastoglobules related to drought stress (ANDERSON et al., 2016) and especially the effect that high temperatures may have on plant physiological mechanisms (BITA; GERATS, 2013).

The first principal component, PC1, was established mainly through means of the contribution associated with the eigenvectors of the seed-fill period (0.38), plant height at maturity (0.37), lodging (0.34), and number of days to flowering (0.33) traits. Structuring of principal component 2, PC2, was based on eigenvectors estimated by the means of the traits related to the fruit [pod length (0.37) and pod weight (0.60)] and the seed [100 seed weight (0.57)]. The consistency of the third principal component, PC3, was mainly from the means of the number of days to pod maturation (0.43), number of days to flowering (0.37), and seed-fill period (0.28) traits.

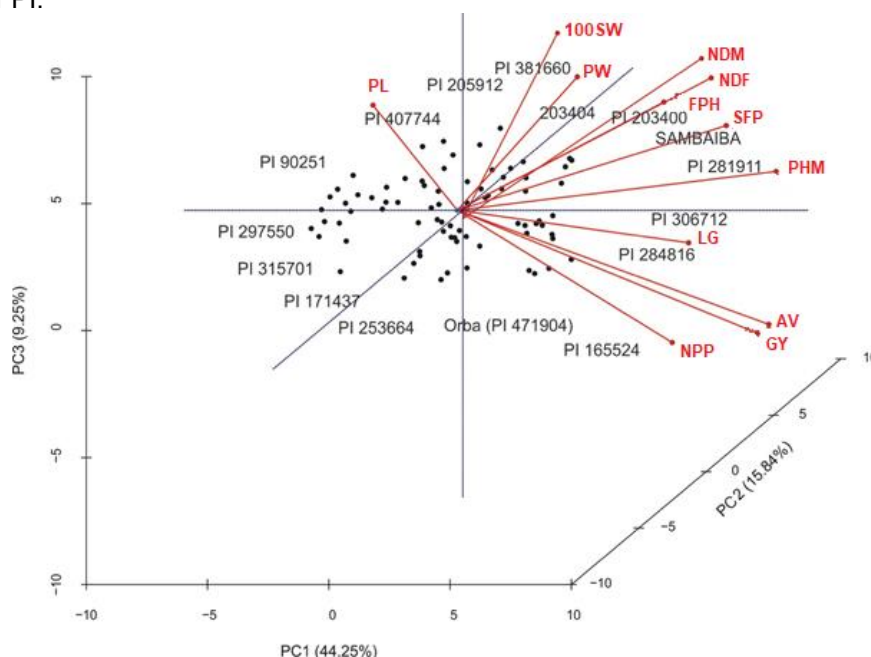
Thus, the axes of the first three principal components (PC1, PC2, and PC3) were established with traits of greater discriminatory power with direct associations among them, that is, greater mean values for one trait also imply greater mean values for the others with the same signal (Table 2).

Although it is recommended that the inferences regarding estimates for heritability necessarily be applied to the same set of genotypes, because the environmental component directly affects the values of the estimates, this recommendation can be made more flexible when dealing with traits with high magnitude of heritability. The traits that have expression regulated by a small number of genes are not greatly affected by the environment. In light of this information, directing strategies for selection of genotypes becomes more efficient (BALDISSERA et al., 2014).

The values in the literature for heritability of the variables of greatest discriminatory power among the three principal components (PC1, PC2, and PC3) were 93.23% (TEIXEIRA et al., 2017) for days to flowering of the PC1 and PC2, and 85.45% for 100 seed weight (TEIXEIRA et al., 2017) in PC2. Thus, it is possible to make inferences under the perspective of achieving genetic progress from selection of the soybean genotypes evaluated in this study, since we found values of high magnitude, classified as having high heritability. This makes the possibility of gains even more concrete since evidence in the literature shows that values greater than one in the CV_g/CV_e ratio for the traits mentioned indicates that genetic variation is the parameter of greatest importance in variation of the traits of greatest discriminatory power of PC1, PC2, and PC3.

The main associations among the traits and the soybean genotypes evaluated were analyzed in a three-dimensional plane in a biplot, considering the first principal components PC1 (35.29%), PC2(15.84%), and PC3 (9.25%) (Table2, Figure 1).

Figure 1. Three-dimensional scatter plot of 76 PIs and 16 Brazilian cultivars of soybean [*Glycine max* (L.) Merrill] and projections of the vectors of 12 traits related to production and yield components. Teresina, PI, Brazil, 2014, UFPI.

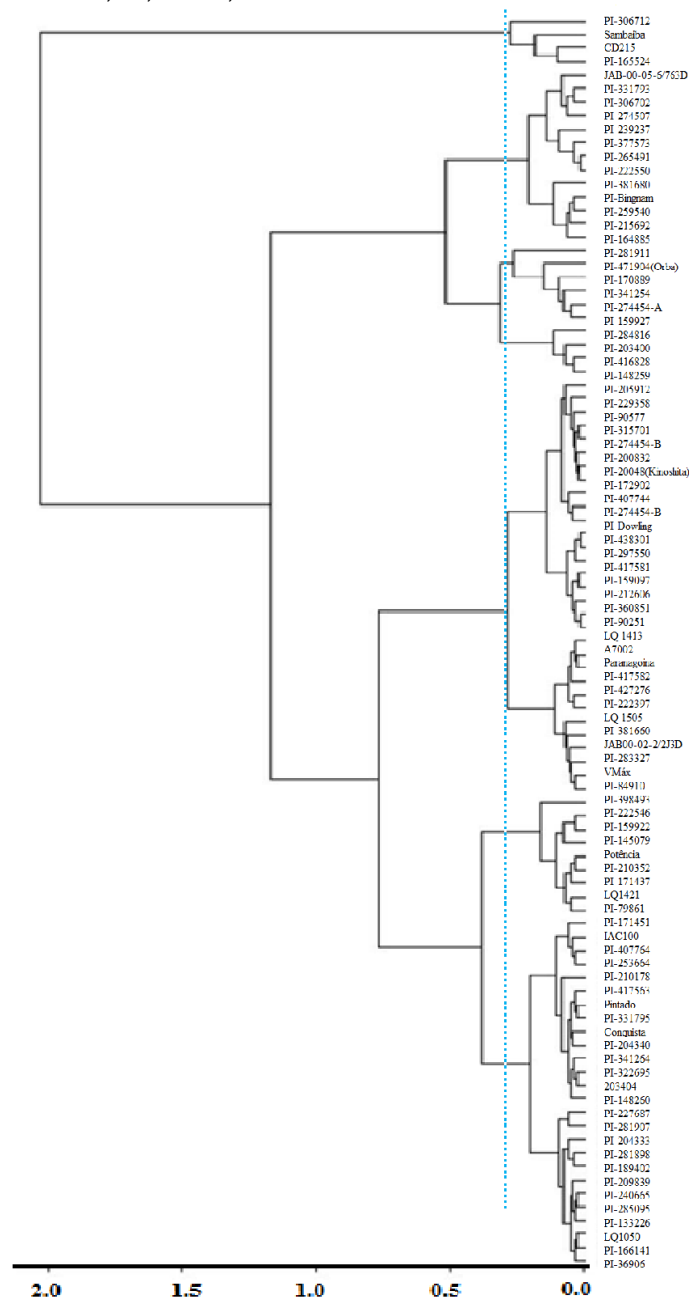


Among the genotypes plotted on the three principal components selected for estimating genetic diversity in the three-dimensional plane and taking the allocation of the Brazilian soybean cultivars Sambaíba and 203404 as a reference, the genotypes with best performance for the traits of greatest discriminatory power are the PIs 165524, 407744, 205912, 381660, 203400, and 281911 (Figure 1). The genotypes also exhibit greater variability for the number of days to flowering, plant height at maturity, seed-fill period, number of days to maturity, pod weight, pod length, and 100-seed weight traits.

The Brazilian cultivars are already adapted to the edaphic and climatic conditions for low latitudes. They are therefore the best reference of adjustment for selection of new soybean genotypes to be included in the genealogy of future crosses that resulted in new varieties to be released in Brazil.

From Euclidean distance by the UPGMA method, a dendrogram was generated that was able to allocate the 16 Brazilian cultivars and 76 PIs in six diversity panels with consistent structuring and without the presence of duplicates, allowing high adjustment of the matrices and two-dimensional representation by the cophenetic correlation coefficient of 0.79 and mean similarity of 0.4 between the groups of genotypes studied (Figure 2).

Figure 2. Dendrogram of UPGMA hierarchical cluster analysis using mean Euclidean distance for the twelve traits related to the production and yield components among 76 PIs and 20 Brazilian cultivars of soybean [*Glycine max* (L.) Merrill]. Teresina, PI, Brazil, 2014.



Allocation of the genotypes among the diversity panels occurred in the following manner: Group I formed of two Brazilian genotypes, one from India and another from South Africa; Group II, formed of 46.2% of the genotypes belonging to the American continent (four from South America and the other two from Central America and North America), 38.5% belonging to the Asian continent, and 15.4% belonging to the African continent; Group III, 60% Asian, 20% African, 10% American, and 10% European; Group IV, with the greatest concentration of Brazilian cultivars, six in all, and composed in general by 38.71% belonging to the American continent (58.33% from South America, 28.57% from North America, and 2.96% from Central America), 51.61% to the Asian continent, 6.46% to the African continent, and 3.22% to the European continent; Group V was formed of nine accessions, among which four are South American, and the others Asian and African; and Group VI, 53.45% Asian, 34.62% South American, and 11.93% African (with most of the genotypes coming from the southern part of the continent) (Table 1 and Figure 2).

The hierarchical clustering with little gradation in the dendrogram and the allocation in different groups for genotypes of the same origin, such as Brazilian soybean cultivars allocated in Groups I, IV, and V, corroborate the narrow genetic base that these materials have. However, in spite of the low performance of the mean and not very productive genotypes, the genotypes identified as African PIs generally appeared distributed in defined groups, forming small subgroups, showing the variation in the gene pools of these materials for the morphoagronomic traits evaluated (Table 1 and Figure 2).

Expressive subgroups from Asian genotypes were structured in four of the diversity panels; geographic position, local trade, and distribution of soybean genotypes are a probable explanation for such fragmented allocations (Table 1 and Figure 2). It is noteworthy that the Chinese genotypes also had similar allocation and appeared in five of the six groups formed. A similar result was observed by Marconato et al. (2017), who attributed structuring as a result of the center of origin of soybean being China.

In Groups IV, V, and VI, the association between the improved Brazilian genotypes and the Chinese genotypes was observed, as was already found in other evaluations with the same genotypes (MARCONATO et al., 2017). In addition to the center of origin, the morphological similarity is evident among the soybean genotypes and, therefore, confirms the joint allocation.

In an overall manner within all the genetic diversity panels, there was structuring of subgroups among the soybean genotypes originating from China, Taiwan, the Philippines, Thailand, and Indonesia, which are coastal and island countries or regions. These same conformations can be found in studies of Oliveira et al. (2010) and Marconato et al. (2017),

showing the consistency of the group formations established in this study. Another important fact was the prevalence of the joint allocation among South American genotypes, the only exception being observed in Group I, in which the Brazilian genotypes were associated with Asian and African genotypes (Figure 2).

The induction of flowering in soybean occurs in a critical and specific period for each genotype, constituting one of the limiting factors for broad cultivation of soybean in low latitude regions, since soybeans are plants adapted to short days (ZHANG; WANG; HESKETH, 2001). In a certain way, this physiological requirement selected a large group of soybean genotypes with similar traits, especially for the traits that are expressed between the phenological phases of emergence and the beginning of flowering, which are strongly affected by photoperiod and temperature (CÂMARA et al., 1997; DESTRO et al., 2001).

CONCLUSION

The genetic diversity studied through production and yield components of the soybean genotypes is estimated in a satisfactory manner through the following traits: number of days to flowering, seed-fill period, number of days to maturity; plant height at maturity, 100-seed weight, agronomic value, and lodging.

The 16 Brazilian cultivars and 76 PIs were structured in six diversity panels that were consistent and without duplicates.

The PIs 165524, 407744, 205912, 381660, 203400, and 281911 and the Brazilian cultivars Sambaíba and 203404 show potential for providing genes related to tolerance to stress from temperatures higher than 30°C and latitudes below 10°S.

REFERENCES

1. Agaewal, D. K., et al. (2013). Soybean: Introduction, improvement, and utilizations in India – problems and prospects. **Agricultural Research**, 2, 293-300.
2. Al-Hadi, M. A. G., et al. (2017). Morpho-physiological characterization of soybean genotypes under subtropical environment. **Genetika**, 49, 297-311.
3. Anderson, J. E., et al. (2016). Environmental association analyses identify candidates for abiotic stress tolerance in **Glycine soja**, the wild progenitor of cultivated soybeans. **Bethesda**, 6, 835-843.
4. Baldissera, J. N. C., et al. (2014). Genetics factors related with the inheritance in autogamous plant populations. **Revista de Ciências Agroveterinárias**, 13, 181-189.
5. Bitá, C. E., & Gerats, T. (2013). Plant tolerance to high temperature in a changing environment: Scientific fundamentals and production of heat stress-tolerant crops. **Frontiers in Plant Science**, 4, 1-18.
6. Câmara, G. M. M. S., et al. (1997). Influence of photoperiod and air temperature on the growth, flowering and maturation of soybean (**Glycine max** (L.) Merrill). **Scientia Agricola**, 54, 149-151.
7. Companhia Nacional de Abastecimento – CONAB. (2024). Último levantamento da safra 2023/2024. Disponível em: <<https://www.conab.gov.br/ultimas-noticias/5728-ultimo-levantamento-da-safra-2023-2024-estima-producao-de-graos-em-298-41-milhoes-de-toneladas#:~:text=Dentre%20as%20culturas%20afetadas%20pelo,rela%C3%A7%C3%A3o%20ao%20per%C3%ADodo%202022%2F2023>>. Acesso em 01 de outubro, 2024.
8. Cruz, C. D. (2013). GENES - a software package for analysis in experimental statistics and quantitative genetics. **Acta Scientiarum Agronomy**, 35, 271-276.
9. Cruz, C. D., Regazzi, A. J., & Carneiro, P. C. S. (2012). **Modelos biométricos aplicados ao melhoramento genético** (3ª ed.). Editora UFV.
10. Damasceno Junior, P. C., et al. (2015). Diversidade genética em duas espécies de Caricáceas e suas relações genéticas com **Carica papaya** L. **Revista Ciência Agronômica**, 46, 733-739.
11. Destro, D., et al. (2001). Photoperiodism and genetic control of the long juvenile period in soybean: A review. **Crop Breeding and Applied Biotechnology**, 1, 72-92.
12. Farias, J. R. B., Nepomuceno, A. L., & Neumaier, N. (2007). **Ecofisiologia da soja**. Embrapa Soja. Disponível em: <<https://www.infoteca.cnptia.embrapa.br/handle/doc/470308>>. Acesso em 15 de maio, 2020.
13. Federação das Indústrias do Estado de São Paulo – FIESP. (2020). Safra mundial da soja. Disponível em: <<https://www.fiesp.com.br/indices-pesquisas-e-publicacoes/safra-mundial>>. Acesso em 14 de maio, 2020.



14. Ferreira Júnior, J. A., et al. (2015). Diversidade genética em linhagens avançadas de soja oriundas de cruzamentos biparentais, quádruplos e óctuplo. **Revista Ciência Agronômica**, 46, 339-351.
15. Gomes, L. S., et al. (2014). Four conventional soybean **Glycine max** (L.) Merrill seeds exhibit different protein profiles as revealed by proteomic analysis. **Journal of Agricultural and Food Chemistry**, 62, 1283-1293.
16. Hacisalihoglu, G., et al. (2018). Quantitative trait loci associated with soybean seed weight and composition under different phosphorus levels. **Journal of Plant Interactions**, 60, 232-241.
17. Kaise, H. F. (1960). The application of electronic computers to factor analysis. **Educational and Psychological Measurement**, 20, 141-151.
18. Lin, J., et al. (2016). Transgenic soybean overexpressing **GmSAMT1** exhibits resistance to multiple-HG types of soybean cyst nematode **Heterodera glycines**. **Plant Biotechnology Journal**, 14, 2100-2109.
19. Marconato, M. B., et al. (2017). Genetic divergence in a soybean (**Glycine max**) diversity panel based on agro-morphological traits. **Genetics and Molecular Research**, 15, 1-11.
20. Oliveira, A. S., et al. (2015). Genetic variability and yield potential of three semiexotic maize (**Zea mays* L.*) populations. **Bioscience Journal**, 31, 1609-1617.
21. Oliveira, M. F., Nelson, R. L., & Geraldi, I. O. (2010). Establishing a soybean germplasm core collection. **Field Crops Research**, 119, 277-289.
22. Pangeni, D., et al. (2017). Effect of replacing conventional soybean meal with low oligosaccharide soybean meal fed to weanling piglets. **Journal of Animal Science**, 95, 320-326.
23. Pham, Q. V., Nguyen, T. T. N., Vo, T. T. X., Le, P. H., Nguyen, X. T. T., Duong, N. V., & Le, C. T. S. (2023). Applying the SIMPLE crop model to assess soybean (**Glycine max** (L.) Merr.) biomass and yield in tropical climate variation. **Agronomy**, 13, 1180.
24. Priolli, R. H. G., et al. (2004). Diversidade genética da soja entre períodos e entre programas de melhoramento no Brasil. **Pesquisa Agropecuária Brasileira**, 39, 967-975.
25. Rodrigues, J. I. S., et al. (2010). Mapeamento de QTL para conteúdos de proteína e óleo em soja. **Pesquisa Agropecuária Brasileira**, 45, 472-480.
26. Singh, D. (1981). The relative importance of characters affecting genetic divergence. **The Indian Journal of Genetics e Plant Breeding**, s/v, 237-245.
27. Spehar, C. R. (1994). Breeding soybeans to the low latitudes of Brazilian Cerrados (Savannahs). **Pesquisa Agropecuária Brasileira**, 29, 1167-1180.
28. Steinke, E. T. (2012). **Climatologia fácil** (1ª ed.). São Paulo: Oficina de Textos.



29. Teixeira, F. G., et al. (2017). Inheritance of precocity and of agronomic characters in soybean. **Genetics and Molecular Research**, 16, 1-13.
30. Wysmierski, P. T., & Vello, N. A. (2013). The genetic base of Brazilian soybean cultivars: Evolution over time and breeding implications. **Genetics and Molecular Biology**, 36, 547-555.
31. Zhang, L., Wang, R., & Hesketh, J. D. (2001). Effects of photoperiod on growth and development of soybean floral bud in different maturity. **Agronomic Journal**, 93, 944-948.

INTRA-ABDOMINAL GOSSYPIBOMA RETAINED FOR 30 YEARS, MIMICKING RETROPERITONEAL TUMOR: CASE REPORT

<https://doi.org/10.56238/sevened2024.029-019>

Pedro Henrique de Almeida Barbosa¹, Ana Flavia Rocha de Oliveira², Gabriel Cerqueira Teixeira³, Aléxia Oliveira Leite⁴, Laís Martins Brandão⁵, Igor Macedo de Oliveira⁶, Assiane Gabriela Anceles da Rocha⁷, Debora Ferreira de Sousa⁸, Roberto Neves Baptista Campos⁹, Marcela Maria Cavalcanti Lira¹⁰ and Fernanda Moreira Henriques¹¹

ABSTRACT

The word gossypiboma derives from the Latin gossypium, meaning cotton, and the Swahili Boma, hiding place. The term refers to surgical items of textile matrix inadvertently left inside cavities after closure of the surgical wound. In the literature, its incidence is around 1% of abdominal surgeries, but it is believed that there is underreporting. It can cause nonspecific symptoms such as abdominal pain and abscess at the beginning of the condition, or progress to intestinal obstruction, fistulas and rectal extrusion if retained for a prolonged time. The present study aims to report the case of a patient with a history of total hysterectomy for 30 years, admitted with obstruction to the emergency room of a tertiary hospital, where exploratory laparotomy was indicated and hypothesized retroperitoneal

¹ Resident Physician of the General Surgery Service. Otávio de Freitas Hospital. Rua Aprígio Guimarães s/n – Tejipió, Recife-PE.

E-mail: pedro.henrique1996@live.com

² Resident Physician of the General Surgery Service. Otávio de Freitas Hospital. Rua Aprígio Guimarães s/n – Tejipió, Recife-PE.

E-mail: anafaviamedfps@gmail.com

³ Resident Physician of the General Surgery Service. Otávio de Freitas Hospital. Rua Aprígio Guimarães s/n – Tejipió, Recife-PE.

E-mail: teixeira3gabriel@gmail.com

⁴ Resident Physician of the General Surgery Service. Otávio de Freitas Hospital. Rua Aprígio Guimarães s/n – Tejipió, Recife-PE.

E-mail: alexialeit@gmail.com

⁵ Resident Physician of the General Surgery Service. Otávio de Freitas Hospital. Rua Aprígio Guimarães s/n – Tejipió, Recife-PE.

E-mail: lais.brandao@upe.br

⁶ Resident Physician of the General Surgery Service. Otávio de Freitas Hospital. Rua Aprígio Guimarães s/n – Tejipió, Recife-PE.

E-mail: moigor6@hotmail.com

⁷ Resident Physician of the General Surgery Service. Otávio de Freitas Hospital. Rua Aprígio Guimarães s/n – Tejipió, Recife-PE.

E-mail: assiane.rocha@gmail.com

⁸ Resident Physician of the General Surgery Service. Otávio de Freitas Hospital. Rua Aprígio Guimarães s/n – Tejipió, Recife-PE.

E-mail: debora.ferreirasousa@ufpe.br

⁹ Resident Physician of the Digestive System Surgery Service. Oswaldo Cruz University Hospital. Rua Arnobio Marques, 310 – Santo Amaro, Recife – PE

E-mail: robertonb.campos@live.com

¹⁰ Student at the Catholic University of Pernambuco. Rua do Príncipe, 526-Boa Vista, Recife-PE

E-mail: marcelam.clira@gmail.com

¹¹ Doctor from the Maurício de Nassau University Center – UNINASSAU. Rua Jonathas de Vasconcelos, 316 – Boa Viagem, Recife – PE

E-mail: nandamhenriques@gmail.com



tumor during the procedure was raised. After discussing the case in a clinical meeting, the hypothesis of gossypiboma was raised and a reapproach was chosen, which confirmed the finding of a foreign body in the abdominal cavity.

Keywords: Gossypiboma. Intestinal obstruction. Retroperitoneal tumor. Exploratory laparotomy.

INTRODUCTION

Gossypiboma corresponds to an inabsorbable material left inside the patient's body during the surgical procedure². The incidence is between 1/1,000 and 1/10,000 surgeries⁴ and 0.3 to 1% in abdominal surgeries¹, although studies point to underreporting. They are most commonly found in: abdomen (56%), pelvis (18%) and thorax (11%)³.

Although the symptoms are nonspecific, they may present abscess, abdominal pain, bleeding, and septic complications. If identified late, they may present: intestinal obstruction, fistulization, and extrusion through the rectum. Risk factors include emergency procedures, prolonged operative time, and incomplete surgical pad counts.³

OBJECTIVE

To report the rare case of a patient who remained asymptomatic for three decades with a gossypiboma in the abdominal cavity after total hysterectomy (HTN).

METHODOLOGY

The information contained in this study was obtained through a review of the medical records, interviews with the patient, registration of the reports of the diagnostic methods to which the patient was submitted, and a review of the literature.

RESULTS

A.C.S., female, 65 years old, with a report of weight loss, post-feeding vomiting and cessation of feces two weeks after admission. She was referred from an external service after a computed tomography of the abdomen, with an image suggestive of bezoar and distension of intestinal loops upstream.

In view of the case, exploratory laparotomy with loop ileostomy and mesenteric lymph node biopsy was chosen due to the suspicion of retroperitoneal tumor, which was suggested intraoperatively.

In the postoperative period, contrast-enhanced abdominal CT was performed for staging, which showed a heterogeneous lesion measuring approximately 10.6 x 8.4 cm, suggestive of gossypiboma. The case of the patient was discussed in a clinical meeting and surgical treatment was indicated for the removal of a foreign body, corroborated by the history of hypertension 30 years ago and lymph node biopsy with absence of epithelium in the sample. Therefore, enterectomy and removal of a foreign body were performed.

After 28 days, the patient underwent early intestinal transit reconstruction, without intercurrents.

Figure 1: Abdominal gossypiboma



Source: authorship


CONCLUSION

It is still difficult to diagnose gossypibomas accurately, a fact that implies a considerable increase in morbidity and costs. A surgical safety protocol, such as the WHO checklist,¹ adequate staff training, and institutional continuing education measures should be established in order to reduce gossypiboma occurrence rates. These strategies promote greater surgical safety, better patient care, and decreased morbidity and mortality.



REFERENCES

1. Alemu, B. N., & Tiruneh, A. G. (2020). Gossypiboma: A case series and literature review. **Ethiopian Journal of Health Sciences**, 30(1), 1-6.
2. Hameed, A., Chaudhary, S., & Ali, M. (2014). Intrathoracic gossypiboma. **Case Reports**, 2014, bcr2013201814.
3. Hempel, S., Dorr, N., & Daza, A. (2015). Wrong-site surgery, retained surgical items, and surgical fires. **JAMA Surgery**, 150(8), 796-797.
4. Manzella, A., Filho, P. B., Albuquerque, E., Farias, F., & Kaercher, J. (2009). Imaging de gossypibomas: Revisão pictórica. **AJR American Journal of Roentgenology**, 193(6), 94-101.

**SUSTAINABILITY IN FAMILY FARMING: CHALLENGES AND OPPORTUNITIES
– A CASE STUDY OF FAMILY FARMERS IN CAIUÁ/SP** <https://doi.org/10.56238/sevened2024.029-020>**Allan Elias da Silva¹****ABSTRACT**

Family farming plays a vital role in food security and rural development, especially in rural areas. This study investigates sustainability in family farming, focusing on the Nossa Senhora das Graças Settlement, in Caiuá, São Paulo. The objective was to analyze agricultural practices, identify challenges and propose improvements to promote more sustainable practices. The qualitative and exploratory research included semi-structured interviews and direct observations of agricultural practices. The results reveal a limited diversity of crops, predominance of traditional soil conservation techniques and mixed use of natural pesticides and chemicals. Challenges include a lack of resources, technical assistance, and knowledge about sustainable practices. Despite recognizing the importance of sustainability, farmers face significant barriers that limit the full adoption of sustainable practices. The research highlights the need for public policies and training programs to support the transition to more resilient and sustainable practices in family farming.

Keywords: Family Farming. Sustainability. Settlement of Our Lady of Graces. Sustainable Practices. Barriers.

¹ Highest degree: Doctoral candidate in Agribusiness and Development
Academic institution: UNESP - Faculty of Science and Engineering of Tupã/SP

INTRODUCTION

Agriculture plays a crucial role in the global economy and food security. However, the challenges facing contemporary agriculture are significant, including the need to increase food production to meet the growing demand of the world's population, while reducing environmental impact and promoting social justice. In this context, family farming stands out, as it plays a fundamental role in food production, especially in rural regions.

The general objective of this work is to investigate sustainability in family farming, focusing on understanding the challenges faced by farming families and identifying opportunities to promote more sustainable practices. Specific objectives include:

- Analyze the agricultural practices currently adopted by farming families and assess their environmental impact;
- To identify the main challenges faced by families in the search for sustainable agricultural practices, having as a research space, the small producers of agrarian reform in the Municipality of Caiuá, in the interior of São Paulo, precisely in the Settlement called "Nossa Senhora das Graças".

The central problem that the article proposes to investigate concerns how sustainable agricultural practices can be promoted and implemented effectively in family farming, considering the specific challenges and opportunities of this context.

The present research becomes relevant due to the strategic importance of family farming and its potential to contribute to sustainable development. The need to address environmental, social, and economic issues related to agriculture is crucial at a time when society is increasingly aware of global challenges such as climate change and food security. By understanding the challenges faced by farming families and identifying opportunities to improve sustainability, the survey can provide valuable guidance for governments, non-governmental organizations, farmers, and other actors interested in promoting sustainable family farming. Furthermore, this research aligns with the United Nations 2030 Agenda and its Sustainable Development Goals (SDGs), contributing to the advancement of these goals.

In the following topic, the multifunctionality of agriculture historically will be addressed. Then, the importance of sustainable development in this dimension will be discussed, where heterogeneous definitions and characteristics of the family farmer will be highlighted. Therefore, public policies aimed at these social actors will be explored, as well as sustainability involving primordial pillars such as: society, environment and economy. In order to evidence the theoretical praxis, a study of a Rural Settlement in the Municipality of Caiuá/SP – Assentamento Nossa Senhora das Graças will be presented, with the purpose

of evidencing local sustainable practices, in which it has the lowest degree of urbanization in the Pontal do Paranapanema Hydrographic Unit, in the interior of São Paulo.

AGRICULTURE AND ITS MULTIFUNCTIONALITY

After decades of modernization of agriculture, which tried to obtain rapid productivity gains in the territory, in the 1990s, the notion of multifunctionality of agriculture appeared and a social demand for other functions for agriculture in addition to production emerged (Guillamiun *et al.*, 1999).

Givord (2001) points out that, for a long time, the opposition between the "Rural Model" versus the "Agricultural Model" (or the "Rural" *versus* the "Agro"), made them seem like competitors, but today they are seen as complementary. For the author, this integration was enshrined, at the political and legal level in the European Union, in the concept of multifunctionality of agriculture, expressed by "Agenda 2000" which establishes rural development as the second pillar of the Common Agricultural Policy (CAP). This concept is also internationally recognized in the debates promoted about Biomass: it is plant production, capable of being transformed into energy, raw material for Biofuels that are nothing more than a form of alternative to the use of oil as the main energy source of our society. Solar energy is converted via photosynthesis into green matter and transformed into a form of energy available for the means of transport and power of industrial processes, Biofuels.

The new functions that agriculture has been assuming go far beyond that. Human beings are highly dependent on these functions, especially in their social aspect. Considering the territory as an inhabited space, the role of agriculture in its management is mainly grouped around three axes: the economic role, the ecological role and the social role (Guillaumin *et al.*, 1999).

As for the economic role, agricultural products can have an effect on the development of the territory, due to their economic impact (agri-food sector) and the effects that fall on other sectors (local economic dynamism). In the ecological aspect, agriculture is also related to the constitution and management of the landscape. It participates in the preservation of biodiversity, in the maintenance of vegetation cover, in the protection of water sources, among others. And, above all, because of its social importance. This is one of the important functions of agriculture in the territory, in terms of human presence, as it has the ability to maintain an employed population, as well as to animate rural life (Guillaumin *et al.*, 1999).

These functions, sometimes called "new functions" can be considered as positive externalities of the agricultural production activity, for example, the constitution of a pleasant landscape. On the other hand, they can also be services demanded from agriculture by other actors, which lead to modifying their practices, such as changing the date of harvest to preserve an animal species, maintaining corridors to avoid forest fires, welcoming students for practical classes, among others (Guillaumin *et al.*, 1999)

SUSTAINABLE DEVELOPMENT IN AGRICULTURE

The word "development" suggests change, since what develops does not remain static. However, defining what it means that a society is undergoing stage changes is a more complex challenge.

The term "development" often evokes the traditional division of the world into developed and underdeveloped countries. This notion was originally used to justify the expansion of the North American production model, under the premise of seeking a fair and democratic distribution of global wealth. This process began around 1949, when the then US president, Harry Truman, proposed a "bold and modern program" to allow underdeveloped areas to have access to scientific advances and industrial progress achieved by the United States (Esteva, 2000). Since then, "development" has often been used as a synonym for growth, evolution, and maturation. However, for a large part of the world's population, this positive meaning of the word "development" is a constant reminder of what they are not (Esteva, 2000).

The concept of development is encompassed by several other relevant themes, as a means of progress and structuring. Krenak (2019) reflects that sustainability is a myth, which is invented to justify the evils we do to nature. In this sense, he asks: "Natural resource for whom? Sustainable development for what? What does it take to sustain?" (Krenak, 2019, p. 12).

In contrast, several environmentalists and scholars define and expose the composition of this form of development. According to Sachs (1998), sustainable development must encompass the following dimensions:

- **Social Sustainability:** This refers to a development process in which economic growth aims to build a more equitable society by reducing the disparities between rich and poor. This implies a fairer distribution of income and goods, seeking greater equality (Sachs, 1998).
- **Economic Sustainability:** It involves the efficient allocation of public and private resources. Economic efficiency should not only be evaluated on the basis of the

profitability of firms on a microeconomic scale, but also in terms of macroeconomic impacts that benefit society as a whole (Sachs, 1998).

- **Ecological Sustainability:** Refers to the carrying capacity of ecosystems, the reduction of the use of non-renewable resources, the reduction of waste emissions, and the balance in the consumption of natural resources between rich and poor countries. This also involves research and development of less polluting, low-cost, and efficient technologies for rural and urban environments, as well as appropriate environmental regulations (Sachs, 1998).
- **Spatial Sustainability:** Focuses on achieving a more balanced configuration between rural and urban areas, seeking a more efficient territorial distribution of human settlements and economic activities. This implies territorial planning and development that avoids excessive concentration in urban areas and promotes sustainable development in rural areas (Sachs, 1998).
- **Cultural Sustainability:** It involves the search for endogenous roots in modernization processes and integrated agricultural systems. This means seeking changes within the cultural continuum and translating the concept of eco-development into specific solutions that respect the culture, the ecosystem and the local area. It is essential to consider culture as an integral part of sustainable development, preserving local traditions and knowledge (Sachs, 1998).

These dimensions represent fundamental pillars of sustainable development in agriculture and demonstrate the need to consider not only economic growth, but also social, ecological, spatial and cultural issues to ensure equitable and lasting development.

FAMILY FARMING IN BRAZIL

Historically, humanity has evolved from a natural environment to a technical environment, and after the 1970s, it has reached a technical-scientific-informational environment, in which the role of the sciences has become increasingly evident as an engine of human progress (Santos, 2006).

It is important to highlight that farmers grouped under the term "family" do not form a homogeneous group. In Brazil, of the almost 4 million family farmers, the characteristics vary widely due to several factors of agricultural establishments such as: size, type of soil, climate, relief, water availability; characteristics of the farmer such as: gender, age, level of education; Characteristics of agricultural production: mono or polyculture, types of cultivation and breeding, technology used, access to support services, income) and other

preponderant differences such as cultural diversity and family income sources. Creating a concept that encompasses such diversity is not trivial and is unlikely to be unanimous and fixed over time (Castro, 2023).

According to the Food and Agriculture Organization of the United Nations (FAO) (2018), family farming involves the management of agricultural activities, forestry, fishing, livestock and aquaculture by a family, which depends mainly on the work of its own members, integrating economic, environmental, social and cultural functions.

In the legal sphere, with the objective of supporting the credit policy aimed at the sector, Law No. 11,326, of July 2006, defines in article 3 the guidelines for the National Policy on Family Farming and establishes criteria for the identification of this public. According to the law, a family farmer or rural family entrepreneur is considered to be one who carries out activities in rural areas and simultaneously meets the following requirements: not having an area larger than four fiscal modules; predominantly use family labor in their activities; obtain a minimum percentage of family income from their economic activities, as defined by the Executive Branch; and manage the establishment with the participation of the family. The exception to the area limit applies in cases of rural condominium or other forms of collective property, provided that the ideal fraction per owner does not exceed four fiscal modules (BRASIL, 2006).

The family farmer has a special connection with the land, which serves as both a place of work and a home. This intimate relationship motivates the search for production methods that respect and preserve the environment, value human work and improve the quality of life in both rural and urban areas (Wanderley, 2009). Regarding the conceptualization of family farming and the various synonyms used in the literature and legislation, the importance of this sector in the Brazilian scenario is highlighted, contrary to the historical view of it being a low-income and subsistence agriculture (Abramovay, 1997).

PUBLIC POLICIES IN FAVOR OF FAMILY FARMING

Studies on public policies (PP) are recent in Brazil, resulting in conceptual divergences (Lima, 2012). Secchi (2015) points out that, in Portuguese and other Latin languages, "politics" can have two connotations, differentiated in English by the terms *politics* and *policy*, the latter being similar to public *policies*. Rua (1998) defines politics as formal and informal procedures that express power relations to resolve conflicts over public goods. Secchi (2015) also adds that public policies deal with the concrete and symbolic content of political decisions and the process of their construction and performance.

According to Schneider and Grisa (2015), several public policies aim to strengthen and develop family farming in Brazil, focusing mainly on supporting less favored farmers. It is crucial that both public managers and the population in general understand the functioning of these policies.

Abramovay (2006) highlighted three important dimensions for the valorization of family farming in Brazil. First, on the intellectual level, the emergence of studies and research has helped to understand the diversity of family farming and its socioeconomic importance. Second, in terms of public policies, the creation of PRONAF and the increase in agrarian reform settlement projects in the 1990s provided new job and business opportunities in the countryside for many families. Finally, on the social level, family farming is supported by social movements and unions that fight for the economic viability of family production.

Next, three of the main nationally relevant public policy programs will be exposed: PRONAF, PAA and PNAE.

National Program for the Strengthening of Family Agriculture – PRONAF

When public policies for family farming are mentioned, PRONAF is often the main highlight. The Program financially supports individual or collective projects that aim to generate income for family farmers and agrarian reform settlers. Its creation marks an important point in rural areas, recognizing the particularities of family farming, which was previously considered only a subsistence activity (Leite, 2021). Created in 1996 by Decree No. 1,946, it was developed with the collaboration of governments, NGOs and social movements. The program initially focused on three areas:

- Credit, receiving more than 90% of the resources;
- Municipal Infrastructure and Services, which from 2003 onwards began to be addressed territorially; and
- Training, which currently has less relevance. The resources come from the General Budget of the Union (OGU), the Worker Support Fund (FAT), cooperative banks and constitutional funds, and are managed by the National Treasury to directly finance the beneficiaries and equalize interest rates (Silva, 2008).

The main purpose at the time of its creation was to offer lines of credit to a specific social group, present throughout Brazil, especially in areas with low economic activity. Over time, the program has undergone several regulatory changes to expand family farming's access to credit and facilitate its insertion in the financial market. Today, it serves as the

basis for several programs to support family agricultural production, such as the PAA (Silva, 2011).

To access PRONAF financing, it is necessary to have some requirements such as the Declaration of Aptitude (DAP) or the National Registry of Family Agriculture (CAF-Pronaf), which must be issued by accredited entities. It should be noted that funding is prioritized for agroecology projects, initiatives that reduce greenhouse gas emissions, and for proposals led by women and youth. The program is operated by public and private banks, BNDES, and rural credit cooperatives, and finances a variety of activities, from the cultivation of staple foods and agroecological products to investments in rural housing and rural tourism (Mapa, 2024).

For Schneider, Cazella and Mattei (2004), the creation of this program was a significant milestone in public policies for the Brazilian rural environment. This program recognizes and legitimizes a new social category, family farmers, formerly known as small producers, family producers, low-income producers or subsistence farmers.

National School Feeding Program - PNAE

The National School Feeding Program (PNAE) became a public policy for family farmers with Law No. 11,497, of June 16, 2009. This law requires that at least 30% of the resources of the National Fund for the Development of Education (FNDE) in the PNAE be used to buy food from family farms and rural entrepreneurs, prioritizing agrarian reform settlements, indigenous communities and quilombolas (Brasil, 2009, Art. 14).

The regulation facilitated the direct marketing of family farming products (Constanty; Zonin, 2016), promoted the formal organization of farmers (Silva; Days; Amorim Júnior, 2015); guaranteed quality food for vulnerable populations (Triches; Barbosa; Silvestri, 2016), expanding the State's view of food beyond the issue of hunger (Moura, 2014); and encouraged the agenda of directing organic foods (Saraiva *et al.*, 2013). In the public sector, as a relevant premise, the creation of public calls enabled greater access for family farmers to government purchases (Schwartzman *et al.*, 2017).

For Saraiva *et al.* (2013) the PNAE promotes local development by interacting with regional agriculture. Franzoni and Silva (2016) consider it part of the "new paradigm of rural development", reflecting changes in food consumption and agri-food markets. Torres *et al.* (2011) emphasize that the PNAE is an instrument of sustainable and equitable development, supporting family farming and ensuring food security in schools with agroecological products.

In the context of family farming, it can be considered linked to innovation, technology and citizenship, addressing topics such as social innovation and social technology. It is important in the sense of supporting family farming, contributing to social transformation, promoting socio-environmental sustainability, organizational innovation and access to new technologies, in addition to serving as a pedagogical process (Franzoni and Silva, 2016).

Food Acquisition Program - PAA

The Food Acquisition Program (PAA) aims to strengthen family farming and its associated activities, with an emphasis on areas of greater economic vulnerability. It seeks to promote sustainable practices and ensure access to nutritious food for people in situations of food insecurity, aligning with the right to adequate food. In addition, it encourages the consumption of locally produced food, supports the acquisition of products for initiatives such as Solidarity Kitchen, and facilitates the formation of stocks by cooperatives (Brasil, 2023).

The PAA also aims to strengthen local marketing networks, value biodiversity and organic production, and promote healthy eating habits. The Program encourages cooperativism and associativism, supports the production of specific communities and promotes practices that conserve natural resources, with the goal of reducing inequalities and supporting farmers who have dependents with disabilities (MDA, 2023).

Reintroduced by President Lula in 2023, the Program brought significant updates, such as increasing the sales limit for family farmers to R\$ 15 thousand. Thus, it now also facilitates access for indigenous peoples and quilombola communities, and prioritizes the inclusion of women and agrarian reform settlers; It also carries out the public purchase of food from family farming without bidding, with the purpose of redistributing these products to people in vulnerable situations, promoting income in the countryside and helping to fight hunger. Currently, it offers five modalities: purchase with simultaneous donation, PAA-Milk, direct purchase, institutional purchase, and support for the formation of stocks (MDA, 2023).

FAMILY FARMING AND SUSTAINABILITY

According to Silva (2007, p. 20) "sustainable agriculture is that which is capable of maintaining its productivity and usefulness to society, being economically viable, commercially competitive, environmentally acceptable and socially just". Veiga (1996) observes that, in the family farming model, the integration between work and management facilitates the adaptation of decisions to the specific characteristics of the production

process. This model highlights the use of internal inputs, the diversification of activities and the conservation of natural resources.

According to Bianchini (2005), sustainable rural development must meet three main aspects:

1. **Ecological:** Minimize negative impacts on the environment, preserve soil fertility, ensure the stability of water resources, and protect biological diversity.
2. **Social:** Valuing local knowledge and internal community resources, promoting equity in access to new technologies.
3. **Economic:** Ensure the viability of local populations, improve the quality of life and establish a sustainable agri-food system at all levels.

The concept of sustainable rural development is an overarching idea that incorporates diverse social movements, including trade unions, land movements, and environmental initiatives. It also encompasses organic agriculture and movements that promote Agroecology as a basis for a transformation in agricultural practices, in addition to including segments with a preservationist perspective. For Almeida (1998), this is a model in constant evolution, where the joint action of NGOs and social movements, in interaction with public policies, helps to outline guidelines, although there is still no unifying concept that encompasses all the proposals and interests at stake.

In recent years, the discussion about the relevance and role of family farming in the development of Brazil has intensified. This debate is driven by very relevant themes such as: sustainable development, employment and income generation, food security and local development (FAO/INCRA, 2000). Wanderley (2000) suggests that Brazil is gradually recognizing the importance of family farmers, previously considered only as the rural poor. Currently, these small producers or low-income farmers, who are the focus of studies on rural development, are seen as representatives of an alternative agricultural model, distinct from the predominant landowner and employer agriculture in the country.

CASE STUDY

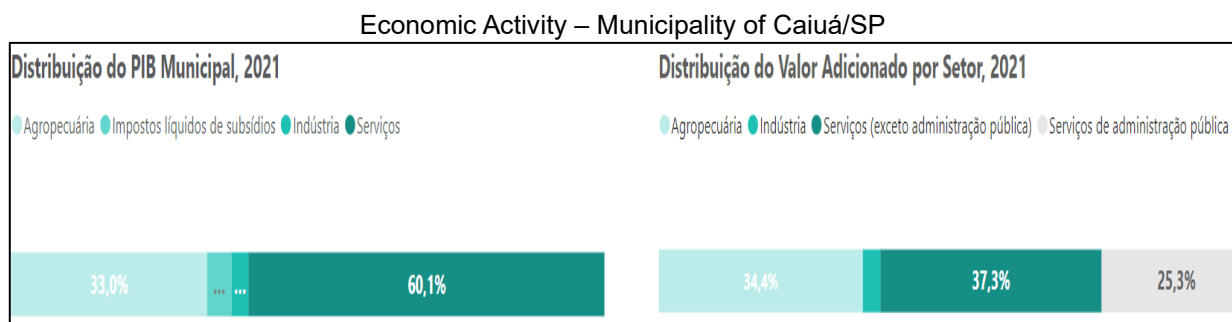
From this topic, a case study will be exposed on the Municipality of Caiuá, located in the interior of São Paulo, where the Rural Settlement called "Nossa Senhora das Graças" will be specifically addressed as a research territory.

The Municipality of Caiuá

Caiuá/SP is part of the Electoral Zone of Presidente Venceslau, but belongs to the District of Presidente Epitácio/SP, where all real estate registrations, protests and lawsuits

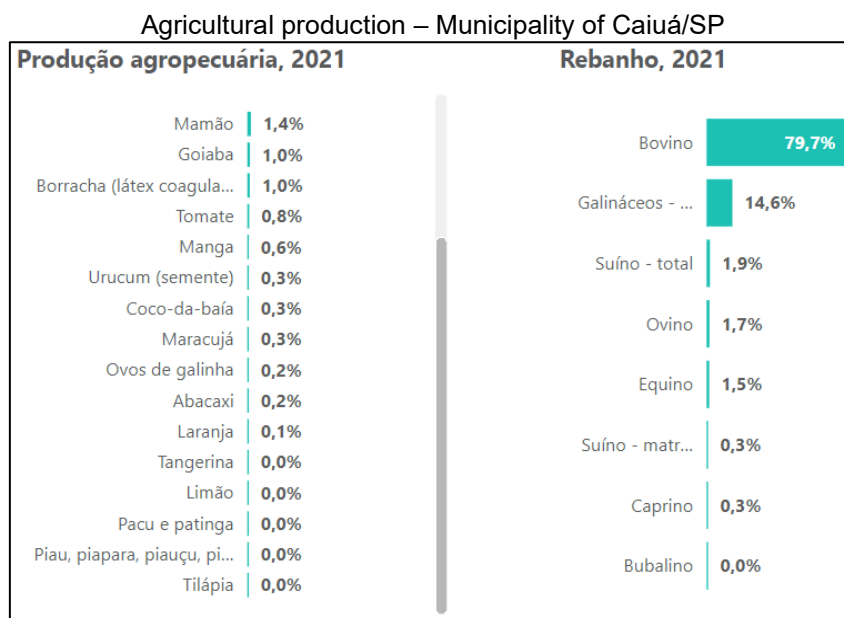
are carried out. The inhabitants are called Caiuáenses and the municipality has a single District of Peace, with a 4th Class Police Station in the Subregion of Presidente Venceslau. It is located in the southwestern part of the State of São Paulo, where it occupies an area of 505 km², bordering itself to the north by Panorama/SP, to the south by Marabá Paulista/SP, to the east by Presidente Venceslau/SP and to the west by Presidente Epitácio/SP (Caiuá City Council, 2024).

In the municipality, the predominant economic activity is the Services sector, followed by the Agriculture sector, as shown in the following table:



Source: Seade (2021).

In the context of agricultural production, the focus of this article, there are the following divisions:



Source: Seade (2021).

According to information brought by Seade (2021), in agriculture the main crops are papaya, guava, and latex. However, cattle ranching is highly predominant with about 80% of the total.

Population and degree of urbanization

Municipalities of Pontal do Paranapanema	Population (IBGE, 2022)	Degree of urbanization (%) (Government of the State of São Paulo, 2022)
Alfredo Marcondes	4.445	90,5
Álvares Machado	27.255	91,3
Anhumas	4.023	87,7
Caiabu	3.712	85,5
Caiuá	5.466	38,3
Emilianópolis	3.014	87,7
North Star	2.703	86,6
Euclid da Cunha Paulista	7.924	64,5
Iepê	7.619	92,8
Indiana	5.090	88,2
João Ramalho	4.371	89
Marabá Paulista	4.573	44,5
Martinópolis	24.881	86,9
Mirante to Paranapanema	15.917	58,9
Nantes	2.660	95,6
Narandiba	5.713	81,3
Piquerobi	3.264	79,7
Pirapozinho	25.348	95,9
President Bernardes	14.490	83,7
President Epitácio	39.505	94
President Prudente	225.668	98
President Venceslau	35.201	97
Rancharia	28.588	91,8
Regent Feijó	20.145	93,9
Ribeirão dos Índios	2.025	88,6
Rosana	17.440	96,4
Sandovalina	3.645	80,1
Saint Anastocio	17.963	94,3
Saint Expedite	3.000	93,3
Taciba	6.260	87,9
Tarabaí	6.536	94
Teodoro Sampaio	22.173	82,7
	600.617	96,5

Source: Government of the State of São Paulo (2022); IBGE (2023); Adapted by the author (2024).

It can be concluded that the Municipality in comparison with the others of Pontal do Paranapanema is the one with the lowest degree of urbanization, where of its 5,466 inhabitants (last Demographic Census) and a degree of urbanization of 38.3%. This means that approximately 2,093 people reside in the urban area, while about 3,373 inhabitants live in rural areas. Thus, the importance of promoting family farming activities is perceived.

In addition to the city (urban perimeter), the Municipality has units called Agrovilas III and IV and nine more rural settlements, which makes the management and operationalization of public policies quite complex. Carvalho (1998) defines settlements as areas of land expropriated or acquired by the government for agrarian reform, where families of rural workers live and produce, constituting a heterogeneous social group.

The Lagoa São Paulo resettlement, created in 1983 in the municipalities of Presidente Epitácio and Caiuá, with technical assistance from the Companhia Energética

de São Paulo (CESP), originated Agrovilas III and IV de Caiuá. This resettlement was established to house families from the islands and farms flooded by the construction of the Sérgio Motta Hydroelectric Power Plant (Porto Primavera) in Rosana, as well as individuals who became unemployed after working on the construction of the plant. Viudes (2017) identifies the other Settlements in the Municipality:

- **Maturi Settlement:** implemented in: 1998; area: 4,519.35 ha; settled families: 172; distance from the municipal seat (urban area): about 60 km. It is the largest settlement in the municipality; together with the Luís de Moraes Neto settlement, it is the furthest from the seat of the municipality;
- **Luís de Moraes Neto Settlement:** implemented in: 2003; area: 1,713.09 ha; settled families: 72; lots: 104; distance from the seat of the municipality (urban area): about 60 km;
- **Santa Rita Settlement:** implemented in 1998 with an area: 523.54 ha and 21 lots with settlers;
- **Santa Angelina Settlement:** implemented in 2002, it has 23 lots with settlers;
- **São Francisco Settlement:** implemented in 2003, it has 22 lots with settlers;
- **Malú Settlement:** implemented in 2003, it has 25 lots with settlers;
- **Engenho Settlement:** implemented in 2001, it has 19 lots, 15 in the municipality of Caiuá/SP and 4 in the municipality of Presidente Epitácio/SP.

Settlement of Our Lady of Grace

In March 2007, the Land Institute of the State of São Paulo (Itesp) implemented the Nossa Senhora das Graças settlement, located in the municipalities of Caiuá and Presidente Venceslau, in Pontal do Paranapanema, benefiting 66 families in a total area of 1,544.66 hectares (Government of the State of São Paulo, 2010)

Despite the implementation of agrarian reform areas, a significant portion of the settled population faces difficulties in receiving public funds. A striking example is found in this Settlement. Effectively created in 2010, the Nossa Senhora das Graças Settlement, under the coverage area of the ITESP Foundation, still has families that have problems receiving public funds due to default.

Another point is the commercialization of milk, which faces difficulties, mainly due to the low prices paid by dairy products. Aspects such as the lack of infrastructure, both for storage and marketing, contribute significantly to the low value of the product in the market. The absence of cooling tanks in the settlements forces producers to deliver milk in gallons, resulting in even lower prices (Carmo, 2015).

METHODOLOGY

The present research has a qualitative nature with exploratory purpose and aims to understand the dynamics and challenges faced by the settlers of the Nossa Senhora das Graças Settlement, located in Caiuá/SP. The qualitative approach is chosen for its ability to provide a deep and detailed understanding of participants' perceptions and experiences. Exploratory research, in turn, seeks to identify and examine little-known or little-studied phenomena, providing initial knowledge that can serve as a basis for more in-depth future studies. In addition, a literature review was carried out to theoretically support the study, allowing a comparative and contextualized analysis of the data collected in the field (Andrade 2017).

The field study was conducted in the municipality of Caiuá, located in the state of São Paulo. The area of specific focus is the Nossa Senhora das Graças Settlement, a settlement that is home to several families who depend on family farming for their livelihoods. This region was chosen for its peculiar characteristics and the relevance that family farming has for the local economy and for the sustainability of the communities present there.

Data collection was carried out with the settlers, where semi-structured interviews were conducted to capture the perceptions, experiences and challenges faced by the residents of the settlement. The interviews allowed for direct and flexible interaction with the participants, enabling the collection of rich and detailed information about their realities and perspectives. In addition, the agricultural practices and living conditions of the settlers were observed, complementing the data obtained in the interviews (Marconi; Lakatos, 2007).

The analysis of the collected data was carried out based on the information obtained in the interviews. The analysis process followed the content analysis technique, which involves the categorization and interpretation of textual data, seeking to identify patterns, themes and emerging meanings. This approach allowed for an in-depth understanding of the experiences and challenges reported by the settlers, providing relevant information on the sustainability of family farming in the Caiuá region. The results were compared with the reviewed literature, allowing for a critical and contextualized analysis of the study's findings.

DATA COLLECTION

A research was conducted in the Nossa Senhora das Graças Settlement, using the methodology of semi-structured interviews, with the objective of obtaining a comprehensive view of the agricultural practices currently adopted by farming families and evaluating their

environmental impact. This study also aimed to identify the main challenges faced by families in the search for sustainable agricultural practices.

As previously stated, the Settlement has a total of 1,544.66 hectares, which are divided among 66 families, totaling approximately 9.67 bushels of land for each lot, or 96,710.5007 square meters of rural space.

The questionnaire (see appendix A) was applied to 7 families belonging to the Settlement, which have an average of 2 residents. The questions were answered mostly by the women of the household. It should be noted that the fact of not having other adults in the house presupposes another frequent problem in Family Farming units – rural succession.

Initially, residents were asked what types of crops are on the property. The answers were not very varied, however, as can be seen in the graph, vegetables (such as okra, gherkin, beans, sweet potatoes, corn and vegetable garden foliage) were the most mentioned, outlining a common productive characteristic among the residents.

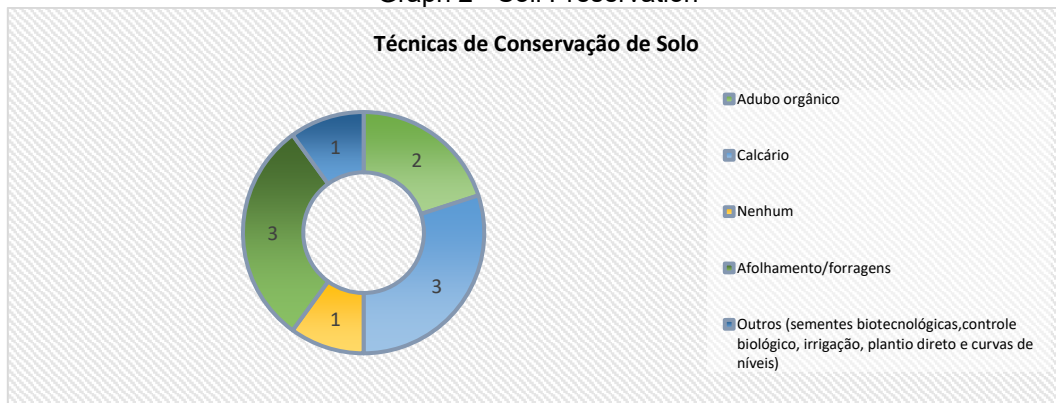
Graph 1 – Crops of the properties



Source: Author (2024).

When asked about the main soil and water conservation techniques, numerous answers were obtained, however, limestone, foliage and the use of organic fertilizers are the main tools used.

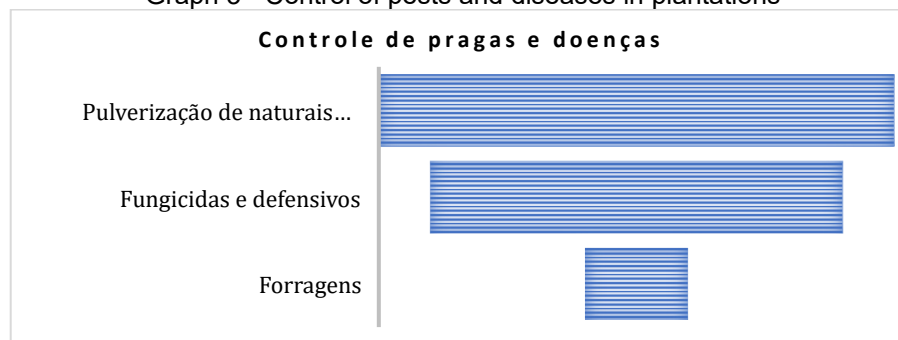
Graph 2 - Soil Preservation



Source: Author (2024).

When questioning the main mechanisms to defend crops from pests and diseases, there was a very peculiar division between natural products and fungicides and various pesticides. This fact exposes that there is the use of unnatural mechanisms such as the use of pesticides, but the spraying of natural products is cited with predominance.

Graph 3 - Control of pests and diseases in plantations



Source: Author (2024).

When asked: "How is climate change impacting the production of the lot?", unanimous answers such as: "with rigor and a lot of difficulty", "with a drop/damage to production", "with an increase in production expenses", "bringing more pests".

Another point of great propensity in responses concerns access to resources and technologies in order to implement more sustainable agricultural practices. Of all the 7 responses collected, only 1 resident said affirmatively, a fact that they justify by the lack of "technical assistance", "machinery" and "financial resources" for this specific area.

Another point asked to residents was whether they have knowledge about sustainable agricultural practices and, if so, which ones they would consider more viable. The answers are shown in the graph below:

Graph 4 - Knowledge about sustainable agricultural practices



Source: Author (2024).

The answers, unfortunately, expose a worrying trend, where more than 50% do not know viable practices that could generate applicability on their rural property. An additional point highlighted is that there are some initiatives such as SENAR courses, but many do not participate, or do not participate frequently; some also said that "there are no initiatives", which may demonstrate a lack of knowledge on the part of the Settlement as a whole or even a lack of incentive to the importance of training.

Still on which opportunities could improve sustainability in local agriculture, the following were vehemently mentioned: technical assistance, government funding in projects aimed at Family Farming and even an "association", which has already been implemented, but what is perceived is little participation and distrust among some residents. In this same aspect, participation in the Associations was questioned, where only 3 families stressed participating and believing that it can contribute to a more sustainable environment. Furthermore, it was questioned whether the residents would be open to experimenting with new sustainable practices and technologies, as a result, it was found that 100% of the interviewees are willing to seek and learn new ideas that permeate sustainability, but some exclaimed that these policies are far from being effective in the Nossa Senhora das Graças Settlement.

Finally, they were asked if they imagine that sustainability in family farming tends to contribute to greater food security and social justice, where all the answers were affirmative in the sense of avoiding pesticides, having fewer health problems, not harming the soil anymore and having the possibility of more access to food produced by those who need it most.

RESULTS AND DISCUSSION

The study carried out in the Nossa Senhora das Graças Settlement revealed crucial aspects about the agricultural practices adopted by the families, highlighting both the

opportunities and the challenges faced in the search for a more sustainable agriculture. The research showed a limited diversity of crops, with a predominance of vegetables such as okra, gherkin, beans, sweet potatoes, corn and foliage. This productive homogeneity suggests an orientation focused mainly on subsistence and the local market, which reflects the multifunctionality of agriculture, as discussed by Guillaumin et al. (1999), where the productive function is only one of the several dimensions that agriculture can encompass.

The adoption of soil and water conservation techniques, such as the use of limestone, foliage and organic fertilizers, indicates an awareness of the importance of ecological sustainability, as described by Sachs (1998). However, the research points to a limitation in the implementation of these practices, attributed to the lack of resources and technical assistance, which underlines the need for more robust public policies that support sustainable development in family farming (Silva, 2007).

In pest and disease control, the divide between the use of natural pesticides and chemicals reflects a tension between the desire for more sustainable practices and the reliance on conventional methods. This can be interpreted in light of the concept of multifunctionality, where agriculture not only produces food but also impacts soil health and environmental quality (Guillaumin et al., 1999). The continued use of pesticides, although contradictory in relation to ecological sustainability, can be understood as a response to the lack of viable alternatives and limited knowledge about more sustainable practices.

Climate change has been unanimously recognized as a significant challenge, directly affecting agricultural productivity and increasing production costs. This recognition emphasizes the urgent need for adaptation and mitigation through more resilient agricultural practices, aligned with the principles of ecological and economic sustainability (Sachs, 1998). Farmers' perceptions of climate impacts corroborate the importance of public policies that integrate these dimensions and promote the resilience of rural communities.

Regarding access to technologies and resources to implement more sustainable practices, most respondents reported difficulties, citing the lack of technical assistance, machinery and financial support as the main barriers. This situation reflects the structural vulnerability of the families in the settlement and highlights the need to strengthen programs such as PRONAF and PAA, which aim to support family farming through credit and technical assistance, as discussed in the literature on public policies (Schneider and Grisa, 2015).

Limited knowledge about sustainable agricultural practices, admitted by more than half of the interviewees, indicates a gap in education and training, even with the existence

of initiatives such as SENAR courses. This suggests that there is an urgent need for greater encouragement and dissemination of these training opportunities, to ensure that farmers have the necessary tools to adopt more sustainable and competitive practices (Veiga, 1996; Bianchini, 2005).

On the other hand, it is promising that all respondents expressed a willingness to experiment with new sustainable practices and technologies. However, skepticism about the effectiveness of these policies may be a reflection of past experiences or a lack of ongoing support. This reinforces the need for more effective public policies and an integrated approach that considers the social, economic, and ecological dimensions of sustainability (Sachs, 1998).

Finally, all participants agreed that sustainability in family farming is crucial to ensure food security and promote social justice. This consensus reflects an understanding that sustainable agricultural practices are essential to preserve soil health, reduce the use of pesticides, and increase access to healthy food within the community, in line with the pillars of sustainable development in agriculture (Silva, 2007).

These results indicate that while there is a growing awareness of the importance of sustainability, the implementation of more sustainable agricultural practices in the Nossa Senhora das Graças Settlement still faces significant challenges. These challenges are mainly related to the scarcity of resources, limited knowledge, and lack of adequate technical support. Therefore, there is an urgent need for more effective public policies and training programs that can support farming families in the transition to more sustainable and resilient agricultural systems, as recommended by several authors in the theoretical framework.

FINAL CONSIDERATIONS

This study explored the agricultural practices adopted in the Nossa Senhora das Graças Settlement, focusing on sustainability and the challenges faced by family farmers. The analysis revealed that while there is a growing awareness of the importance of ecological, economic, and social sustainability, the implementation of more sustainable practices still faces significant barriers, such as lack of resources, limited knowledge, and insufficient technical assistance.

The research highlighted the multifunctionality of family farming, showing that, in addition to its productive function, agriculture plays crucial roles in environmental preservation and in maintaining social cohesion in rural areas. However, reliance on conventional methods, such as the use of pesticides, and limited crop diversification, mean



that many farmers are still unable to fully adopt sustainable practices. This points to the need for continuous and more robust support from public policies, such as PRONAF and PAA, which have the potential to facilitate the transition to more sustainable practices, but which need to be more accessible and effective in their implementation.

The difficulties faced by farmers in accessing technologies and resources, coupled with limited knowledge about more sustainable practices, suggest the importance of strengthening capacity building and education initiatives in the field. Training programs, such as those offered by SENAR, need to be widely disseminated and adapted to local realities so that they can effectively train farmers to adopt more sustainable practices. It is noteworthy that there is a clear willingness among farmers to experiment with new practices and technologies, which is a positive sign for the future of sustainable agriculture in the settlement. However, this provision must be supported by effective public policies and technical assistance that is continuous and adapted to local needs.

Thus, for family farming in the Nossa Senhora das Graças Settlement to achieve a sustainability model that is economically viable, environmentally responsible, and socially just, an integrated approach is needed that considers the multiple dimensions of sustainability. More effective public policies, more accessible training programs, and ongoing technical assistance are crucial elements to support this transition. Only with adequate support will family farmers be able to overcome current challenges and contribute significantly to food security, environmental preservation and sustainable rural development.

This study contributes to the understanding of the challenges and opportunities in the context of family farming, highlighting the importance of public policies and an integrated approach to promote sustainability in the field. Future research could benefit from a more in-depth focus on the evaluation of specific public policies and the analysis of agroecological practices, aiming to offer practical solutions to the challenges identified, in addition to observing the phenomenon of rural succession in small properties, with a focus on the family production process.

REFERENCES

1. Abramovay, R. (1997). Agricultura familiar e uso do solo. *São Paulo em Perspectiva*, 11(2), 73-78.
2. Abramovay, R. (2006). *Agricultura familiar e reforma agrária: Estudo da dimensão territorial do PPA*. Brasília: CGEE.
3. Almeida, J. (1998). Da ideologia do progresso à ideia de desenvolvimento (rural) sustentável. In J. Almeida & Z. Navarro (Orgs.), *Reconstruindo a agricultura: Ideias e ideais na perspectiva do desenvolvimento rural sustentável* (2ª ed.). Porto Alegre: Editora da Universidade/UFRGS.
4. Andrade, M. M. de. (2017). *Introdução à metodologia do trabalho científico* (10ª ed.). São Paulo: Atlas.
5. Bianchini, V. (2005). Políticas diferenciadas para a agricultura familiar: Em busca do desenvolvimento rural sustentável. In F. B. Botelho Filho (Org.), *Agricultura familiar e desenvolvimento territorial: Contribuições ao debate* (pp. 81-98). Brasília: Universidade de Brasília, Centro de Estudos Avançados Multidisciplinares.
6. Brasil. (1996). Decreto nº 1.946, de 28 de junho de 1996. Cria o Programa Nacional de Fortalecimento da Agricultura Familiar - PRONAF, e dá outras providências. Disponível em https://www.planalto.gov.br/ccivil_03/decreto/d1946.htm
7. Brasil. (2006). Lei nº 11.326, de 24 de julho de 2006. Estabelece as diretrizes para a formulação da Política Nacional da Agricultura Familiar e Empreendimentos Rurais. Disponível em https://www.planalto.gov.br/ccivil_03/_ato2004-2006/2006/lei/l11326.htm
8. Brasil. (2009). Lei nº 11.947, de 16 de junho de 2009. Dispõe sobre o atendimento da alimentação escolar e do Programa Dinheiro Direto na Escola aos alunos da educação básica. Disponível em https://www.planalto.gov.br/ccivil_03/_ato2007-2010/2009/lei/l11947.htm
9. Brasil. (2023). Lei nº 14.628, de 20 de julho de 2023. Institui o Programa de Aquisição de Alimentos (PAA) e o Programa Cozinha Solidária. Disponível em https://www.planalto.gov.br/ccivil_03/_Ato2023-2026/2023/Lei/L14628.htm
10. Câmara Municipal de Caiuá. (2024). História do Município de Caiuá. Disponível em <https://camaracaiua.sp.gov.br/?pag=T1RVPu9EZz1PV0k9T1RrPU9UUT1OMIE9T0dNPU9XST1PR1U9T0dNPU9HWT1PV009T1dZPQ==&id=6>
11. Carmo, J. G. do. (2015). *O PRONAF nos municípios de Caiuá e Teodoro Sampaio – SP*. Presidente Prudente: [s.n].
12. Carvalho, H. M. (1998). *Formas de associativismo vivenciadas pelos trabalhadores rurais nas áreas oficiais de reforma agrária no Brasil*. Curitiba: Ministério Extraordinário de Política Fundiária e Instituto Interamericano de Cooperação para a Agricultura.
13. Castro, C. N. de. (2023). *Conceitos e legislação sobre a agricultura familiar na América Latina e no Caribe*. Brasília: IPEA.

14. Constanty, H. F. P.; & Zonin, W. J. (2016). Programa Nacional de Alimentação Escolar (PNAE) e sustentabilidade: O caso do município de Marechal Cândido Rondon. **Desenvolvimento e Meio Ambiente**, 36, 371-392.
15. Esteva, G. (2000). Desenvolvimento. In W. Sachs (Ed.), **Dicionário do desenvolvimento: Guia para o conhecimento como poder** (pp. 136-142). Petrópolis, RJ: Vozes.
16. FAO/INCRA. (1996). **Perfil da agricultura familiar no Brasil: Dossiê estatístico** (C. E. Guanziroli, Coord.). Projeto UFT/BRA/036/BRA. Brasília, DF. 24p.
17. FAO. (2018). **El trabajo de la FAO en la Agricultura Familiar: Prepararse para el Decenio Internacional de Agricultura Familiar (2019-2028) para alcanzar los ODS**. Nova York, Estados Unidos: FAO.
18. Franzoni, G. B., & Silva, T. N. da. (2016). Inovação social e tecnologia social: O caso da cadeia curta de agricultores familiares e a alimentação escolar em Porto Alegre/RS. **Desenvolvimento em Questão**, 14(37), 353-386.
19. Givord, D. (2023). Defensa del modelo rural y agrario europeo en la OMC. Disponível em <http://www.rural-europe.aeidl.be/rural-es/biblio/>
20. Governo do Estado de São Paulo. (2010). Pontal do Paranapanema ganha mais um assentamento. Disponível em <https://www.saopaulo.sp.gov.br/spnoticias/ultimas-noticias/pontal-do-paranapanema-ganha-mais-um-assentamento/>
21. Governo do Estado de São Paulo. (2022). **Plano de Ações para o Desenvolvimento Econômico Sustentável do Pontal do Paranapanema - PADES-Pontal 2022**. Secretaria de Desenvolvimento Econômico – SDE. Disponível em https://www.desenvolvimentoeconomico.sp.gov.br/wp-content/uploads/2022/12/pdes_pontal2022_ok-2.pdf
22. Guillaumin, A., Dockès, A. C., & Perrot, C. (1999). Des éleveurs partenaires de l'aménagement du territoire des fonctions multiples pour une demande sociale à construire. **Le Courrier de l'environnement**, (38). Paris: INRA.
23. IBGE. (2023). População. Disponível em <https://cidades.ibge.gov.br/brasil/sp/panorama>
24. Krenak, A. (2019). **Ideias para adiar o fim do mundo**. São Paulo: Companhia das Letras.
25. Leite, M. L. dos S. (2021). **Políticas públicas, agricultura familiar e sustentabilidade** (1ª ed.). Foz do Iguaçu, PR.
26. Lima, W. G. (2012). Política pública: Discussão de conceitos. **Interface**, 1(5), 49-54.
27. MAPA. (2024). Acessar o Programa Nacional de Fortalecimento da Agricultura Familiar (Pronaf). Disponível em <https://www.gov.br/pt-br/servicos/acessar-o-programa-nacional-de-fortalecimento-da-agricultura-familiar-pronaf>
28. Marconi, M. de A., & Lakatos, E. M. (2007). **Técnicas de pesquisa**. São Paulo: Atlas.
29. MDA. (2023). O PAA está de volta! Disponível em <https://www.gov.br/mda/pt-br/noticias/2023/03/o-paa-esta-de-volta>

30. Moura, J. T. de V. (2014). Ambiente político e tecido social no Programa Nacional de Alimentação Escolar (PNAE) no Território Mato Grande/RN. **Revista Política e Planejamento Regional**, 1(2), 189-210.
31. Saraiva, E. B., et al. (2013). Panorama da compra de alimentos da agricultura familiar para o Programa Nacional de Alimentação Escolar. **Ciência & Saúde Coletiva**, 18(4), 927-936.
32. Schwartzman, F., et al. (2017). Antecedentes e elementos da vinculação do programa de alimentação escolar do Brasil com a agricultura familiar. **Cadernos de Saúde Pública**, 33(12), 1-15.
33. Silva, N. L. S. (2007). **Estudo da sustentabilidade e de indicadores de desenvolvimento rural** (Tese de doutorado). Universidade Estadual de Maringá, Maringá.
34. Rua, M. das G. (1998). Análise de Políticas Públicas: Conceitos básicos. In M. das G. Rua & M. I. Valadão (Eds.), **O Estudo da Política: Temas selecionados** (pp. 29-49). Brasília: Paralelo 15.
35. Sachs, I. (1998). Do crescimento econômico ao ecodesenvolvimento. In P. F. Vieira, M. A. Ribeiro, et al. (Orgs.), **Desenvolvimento sustentável e meio ambiente no Brasil: A contribuição de Ignacy Sachs** (pp. 161-180). Porto Alegre: Pallotti; Florianópolis: APED.
36. Secchi, L. (2015). **Políticas Públicas: Conceitos, esquemas de análise, casos práticos** (2. ed.). São Paulo: Cengage Learning.
37. Schneider, S., & Grisa, C. (2015). **Políticas públicas de desenvolvimento rural no Brasil: Políticas agrícolas**. Porto Alegre: Editora da UFRGS.
38. Schneider, S., Cazella, A. A., & Mattei, L. F. (2004). Histórico, caracterização e dinâmica recente do Pronaf - Programa Nacional de Fortalecimento da Agricultura Familiar. In S. Schneider, M. K. Silva, & P. E. M. Marques (Orgs.), **Políticas públicas e participação social no Brasil rural** (pp. 47-69). Porto Alegre: Ed. Universidade/UFRGS.
39. SEADE. (2021). Seade Municípios. Economia. Disponível em <https://municipios.seade.gov.br/economia/>
40. Santos, M. (2006). **A Natureza do Espaço: Técnica e Tempo, Razão e Emoção** (4. ed.). São Paulo: Editora da Universidade de São Paulo.
41. Silva, S. P. (2011). Políticas públicas, agricultura familiar e desenvolvimento territorial. **Cadernos Gestão Pública e Cidadania**, 16(58).
42. Silva, S. P. (2008). **Políticas públicas e agricultura familiar: Uma abordagem territorial do Pronaf no Médio Jequitinhonha**. Viçosa: UFV.
43. Silva, M. G., Dias, M. M., & Amorim Júnior, P. C. (2015). Mudanças organizacionais em empreendimentos de agricultura familiar a partir do acesso ao Programa Nacional de Alimentação Escolar. **Revista de Economia e Sociologia Rural**, 53(2), 289-304.



44. Torres, F. de L., et al. (2011). Inserção da agricultura familiar sustentável no Programa Nacional de Alimentação Escolar, PNAE: O caso da COOPAPI, Apodi-RN. *Cadernos de Agroecologia*, 6, 1-6.
45. Triches, R. M., Barbosa, L. P., & Silvestri, F. (2016). Agricultura familiar e alimentação escolar no estado do Paraná: Uma análise das chamadas públicas. *Revista Paranaense de Desenvolvimento*, 37(130), 29-43.
46. Veiga, J. E. da. (1996). Agricultura familiar e sustentabilidade. *Cadernos de Ciência & Tecnologia*, 13(3), 383-404.
47. Viudes, P. F. do N. (2017). A questão territorial e os desafios para a política de assistência social: O caso de Caiuá/SP. *II Seminário Nacional de Serviço Social, Trabalho e Políticas Sociais*. Universidade Federal de Santa Catarina, Florianópolis.
48. Wanderley, M. de N. B. (2000). A valorização da agricultura familiar e a reivindicação da ruralidade no Brasil. *X World Congress of Rural Sociology*. Rio de Janeiro, 30 de julho a 05 de agosto.
49. Wanderley, M. de N. B. (2009). O agricultor familiar no Brasil: Um ator social da construção do futuro. *Agriculturas*, 1(esp), 33-46.

APPENDAGES

APPENDIX A - Semi-Structured Interview

Guarantee of Anonymity in the Interview

I would like to assure you that all information collected during this interview will be treated with complete confidentiality. To protect the privacy of all participants, we will not ask for names, addresses, or any other personal data that could identify you or your family.

The data will be used exclusively for academic research purposes and will be presented anonymously, ensuring that your answers cannot be associated with you. Your anonymity is of utmost importance to us, and we are committed to respecting and protecting your privacy.

Your participation is voluntary, and you can choose not to answer any questions that cause you discomfort. We sincerely appreciate your contribution to this research and hope that your responses will help promote more sustainable agricultural practices and improve the conditions of family farming in our region.

Issues:

About Agricultural Practice

1. What types of crops do you currently plant on your property?
2. What soil and water conservation techniques do you adopt?
3. How do you deal with pests and diseases in crops?

About the Challenges

4. How has climate change impacted your agricultural production?
5. Do you have access to resources and technologies to implement more sustainable agricultural practices?
6. What are the main economic difficulties you face in agriculture?

About Sustainability

7. Do you have knowledge about sustainable agricultural practices? If so, which ones do you consider most viable?
8. Are there local initiatives or programs that encourage sustainable agriculture? Do you participate or have you participated in any at Nossa Senhora das Graças?



About Opportunities

9. What opportunities do you see to improve the sustainability of family farming in the Settlement?
10. Do you participate in farmers' networks or associations? Do you believe it can help promote sustainability?

About Future and Innovation

11. Are you open to experimenting with new sustainable practices and technologies on your property? Do you think they are close in the Settlement?

How do you imagine that sustainability in family farming can contribute to food/food security and social justice?

TIME AND MEMORY: AN ANALYSIS OF THE CHRONICLES OF JOSÉ CHAGAS

<https://doi.org/10.56238/sevened2024.029-021>

Celyanne Geyse Cardoso Furtado¹ and José Dino Costa Cavalcante²

ABSTRACT

This article aims to demonstrate the importance and richness of Maranhão literature, focusing on the perspective presented by the studies of the theorist Paul Ricouer, based on the perspective of the writer José Chagas, who presents the city of São Luís as a literary space in his chronicles. Initially, there is a study on the chronicle textual genre, with emphasis on the writer José Chagas, when addressing the special look of the chronicler on the memories of the city and its daily life. In addition, the relationship established between Time and Memory in the short narrative of José Chagas in his work *On the Art of Speaking Well*.

Keywords: Maranhão Literature. Chronicle. José Chagas. Time. Memory.

¹ Master's student in Letters at the Graduate Program in Letters- São Luís (PGLERAS), at the Federal University of Maranhão-UFMA; member of the Study Group in Maranhão Literature (GELMA/UFMA).

E-mail: celyannegeyse-21@outlook.com

² Professor of the Graduate Program in Letters São Luís (PGLERAS), at the Federal University of Maranhão-UFMA. Professor of the Department of Letters-DELER/CCH-UFMA.

E-mail:josedino@ufma.br

INTRODUCTION

Scholars, in general, affirm that "literature is the art of the word". And, in fact, this definition is widely accepted, there are still those who say that "literature is language loaded with meanings". (Erza Pound). However, according to the thinking of one of the greatest names in the Portuguese language, Fernando Pessoa, defining literature is an arduous task. He says: "we can speculate, but never state categorically what it is." Therefore, we infer the richness of this term and its real importance, as well as its contribution to the variety of texts and literary genres existing in the construction of a literary historiography.

In this way, literature has been helping in the construction of a nation, a people and its history. Just to illustrate, let us remember the epic and founding poems of classical literature, Homer's Iliad and Odyssey, still present today in the literary and historical records of Greece. Literature plays a unique role in "making records", stories and memories of a nation, thus, we highlight the vast and rich Brazilian literature and, in this cut, the Maranhão one, specifically that of São Luís-land of great literary names that need to be disseminated.

Man, in order to demarcate his being in the world and in life, among many possibilities, seeks to understand social relations, raising some reflections on them. This process takes place when he seeks to understand the surroundings and the demands of everyday life. From this aspect and from the perspective of some chroniclers, we have a text born in the city and that gives its hands to society, seeking to signify it, understand it, etc. The chronicle helps the critical-reflective process of the environment and the historical moment through which the historical, social, and cultural segments pass, making it possible to analyze some daily actions, sometimes unnoticed, but eternalized by the chronicler's "small" gaze.

In this sense, it is essential to search for this detailed look, because everyday life is a word easily associated with gender, which does not cause surprise, because this look has as its genre, the report of the day-to-day, which sometimes goes unnoticed, given the urgency of time. However, for Walter Benjamin (1994, p.209), "the chronicler is the narrator of history". He brings in his writings reports of everyday life, eternalizing events in a fluid and light way, causing the easy association of the genre with a conversation. When the reader reads a chronicle, he usually sees himself as a character and perceives in it a little of his own history.

A characteristic that, according to Sá (1965, p.27), is thus associated when there is complicity between the narrator and the reader, and only achieved in well-prepared texts that possess the inexplicable magic of art. In addition, the chronicler is not individual, he

brings the collective, lays bare society and therefore works as a spokesperson, because he reveals ills and frustrations, in addition to being a partner in some revolutions.

Maranhão, despite the poverty that insists on threatening us, scores among the states rich in gastronomy, culture, folklore and literature. To further signify, he is graced with writers who immortalized him in verses and prose, bringing themes that present him in his most authentic essence. Many of these themes are novels, poetry and chronicles that speak of the history and daily life of the city and its people, revealing art and customs of the land.

The chronicle, being an apparently simple text, is initially addressed to those who are in a hurry, "who read in the short intervals of the daily struggle, in transport, or in the rare moment of the truce with television" (SÁ 1985, p.10). However, carrying out a theoretical-reflective study on these narratives will allow us to observe the literary historical value of the genre, transforming craft and pleasure allied for those who propose to study it. Thus, we do not propose a stylistic or formal study, only, but a functional one of this kind, seeking the chronicler himself as an assistant in this exercise.

The study of some chronicles that narrate about the city of São Luís is essential for numerous reasons, after all, there are many authors who sing its charms and disenchantments, revealing everyday life with aesthetic skill. In this sense, we highlight a fantastic writer who contributes a lot to the literary growth of our Island: José Chagas who proposes with great responsibility and ingenuity, to provide lovers of literary reading, a linguistic, artistic and social movement through his work in special prominence: **On the Art of Speaking Well.**

In his book, the chronicler, whose feeling approaches reality and truth with great sensitivity, becomes a spokesperson for the city and why not for Maranhão society? His texts narrate lives, bring people, feelings and real criticism, so they are of great aesthetic beauty. Due to these characteristics, we find the due justification for the choice of the city of São Luís and the chronicler José Chagas who, in his chronicles, addresses several issues, from the simplest to the most delicate.

Although circumstantially, José Chagas makes reflections that arouse interest, giving rise to a reading that thinks about São Luís and his memories. His writing conveys the affairs of the City, in a simple language and, therefore, accessible to the reader. His chronicles, when published, democratize these subjects and the study of them. Thus, this work aims to analyze, in a critical-reflexive way, the daily life of Maranhão through the literary genre chronicle.

Seeking to understand social relations, focusing on the social and historical aspect, bringing excerpts from theorists and scholars in the area: Cândido (1992), Moisés (1995), Sá (1985), Ricouer (1913) among others who will help to achieve the proposal.

For a better approach to the theme in question, the present work will be divided into four chapters. The first discusses the history of the chronicle literary genre, bringing its genesis, as well as some considerations about the content. The third will address the genre in Maranhão literature, as well as some of the main chroniclers of São Luís and we highlight the chronicler José Chagas, exposing his life and work. In the fourth, we bring some of his chronicles, spaces in which he declares his memories for the city of São Luís, discussing some themes - the main focus of the study.

BIRTH AND HISTORY OF THE CHRONICLE

From the Greek *chronikós*, relative to time (*chrónos*), moving to the Latin *chronica*, we have the word chronicle. In the approach to the study of this genre, we realize that it is loaded with definitions, the result of its evolution throughout its history and over time. In this context,

Massaud Moisés, in **Literary Creation**, dedicates an entire chapter to studying it, not only from the point of view of its etymology. For him, the chronicle designated, at the beginning of the Christian era, a list or list of events ordered according to the march of time, that is, a chronological sequence. Situated between the annals and history, it limited itself to recording events without delving into their causes or trying to interpret them. (MOISÉS, 1995, p.101)

Furthermore, if we do a search in a dictionary of literary terms, we observe the following explanation for the word chronicle:

Derived from a Greek term meaning time, the word chronicle refers to a review of events in their temporal order and has a meaning close to the historical. The term chronicle is generally used in reference to any systematic narration of events, with little or no effort in its analysis and interpretation. (SHAN, 1982:130)

The definitions point out that the chronicle, since its beginning, has been related to time, the act of narrating events chronologically in a more specific way. Resuming the focus given by Moses, the initial role of the genre is evident, that is, that he made chronological records without details or comments, that is, he recorded events, without interpreting them.

We understand, then, that only that which was relevant to the history of a given nation was chronicle. That is, they had a record from the great adventures of the kings, to the relevant events of their reigns. When referring to the Portuguese chroniclers, for

example, França (2007:136) comments that their writings were of restricted circulation, only accessible to the court and when read publicly. Other than that, only scholars sought truthful information, since the genre served as a certificate of facts of the kingdom.

It was exactly this type of chronicle that became known as historical chronicle. A type that reached its apex in the Middle Ages, when writing emerged as a validation of the past, along with the belief that the past shed light on the present. This idea today has greater validation by philosophical studies, that is, by understanding the actions of previous generations of a given society, in everyday life. The present/future becomes clearer, and even some actions are justifiable.

In this sense, the genre served strictly to make chronological accounts of history, a definition that is still valid in European countries, with the exception of Portugal and places where Portuguese is spoken, as we read in Coutinho's words.

This was the shape of historiography, particularly in the Middle Ages and the Renaissance, in all parts of Europe, at first in Latin and later in various vulgar languages, including Portuguese, in which true masterpieces were produced. This was the sense that prevailed the most in the various modern European languages, except Portuguese, until today.

In English, Spanish, French, Italian, the word only has this meaning: chronicle is a historical genre. And as a chronicle, "chronicler" and "chronicler" are only used in relation to the chronicle in that sense: they were the individual who wrote the chronicle, in the same way as in the French *chroniqueur chronique*. (COUTINHO, 1987:790).

THE NINETEENTH CENTURY: THE CHRONICLE IN BRAZIL

The eighteenth century, in Brazil, was marked by a literary ideology with the creation of the Minas Gerais School, in the region of Minas Gerais, but frustrated due to the extinction of the Academy of the Forgotten - its base. One of the great importance of these schools and academies is the vestige of the Illuminists who defined the creation of academies in its most restricted and necessary sense.

With literary production, we continued a high quantitative and qualitative growth, as had not been recorded until now.

With this evolution, not only literary, but political and economic, we entered the nineteenth century with productions of different strands, and at different moments that characterize different expressions of social reality, in view, for example, of the Independence of Brazil in 1822. This fact called for the emergence of more liberal visions that gave rise to the feeling that would become the touchstone of Romanticism.

This literary school produced abundantly not only poetry, but prose, from which José Martiniano de Alencar stands out, who had accelerated recognition compared to other writers. As a novelist, he has preserved all the genres created so far; Indianism, mundane novel, historical novel, regional novel and social romance. Alencar, initially publishing in a newspaper, brushed his works with chronicler tinctures, as he poetically reported the birth of the Brazilian race in its most varied lands and customs.

Another novelist who emerged in the second generation of romanticism, and was not a follower of any literary tendency, was Machado de Assis. Some critics say that he was the greatest writer that this century has ever had, because he built his own, personal and extensive line. Machado was a singular figure and served as a framework of influence for several writers of different strands. Within his vast production, the chronicle also deserved special mention.

It was in the nineteenth century, in Brazil, that the chronicle became a different genre, as it was not only up to him to make reports of the past, in practical terms, but to take upon himself the responsibility of aesthetically reflecting on everyday accounts. Built in a light and unpretentious way, with an accessible and uncomplicated language, it gained a place among the people and became fertile in the city, and progressively earned the nickname of literary genre.

In the hands of the chroniclers, the information that occupied only a footnote on everyday matters in the most diverse forms and different thematic axes, literature, art, politics, etc., was transformed into a chronicle.

Over time, it ceased to be a report and became an event, becoming a genre commonly associated with dialogue with present facts. Due to its character, it still requires mandatory reading in printed newspapers, because, although it has a fictional vein, it addresses the social in its various manifestations, keeping a critical eye on life and daily life.

In this way, situations commonly unnoticed by the urgency of the time or perceived by few who do not have a voice to be heard, are the most beautiful chronicles. The chronicler, then, is responsible for interpreting and habitually understanding the city and the feeling of its people through everyday situations. Thus, his role is not restricted only to exalting beauties, but also to highlighting ills and injustices to which the people are subject.

City city par excellence, the genre accounts for what happens in the city, whether with the chronicler himself or with other citizens. True facts that affect the population, the city and its places are food for a good part of the chronicles. Sometimes, they are associated with the news published in newspapers, the declaration of some facts and events. Hence we understand what Beatriz Resende says: "the chronicler is the confidant of

our small complaints, accomplice of our revolts, sympathetic in our losses and in our joys" (1995, p.35)

Can we talk about the Brazilian people's taste for the chronicle? Perhaps so, due to the wide variety of chroniclers we have today. This, perhaps, lies in the fact that Brazil's birth certificate is a chronicle. Although it is a letter from Pero Vaz de Caminha addressed to King Dom Manuel, it contains the poetic description of the new land. "Caminha breaks with the European writing molds to portray the circumstantial and produce a rich and reliable text in which the offal found in it is essential for a better understanding of the whole", says Sá (1985, p. 5-6).

Because it was published in daily or weekly editions, much was required of the chronicler's sensitivity for its production, as it must be recognized that this was not an easy job, because due to the amphibious nature of the text, it was the responsibility of the chronicler to soften the thin line that had been created between journalism and literature, but without ceasing to exercise the function of operating in the life of society and the beings that were in it.

Thus, the chronicle, today, due to its social role, routinely uses news published in the newspaper, but does not strictly follow the precepts to be an essentially journalistic text. This is a genre that has well-defined margins for those who have it as a craft, unlike the chronicler who has the freedom to

To go through all events, passing from jokes to serious subjects, from laughter and pleasure to the miseries and wounds of society; and this with the same grace and the same nonchalance with which a lady returns to the golden pages of her album, with all the finesse and delicacy with which a blond girl gives sota and basto to three dozen worshippers! To make the writer a kind of hummingbird fluttering in a zigzag, and sucking, like honey from flowers, grace, and salt, the spirit that he must discover in the most ordinary suit. (ALENCAR, apud BENDER; LAURITO, 1983, p.18).

In this sense, the difference between the work of the chronicler and the journalist is clear. It is up to the journalist to describe the facts, without comments or any intervention. However, those who write chronicles not only describe, but comment and translate the events in a way that is more accessible to the reader's understanding or delight. In other words, the chronicler constantly transforms his notes into a pleasurable activity, considering those who are in a hurry, allowing himself the act of reading in the small intervals.

The chronicler waits with expectation for "tics" that will give him deserved glory and language, that is, a "frivolous" and unimportant event can be the condition for creation. In this sense, a chronicle by Rubem Braga, "O pavão", whose lyricism draws our attention. In

this chronicle, Braga uses symbolic language to talk about the colors of the peacock's feathers. He says that they appear in the eyes of those who observe them and come close to the act of loving. By this optical phenomenon, which makes lovers glimpse beauty and light in each other.

In this line of thought, Machado de Assis (1977, p.12) comments on the frivolities that can give rise to a chronicle.

I cannot say positively in what year the chronicle was born; but there is every probability of believing that she was contemporaneous with the first two neighbors. These two neighbors, between dinner and snack, sat at the door to peck at the day's successes. They probably began to complain about the heat.

One said she couldn't eat dinner, another that her shirt was more soaked than the herbs she had eaten. To pass from the herbs to the plantations of the frontier dweller, and then to the amorous misdeeds of the said dweller, and to the rest, was the easiest, most natural, and possible thing in the world. This is the origin of the Chronicle.

The critic Antônio Cândido, who played an important role in the matter, declares that the chronicle belongs to the ground floor, that is, to the base, to the ground floor. Life on the ground floor is the study of the genre made by the critic to preface one of the volumes of **Para gostar de Ler**. In it, the author talks about the history of the chronicle and its evolution in Brazil.

Candido (1980, p. 16-9) says that "great prestige is a good symptom of the process of searching for orality in writing, that is, of breaking artifice and of an approximation with what is most natural in the way of being of our time. And this is humanization of the best!"

Candido explains that the chronicle is literally related to the simplicity of the word and it was over time that it became so close to the point of being Brazilian thanks to José de Alencar, Machado de Assis, Olavo Bilac among others. Candido recalls that these chroniclers (serialists) contributed significantly to the genre becoming ours due to the naturalness with which it acclimatized here and the originality with which it developed. The critic also adds:

Before being a chronicle itself, it was "serial", that is, a footnote article on political, social, artistic, literary issues [...] Little by little, the "serial" was shortened and gained a certain gratuitousness, a certain air of someone who is writing for nothing, without giving it much importance. Then, it entered frankly by the light tone and shrunk in size, until it reached what it is today. (1984, p.7)

Note that Antônio Cândido explains why this literature has become so close to the reader: the orality of writing and the simplicity of language. They became a perfect

marriage, and according to the theorist, because it is a short narrative, it asks for a new look. That is, something familiar, intimate that little by little awakens in the reader the "intimate coexistence with the word". A text that, while entertaining the reader, also provides reflections on oneself and from a different perspective on the world.

This prestige about which Candido speaks allows us to dialogue about these topics with great lightness. The chronicle not only informs, but offers an excellent harmony with the author, that is, an immediate interpretation is carried out in this linguistic channel. In **Commentary-Mediation-News**, by Luciana Stegagno Picchio (1997:543), she says that the great prestige of the chronicle is that it provides the reader, author, critic, theoretician with these three aspects to be worked on, fundamental accessories that enrich its construction.

It is also worth mentioning that born in the newspaper as a serial, and having its own place or footer, the genre has a direct relationship with the ground floor, that is, a footnote article on the issues of the day, police, social, artistic, and literary issues. Also according to Antônio Cândido, this "serial" little by little, was shortened and gained a certain gratuitousness, a certain air of someone who is writing for nothing, without having much importance. Then, "it entered frankly by the light tone and shrank in size, until it reached what it is today". (1984, p.7) He completes the review with the following:

For this very reason, she manages almost unintentionally to transform literature into something intimate in relation to each one's life, and when she goes from the newspaper to the book, we find ourselves somewhat astonished that her durability may be greater than she herself thought. (1984, p. 6)

If since its birth, Brazil has had a strong connection with the chronicle about the land and its people transformed into literature, the genre tells about us and our history. This letter, or the first Brazilian chronicle, was not the only legacy that Brazil, its landscape and its people wrote in the literary scene as a whole. Chroniclers emerged and left their legacy, not only for quantity, but for quality, just to mention a few: José de Alencar; Machado de Assis, Rubem Braga, Nelson Rodrigues, Carlos Heitor Cony, Arnaldo Jabor, among others.

THE CHRONICLE IN MARANHÃO LITERATURE IN THE NINETEENTH CENTURY

The chronicler, generally, is the one who has the ability to be indignant with a piece of news, with an observed fact, but who can also understand the deviation of an individual or of this in society. He can also perceive the hidden side of everyday life and predict the unusual, offering suggestions.

To be a chronicler is to be a magician of words and satisfies the reader with his actions and magic. Thus, the success of those who write chronicles is to provoke in the

reader a pleasure, a smile of satisfaction. And, even if there is a contrary reaction from those who read your opinion, the reader almost always experiences a feeling of pleasure for sharing the subject commented on.

In any case, the genre is, and will continue to be, a place of expression for the writer to bring a moment of lightness to the reader. To produce this effect, he needs, in addition to simplicity and clarity, not to go down obscure paths or to use elaborate language. In the words of Lourival Serejo (2011), "it must flow like a river, obeying the limits of the banks, without, however, ceasing to cause erosion to widen its space for creativity". Serejo also adds that what magnifies the chronicle is the way of talking to the reader about a subject that is sometimes so banal or even the lack of a subject. Manuel Bandeira liked Rubem Braga's chronicles without a subject because, according to him, it was in them that the chronicler best expanded his genius. (O Estado do Maranhão, 21/08/2011)

Unfortunately, this genre is still little studied, so it is essential to focus on some texts that allow us to reflect and theoretically work on its importance and validity, as well as to get to know the plethora of artists who skillfully deal with this record made in real time. From this perspective, we understand that the Maranhão chronicle offers its literary contribution capable of enchanting, awakening and preserving in memory, not only local, but national, the subjects addressed.

Thus, by offering a new look, the chronicle can guide the reader, whether a young student or an experienced educator, to new knowledge. Therefore, she offers, promotes and gifts, through her universe, especially with regard to the city of São Luís with its vast literary wealth. As such, this literature needs to be appreciated by the people of Ludovica. Hence, therefore, the presentation and construction of this research that goes beyond the merely academic, to offer a social, educational and pedagogical collaboration.

Getting to know the city of São Luís evokes the memory of several chroniclers, among them, perhaps the one who has sung it the most in his chronicles: José Chagas. Although he is not from Maranhão, he comes to personify São Luís. Nauro

Machado says that the poet is, in fact, "the introspectively unifying projection of a secular history: the one that extends from Santana dos Garrotes, his home ground, to the heart of the Island where he landed and spread in the multiple chorus of his particular voice" (2012, p. 136).

Studying chronicles that narrate São Luís is essential for numerous reasons. The authors who tell their charms and disenchantments, revealing everyday life with sensitivity and aesthetic skill, show true feelings, which is why they are considered spokespersons for



society. Due to these characteristics, we find the due justification for the choice of chronicles and various themes in **Da Arte de Falar Bem**, by José Chagas.

Studies reveal that Maranhão literature and its most outstanding authors have given the due merit that the present day demands. Therefore, it is necessary that we demonstrate this presence, not only in the school space, but also in society in general. We need to awaken in the people of Maranhão the feeling of belonging, because those who feel this way take care. An example of this are the chroniclers who notoriously realize the importance of an awakening to the preservation, memory and knowledge of this literature of local chroniclers.

Due to the need to value and elevate local literature, it is of paramount importance to make Maranhão authors better known, since this literature participates in the formation of a people and its history. Undoubtedly, this plethora of authors and works will appear in the historical records of a society as a whole. For these reasons, we will address questions and discussions that involve the genre and its linguistic and literary content, but at the same time, social in the work of the writer José Chagas.

Now, why not demonstrate the importance of this knowledge in academic spaces? Offering the student a visit to the past and a new look at the future through our literature is fundamental. We can do this by focusing on the fantastic that only the literary universe provides, promotes and offers in a very pleasurable way and with various themes of everyday life that the short narrative also points out.

The chronicle is directly related to ephemerality, a character that is its own. As the etymology itself defines "Khrónos", it means time, that is, this narrative species is involved in what is fleeting and ephemeral. From this perspective, we highlight some names that give this artistic, literary and linguistic universe a noble contribution to the memory of our city. This literary art that expresses the construction of the city, also enriches and gives "testimony" of the role of the chronicler.

In general, this is the behavior of the chronicler and. in São Luís these actions are similar. Several chronicler writers exert influence on our Maranhão and Brazilian literature, notably of relevance. Thus, the list of chroniclers who have imprinted their name in the history of the Maranhão chronicle is vast, and in the city of São Luís, it is no different, as it has, today, a pleiad of renowned chroniclers, such as José Chagas; Ubiratan Teixeira, Ivan Sarney, Joaquim Itapary, Américo Azevedo Neto, among others no less important.

O CHRONICLER JOSÉ CHAGAS

José Francisco das Chagas born on October 29, 1924, the poet José Chagas left a great cultural legacy in more than 20 published books, most of them dedicated to São Luís

Born in Paraíba, but from Maranhão in heart and soul, José Francisco das Chagas, José Chagas, knew how to sing the beauties and ills of São Luís in verse and prose. Born on the Aroeiras farm, in the municipality of Piancó, Paraíba (now Santana dos Garrotes), on October 29, 1924, the poet, if alive, would celebrate his 95th birthday today. A mass in memory of the poet will be celebrated today, at 6 pm, at the Church of Remedies.

Deceased on May 13, 2014, the poet left an enormous contribution to the culture of Maranhão through works such as "Cannons of Silence", "The Roofs", "Tiles of Time", "Caught from the Ground" and "Maré/Memory", among others.

On the occasion of receiving the title of Citizen of Maranhão, made official on October 27, 2004 by the Legislative Assembly as part of the celebrations for the passage of his 80th birthday, the poet said: "I see this moment in an exciting way, a most unforgettable gift. This title complements the involvement I already have with the city, from the beginning, as I was integrated by São Luís and São Luís integrated by me".

Based in Maranhão since 1948, where he spent his entire literary life, José Chagas was a retired employee of the Brazilian Institute of Geography and Statistics (IBGE). He was a councilor of the City Council of São Luís for one term, where he also served as director of the General Secretariat.

A professional journalist, he worked as a technician in Social Communication at the Federal University of Maranhão (UFMA) until he retired. He was a columnist in the newspaper *O Estado do Maranhão*, in which he had a weekly column.

In love with the land of Gonçalves Dias, the poet is the author of more than 20 books, most of them dedicated to the city. The poet debuted in 1955 with the book "Canção da Expectativa". José Chagas assumed Chair No. 28 of the Maranhão Academy of Letters (AML) on April 3, 1975. He was the patron of the 5th edition of the São Luís Book Fair, promoted in 2011 by the City Hall.

José Francisco das Chagas has a collection of several works, as mentioned above. In this way, his literary, linguistic, social, cultural and why not say pedagogical contribution is evident, since literature leads us to reflect on ourselves and the world we inhabit. The expression that this citizen exerts in the formation of our cultural plurality is abundant. Therefore, this notoriety is important to understand and, much more than that, to insert his work for knowledge, so that in this exchange of knowledge between writer-work-reader a precious opportunity is glimpsed: the immersion in Maranhão literature.

SÃO LUÍS FROM THE PERSPECTIVE OF JOSÉ CHAGAS

Da Arte de falar bem, published in 2004, is the third book of chronicles selected by Duarte, with the assistance of the chronicler. The chronicler chooses to defend some children of the land, and, essentially, of the cultural heritage of Maranhão. Chagas preserves a very fine irony, a quality that has always been peculiar to him. Added to this is a spirit full of dedication to its passionate city and everything that inspires and exudes reflection. By narrating certain events, he pays tribute to the historical, geographical and literary truth of yesterday's São Luís, and why not say of today's São Luís? His texts constitute a kind of map of the city, especially of São Luís. He also dedicates to Alcântara, a historic city in Maranhão, one of the longest and most beautiful poems: Alcântara: negotiation of the blue or the castration of angels. To highlight this information, we will follow the sequence of texts studied.

WHERE THE SKY HAS THE MOST STARS

When choosing the chronicle: Where the Sky Has More Stars, we selected some excerpts that address the city of São Luís. José Chagas says: "São Luís gave the Island such a rich geographical breadth that, in the memory of the peoples, it becomes today a continent of Brazilianness and portentous traditions of culture" (CHAGAS, 2004, p. 24). This is a fragment of the chronicle Where the sky has more stars, one of the chronicles that make up the collection On the art of speaking well. All of them were published in the newspaper O Estado do Maranhão and deal with various topics. However, these texts, for the most part, do not go beyond local boundaries in theme. To organize them, the chronicler had the help of Duarte who, in the presentation of the work, expresses: "the honoree anticipates the welcome and solid sympathy that, for more than five decades, has been his bread and wine at the table full of his coexistence with the people of Maranhão" (CHAGAS, 2004). Duarte draws attention to the distance between one publication and another. The simple distance in the date on which these two works came to light shows a certain editorial forgetfulness or neglect, which can be divided between reasons of imponderable origin and weight: the relative discredit of the chronicle in relation to the poem; the notorious scarcity of interests, in the Province and in the Country, because what is not an immediate demand and easy digestion is printed in the book world; and the lack of importance that the author himself has attributed to his work in the daily press, suffice it to know that, of this material, he hardly even kept the originals.

(CHAGAS, 2004) Also in the preface, Duarte explains that the title was chosen in symmetry and in opposition to Carlos Heitor Cony's book, On the art of speaking badly,

published by Civilização Brasileira, in the 60s. The preface confesses to remembering a comment he once heard from a person: "Chagas is a great writer, there is no doubt. But he only knows how to speak badly." To speak of the seriousness with which the chronicler works and his coherence with the inherited values, Duarte explains that the problem is to know what it means, in a proper and full sense, to speak badly, while questioning:

Is it speaking evil to cry out against evil and against the wicked, telling the truth? That being so, shouldn't we stone all the biblical prophets? Or is it not doing good, when one has the courage, moral elevation and sincerity to lend the word to so many who cannot make use of it, attached to 110 creeping reasons that our reason does not reach, including simple and prudent survival strategies? (CHAGAS, 2004)

A CLEAN PAST POND

In the chronicle *Uma lagoa passa a limpa*, when he learns that one of the squares of the tourist complex of Lagoa da Jansen would be named after him, the chronicler confesses: "the Lagoa da Jansen, which was my dirty enemy for so long! Who would believe that? It is as if the governor led the city to tell me: look, if one of your angers was this Lagoa, you will now experience great joy" (2004, p. 264). The chronicler, upon learning of this intention, answers: "the Governor knows of my relationship with São Luís, a relationship of the most authentic and sincere, because it is a relationship of love and hate: the two faces of well-wishing" (2004, p. 264). In the same chronicle he confesses how much the subject had bothered him:

The Jansen Lagoon was, several times, the reason for me of violent insults against those who passed through it and touched it, and the more they touched it, the more their fetidity increased. The Lagoon was not really a flower that could be smelled, not even from afar. And it was openly said that its rottenness was not only environmental, but, above all, moral. It was even said that it was not exactly a lagoon, but a source of illicit wealth. (CHAGAS, 2004, p. 264)

About the aforementioned tribute that is paid to him, without "being deserving" of it and without it being known to him, the chronicler replies: Now I am the name of a square, I who never imagined could be the name of something in the world. I don't know if the square accepted this baptism well. She was not consulted. But you must console yourself with me, because I didn't go either. When I found out, it was already a given name, and there was no more remedy. (CHAGAS, 2004, p. 263).

Also in this chronicle, despite everything that could be a chatter, since he himself, in so many chronicles, had repudiated such a practice, Chagas explains the true relationship he maintains with the city:

St. Louis accepts me as I am and I accept it as it is. This does not mean that we are necessarily in agreement on everything, all the time. The thing is that I love her so much that I sometimes hate her and say snakes and lizards about her. And we all know that the hatred of those who love only increases love, because it is one thing to speak badly, out of simple and deliberate condemnation, another is to speak badly, aiming at the good of what one loves. (CHAGAS, 2004, p. 263)

REASONS FOR MY CANDIDACY

I really stopped going back to my land (...), and I kept singing in my poetry the rooftops of the old city, censoring, with some satirical poems that came to be known throughout Brazil, defects and vices of men who never knew how to love Maranhão, and who live from it, without working for it, nor for it. (CHAGAS, 2004, p. 45)

This "rooting" of the chronicler in São Luís and among his friends, has been building a series of chronicles that stand up in favor of good talking about some 112 illustrious people from Maranhão, as well as about some projects of the land. In this way, those who have or had a relationship of friendship, work and intellectual experience with the chronicler, whether from a social or affective point of view, are present here. For example, in the launch of *Poema Sujo*, by Ferreira Gullar, in a chronicle, Chagas comments: "*Poema Sujo* is a kind of *Song of Exile*" (2004, p. 168). And when talking about the poets and the children of the land, he adds.

Wherever they are, they carry Maranhão within themselves. And, in distance and nostalgia, they transform it into poetry, not by mere overflow of nostalgic nature, but for a greater reason of emotional transcendence, in which the very love of the land is crystallized in a poem of life and truth, for the enrichment of our cultural heritage. (CHAGAS, 2004, p. 168)

TIME AND MEMORY

What is there remembrance? Whose memory is it?" (RICOEUR, 2007, p. 23). In the wake of Husserlian phenomenology, these are essential questions when the theme focuses on the issue of Memory. In relation to the chosen work *On the Art of Speaking Well*, we tried to understand how the author handles memory to build his narrative. And making use of Paul Ricoeur's (2007) proposal proved to be a viable path for reflection. Let us agree that

José Chagas' text encompasses the concept of memory and promotes a broader discussion of its use, as we are dealing with an author who articulates "true" memories with the fictional process. . It is a double work, which forces us to remember that it is a pretension to define the status of "truth" of memory. This is not the case. Because we are dealing with fiction too, and in this aspect we enter the realm of imagination, which leads us to think about the following statement:

It is under the sign of the association of ideas that this kind of short-circuit between memory and imagination is situated: if these two emotions are connected by contiguity, to evoke one—i.e., to imagine—is to evoke the other, and therefore to remember it. Thus, memory, reduced to remembrance, operates in the wake of imagination. (RICOEUR, 2007, p. 25)

This is very propitious for our thinking, because when we speak we are referred to fiction. And here we are dealing with a book, that of José Chagas, in which the imagination is also mixed in memory. This confusion is not uncommon and is welcome, because it enables investigation in the fictional field, even valuing it, since fiction operates from reality. José Chagas' chronicle confirms this, and it takes no effort to realize that memory is our access to the past. Therefore, it is our access to the real.

Considering purely the theme of memory, the dialogue we observed is very productive between the work of José Chagas and the studies of Paul Ricoeur. Returning to Ricoeur (2007), what he postulates about a guiding idea that dissociates imagination and memory draws our attention — when we think about the status of "truth" of memory:

It is in the current tradition of devaluing memory, on the margins of a critique of the imagination, that a dissociation of imagination and memory must be carried out, taking this operation as far as possible. His guiding idea is the difference, which we can call eidetic, between two objectives, two intentionalities: one, that of imagination, focused on the fantastic, fiction, the unreal, the possible, the utopian; the other, that of memory, turned to the previous reality, the anteriority that constitutes the temporal mark par excellence of the "thing remembered", of the "remembered" as such. (p. 25-26).

Starting from this assumption is very pertinent, especially if we take into account, in the case of imagination, that this difference proposed by Ricoeur may be questionable. How to dissociate imagination and memory? He considers imagination to be something invented. But where does the invention come from? And, in general, memory? Isn't there something imaginative in it too?

Especially if we move in a field where reality and imagination mix. On several occasions, Ricoeur (2007, p. 27) refers us to the Platonic theory, but it is Aristotle who

makes the idea more concrete and declares that "memory is the past". This statement serves as a guide for Ricoeur's exploration and, in a way, works as a guide for our reading.

It becomes evident that working with the imagination is related to the human need to fill in the gaps in memory, consciously or unconsciously. Failures that we can attribute to forgetfulness. The problem of forgetting is posed from the beginning as "erasure of traces and as a lack of adjustment of the present image to the impression left as if by a ring of wax. [...] since those founding texts, memory and imagination share the same fate". This situation makes Aristotle's statement that "memory is time" (RICOEUR, 2007, p. 27) more evident.

With regard to the empty spaces of memory, what is at stake is the status of the moment of remembrance, treated as an acknowledgment of impression. The possibility of falsehood is inscribed in this paradox"

(RICOEUR, 2007, p. 30). Here we think about the fact that human memory is not totally reliable. But this does not disqualify the fiction we consider. In relation to the work *On the Art of Speaking Well*, it refers us to a question that the philosopher poses:

Could the relationship with the past be just a variety of mimesis? This confusion will not fail to accompany us. If our doubt is well-founded, there is a risk that the idea of "faithful resemblance", typical of eicastic art, has provided more of a mask than a scale in the exploration of the veritative dimension of memory. (RICOEUR, 2007, p. 32)

This language makes José Chagas introduce us: **We, the fishermen of dreams**. In it, the chronicler speaks of José Sarney, not the man, but the writer of the novel *115 O dono do mar* which, translated into French, was published in Paris. "At this point, the sea, which has an owner here, begins to belong to the world and it is itself that now navigates to other shores" (CHAGAS, 2004, p. 142). This sea now receives its true owner – the fisherman Cristório, the protagonist of the novel. He "fishes today for the world and now takes his fish to France, harvested in the same sea sailed by Daniel de La Touche" (id., ib.).

It is through verbal action that José Chagas traces the path of a work, whose living influence of literature goes beyond the limits of land and sea and will be read by other people who one day wanted to found here in our lands another France, the Equinoctial. Chagas says: "our destiny as Maranhão people was really in the hands of the Portuguese. We repel the other peoples who experienced us directly, such as the French and the Dutch" (id., ib.).

Chagas continues:

It turns out that, by translating his novel into Flaubert's language, José Sarney broke with our historical determinism, inverted the facts, transporting, in a way, Maranhão to France and creating a French São Luís there. Instead of making his journey by sea, as was

the case with Daniel de La Touche when he came to found France, Sarney did was to take the sea of our island there, with its mysteries, its fantastic piocos, its poetry and its telluric force, in the ambience of a regionalism that is universalizing. (...)

The novel is more than a message of our oceanic experience, a message from the distant island, taken to the French who founded a city there, but did not stay, having been defeated and expelled by the Portuguese, in the battle of Guaxenduba. It is not known what magic the Lusitanians did to mobilize forces from beyond, because even Our Lady, according to legend, placed herself next to them, transforming sand into gunpowder to help fight those who were considered invaders. (CHAGAS, 2004, p. 143)

FINAL CONSIDERATIONS

The studies, debates, theories explored that mentioned the history of the chronicle, according to the historical cut of the nineteenth century, led me, based on several theorists and scholars of literature, such as Antônio Cândido, Eduardo Portella, Massaud Moises, Paul Ricouer among others, to the understanding that the chronicle has an expressive role in literature, in addition to the fact that it exerts a lot of influence for the understanding of the problems that emerge in the daily life of the city. Thus, it is possible to conclude that the chronicle has an expressive role in literature, in addition to exerting a lot of influence in society.

To get to what it is today, this short narrative had strong influences on the literary work of each author, whose touch and look is different, although with the same objective, that is, to make the literature of a people. From the various transformations that the chronicle has undergone over time until it was exercised in our literature, it was a long road.

From this perspective, the city of São Luís, rich in subjects to be unveiled by lovers of letters, writers and poets who collaborated with excellence in the preservation of the memory and identity of our capital, but at the same time, who dedicated a critical eye to it, as we realize when studying the chronicles of José Francisco das Chagas. His chronicles that talk about the capital of Maranhão in the work **Da Arte De Falar Bem**, therefore, important reading to be disseminated, known in any reading and study environment.

For this reason, there are many benefits that this literature offers to the student, therefore, the need to know, study and value, whose value is immeasurable. In other words, the chronicle offers the reader in general the creation of research projects, monographic works, articles, such as this work, born from the need to ignore our literary wealth and the necessary conservation of our identity as citizens of Ludovica, inhabitants of a land rich in writers, but little explored.



In this way, we believe that *Time and Memory: an analysis of the chronicles of José Chagas* is an access to an awakening of all, especially those who claim to be educators. We urgently need to observe how and in what way we can work, in the educational universe of Maranhão literature, through this wonderful genre that is the chronicle.

In this way, we will be allowing students a fantastic meeting and exchange of knowledge, in which everyone can participate directly or indirectly in the formation of a society, revisiting the past, but also looking to the future through their own literature. For this reason, I understand that this work is relevant and that, through the knowledge acquired, it awakened in this researcher under construction, greater commitment and commitment to our literature in Maranhão, through the chroniclers of our city of São Luís.

REFERENCES

1. Cândido, A. (1980). **A vida ao rés-do-chão**. São Paulo: Ática.
2. Coutinho, A. (1987). **Crítica e teoria literária**. Rio de Janeiro: Tempo Brasileiro; Fortaleza: Edições UFCE-PROERD.
3. Cândido, A., et al. (1992). **A crônica: o gênero, sua fixação e suas transformações no Brasil**. Campinas: Editora da UNICAMP; Rio de Janeiro: Fundação Casa Rui Barbosa.
4. Cardoso, N. F. (2008, 28 de julho). José Chagas. **O Estado do Maranhão**.
5. *Da arte de falar bem.* (2004). São Luís: Instituto Geia.
6. França, S. S. L. (2007). Os saberes históricos: A concepção de história dos cronistas oficiais. In Idem. **Os reinos dos cronistas medievais (séc XV)**. São Paulo: Annablume.
7. Ricouer, P. (2007). **Da memória e da reminiscência. Memória e imaginação. A memória, a história, o esquecimento** (A. François et al., Trad.). Campinas: Editora da Unicamp.
8. Moisés, M. (1995). **A criação literária. Prosa-II** (19ª ed.). São Paulo: Cultrix.
9. Sá, J. de. (1985). **A crônica** (6ª ed.). São Paulo: Editora Ática, Col. Princípios.
10. Nascimento, C. M. S. (2024). **Tese**. [PDF]. Acessado em 03.07.2024 às 23:25h.
11. Costa, J. R. N. (2024). **Leitura importante**. [PDF]. Acessado em 04.07.2024 às 00:26h.

ANALYSIS OF SCHOOL VIOLENCE IN BRAZIL

<https://doi.org/10.56238/sevened2024.029-022>

Ana Paula Amazonas Soares¹, João Ricardo Gomes Porciúncula Barbosa², Eliane A. Pereira de Abreu³ and Arthur Senna⁴

ABSTRACT

Violence in schools has emerged as an issue of great national relevance after the occurrence of tragic incidents involving children in different states of Brazil. These impactful events raised serious concerns about safety within educational institutions and underlined the urgency of addressing the issue of school violence across the country. The article proposes to analyze violence in high schools, through the responses of school principals. The database is based on the results of the Basic Education Evaluation System (SAEB) in the years 2019 and 2021, in the context of Brazilian states. The data show a decrease in the types of violence reported between 2019 and 2021, except for the Robbery type. For the year 2021, where new types of violence were introduced, mainly of a psychological aspect, the data are worrying about Bullying, Vandalism and the complete non-perception of Harassment

Sexual. By better understanding the dynamics of school violence, it will be possible to develop approaches for increasing social capital, thus promoting a safer and more welcoming school environment, and, consequently, increasing human capital.

Keywords: School violence. Safety. SAEB. Education.

¹ Doctor in Economics
Federal Rural University of Pernambuco
E-mail: ana.soares@ufrpe.br
ORCID: <https://orcid.org/0000-0003-0164-699X>
LATTES: <http://lattes.cnpq.br/0216127558312955>

² Undergraduate student in Economics
Federal Rural University of Pernambuco
E-mail: joao.porciuncula@ufrpe.br
LATTES: <http://lattes.cnpq.br/3249812708063434>

³ Doctor in Economics
Federal Rural University of Pernambuco
E-mail: eliane.abreu@ufrpe.br
LATTES: <http://lattes.cnpq.br/3101422198167935>

⁴ Doctor in Social Sciences
Federal Rural University of Pernambuco
E-mail: artsenna@hotmail.com
LATTES: <http://lattes.cnpq.br/5080883627218468>

INTRODUCTION

The analysis of school violence worldwide is a worrying reality, affecting thousands of students around the world. This complex problem manifests itself in several ways, as presented by international bodies that are highlighted below.

The World Health Organization (2014) states that "*Violence of all types is strongly associated with social determinants such as weak governance; poor rule of law; cultural, social and gender norms; unemployment; income and gender inequality; rapid social change, and limited educational opportunities*" (in free translation: "Violence of all kinds is strongly associated with social determinants such as weak governance; deficient rule of law; cultural, social, and gender norms; unemployment; income and gender inequality; rapid social change and limited educational opportunities").

UNICEF (2021) argues that school violence can have serious psychological effects on children, which can lead to learning problems. It is important that the child feels safe in the school environment, without fear.

The American Center for Disease Control (CDC, 2021) states that: "*School violence is violence that occurs in the school setting. It describes violent acts that disrupt learning and have a negative effect on students, schools, and the broader community*" (in free translation: "School violence is violence that occurs in the school environment. It describes violent acts that disrupt learning and have a negative effect on students, schools, and the community at large").

School violence was characterized as a multifaceted phenomenon, which manifested itself both verbally and physically. In addition, it was noticed that violence inside and outside the family environment was related to occurrences inside the school.

It is important to emphasize that violence, whether physical or verbal, impairs learning and, therefore, decreases the chances of the student developing human capital, as a necessary return on education as a future investment.

Investment in education is an important component for increasing the human capital of the next generations, as cited by the authors Psacharopoulos (2005) and Schultz (1961), who see education as an investment. In other words, the State, as a manager, must think that when fighting violence, it is also investing in human capital.

Solow (1961), in his growth model, considers that capital accumulation should also consider education as an investment in human capital. This model was later matured and developed by Romer (1990), Mankiw, Romer and Weil (1992) and Mincer (1974).

In Brazil, Langoni (1973) places the national education policy as an important instrument for reducing regional inequalities. In the same sense, regarding the explanations

of regional inequality, Barros (2011) demonstrates that "the essence of the explanation of Brazilian regional disparities lies in the differences in the availability of human capital in the various regions, at least with regard to the relative backwardness of the Northeast in relation to the South and Southeast".

Therefore, considering human capital as an important tool for development and for reducing regional disparities is extremely important. Thus, studying the determinants of the assimilation of education provided by the State is an essential theme.

In this sense, the importance of education as an engine of growth (it becomes important to increase income) and development (improvement in the quality of life) begins.

CONTEXTUALIZATION OF VIOLENCE IN SCHOOLS IN BRAZIL

Whereas violence is a global problem. Brazil is not immune. Public policies in this sense have been carried out to contain their impacts on society. The identification of types of violence and how to observe such types in all states have been changing over time.

The increase in cases of violence recently reported in the media, it can be considered that in the last four years there have been twenty-four attacks in schools with 137 victims and 45 died. These are tragic accidents that draw attention to two cases involving children from the daycare center in Santa Catarina, and another in São Paulo, where the student killed a teacher and injured five other classmates.

In addition to the reported cases, Barbieri, Santos and Avelino (2021) present that violence is present in everyday actions in the school environment and that it may not be perceived. However, they emphasize that such acts can be combated with projects and actions, for example art education.

Silva and Assis (2018) demonstrate the importance of preventing and confronting violence in schools, highlighting its role in promoting democratic relations, harmonious coexistence and respect for differences. Generally, these initiatives are promoted by the schools themselves, private institutions or public policies and may include training in social skills, safety and participation.

Once again, one can see the importance given to education as a means of investment in human capital. In other words, it is necessary to present the student with a safe environment so that the proper skills are developed for the development of their own capital (human capital) and that they provide a safe and enriching education for all.

Several studies have highlighted the increase in the occurrence of aggressive behaviors among students, such as bullying, verbal and physical aggression, as well as other forms of school violence. As already emphasized, such negative situations

compromise the quality of education, the well-being of students and the formation of conscious and responsible citizens. Given this scenario, it is essential to explore and apply explanatory approaches at national and local levels that are effective in preventing and combating violence in educational institutions.

In the historical context of the approach to violence, it begins with the post-dictatorship, in the 80s. As can be observed by Sposito (2001) in his brief balance of the texts exposed, he reveals that the themes addressed are centered on the relations of violence within the school – actions against property, such as depredations and graffiti – and violence as forms of interpersonal aggression, especially among the students themselves.

Studies on violence in the era of consolidation of democracy bring themes related to the dynamics between school and peripheries. Especially schools located in areas influenced by drug trafficking or organized crime shows, demonstrating that the behavior of students often reflects a sociability marked by aggression and petty crimes, characterized as incivility, and which has its roots in the crisis of the civilizing process of contemporary society.

The studies addressed in the 80s and 90s focused on the school's infrastructure and its geographical position, that is, on the schools in the periphery that were harmed by the trafficking that enters the school.

Not that peripheral violence and drug trafficking are no longer present in schools, but as will be seen, its impact has decreased significantly over the evolution of democracy and the concern with its impact on human capital.

The study carried out by Giordani, Seffner and Dell'Aglio (2017) already shows this new perception, where with content analysis, it resulted in the identification of four discursive categories: Violence between peers, Violence between students and teachers, Extramural violence and Coping actions.

Verbal violence has become important when it can be known by principals and teachers. In other words, within an abstract awareness that there have always been students who stand out as disturbers of others, there was no way to verify the impact of the actions of these disturbers on school education.

However, with the advent of the internet, in which there is a greater platform for such individuals and their actions are now verified by principals and teachers more easily and not just outside the walls. Bullying is now considered as one of the aspects of violence that must be taken into account.

Bullying is a form of violence that occurs between students and can manifest itself in a variety of ways, such as physical, verbal, and relational aggression. This aggressive and repetitive behavior has devastating effects on victims, leading to mental health problems, low self-esteem, and academic difficulties. In addition, bullying creates a negative school environment, harming the educational experience of all students and perpetuating itself amidst social tolerance and power inequalities among students.

Within the big blanket of bullying, harassment and discrimination can also be observed, both of which focus on the verbal and are mixed with bullying actions. Therefore, covered up by him.

The article by Oliveir-Menegotto, Pàsini and Levandowski (2013) provides a small review of articles published in Scielo on the subject of bullying. The authors mention that it was in the 90s that the theme became visible. However, it was only in 2005 that it began to have scientific prominence here in Brazil, with the increase in scientific publications and has aroused the interest of different areas of knowledge, such as psychopedagogy, law, physical education and pedagogy.

However, until the end of 2011, there were few articles that discussed the role and performance of the psychologist in relation to bullying. At the national level, the topic was only introduced in SAEB questions in 2021 (INEP, 2022).

Preventing violence in schools is one of the most effective strategies to deal with this complex problem. The preventive approach seeks to identify risk factors and promote a safe and welcoming school environment for the socio-emotional development of students.

In this context, works such as that of Olweus (2017) present a comprehensive prevention program, based on school intervention, parental involvement, and community collaboration. This holistic approach aims to engage the entire school community in identifying and addressing bullying by implementing clear rules against aggressive behavior, training teachers and students to deal with these situations, and providing a safe and welcoming environment.

Maldonado and Micheli (2021) highlight the importance of developing socio-emotional skills as a preventive strategy for violence in schools. By strengthening the emotional and relational aspects of students, cultivating skills such as empathy, self-control, conflict resolution, and assertive communication, a safer and more welcoming school environment is created. The book also offers guidelines for mediating conflicts when they arise, emphasizing the importance of a culture of peace and respect.

Giordani, Seffner and Dell'Aglio (2017) highlight the importance of the actions of the school administration in the resolution of conflicts. The study highlighted the need for

intervention projects that focus on social relationships among adolescents, as well as on the training of teachers and the management team, in order to deal effectively with cases of conflict in the school environment.

Interventions must be incorporated continuously and systematically into the school day-to-day, as part of the pedagogical project of public policies at the various levels of power. By being aware of information about possible social vulnerabilities, the State must act in order to prevent the existence and increase of violence in schools, in order to promote the increase of human capital.

Social networks provide their members, according to Wellman and Frank (2001), with emotional help, material help, information, companionship, and a sense of belonging to something greater than themselves. The social support promoted by them is one of the many ways that their members have to obtain resources to be negotiated in their daily lives, to measure and expand their opportunities and to reduce uncertainties.

Preventive approaches must take into account the particularities of the Brazilian context, that is, in addition to considering human capital, one must also seek to increase social capital, such as Puttman (2002), Coleman (1990), Bandeira (1999), Coleman (2000) and Bandeira (2002). Involve all social actors, whether they are the actors directly involved in schools, but also parents, the community and other social actors.

It is the links formed within society, which unite its members around common goals, which is based on the theory of social capital. It is within this perspective that the combat, monitoring and identification of strengths and challenges of public policies are found. Society and leaders, by working collaboratively and dedicatedly, based on the development of social capital, will be able to create a safe school environment for the increase of human capital.

The objective of the article is to focus its considerations on the results on violence obtained in the responses of principals in the Basic Education Evaluation System – SAEB – for the years 2019 and 2021, for all elementary schools whose principals answered questions about violence in schools, regardless of administrative dependence for all of Brazil. Specifically, to observe the types of violence questioned in both years, estimate the number of responses, verify the frequency of occurrence for each type of violence indicated by the school management, promote the calculation of the percentages according to the states and compare the years.



METHODOLOGY

The methodology presented in the study is a quantitative approach, which describes violence in Brazilian elementary schools from the point of view of the answers given by school leaders about the occurrences of violence in their schools. It has an applied nature that describes the percentage of occurrence of violence in the various states and a comparison between the years 2019 and 2021. It is a documentary research, but, at the same time, it calculates the average percentages for the various states in the different years of the SAEB survey.

In the Brazilian context, where violence in schools is a worrying reality, it is important to use SAEB data on violence in schools because it is presented in a standardized way, since the question is always asked in the same way and to all principals of elementary schools.

Therefore, the approaches presented by such a study are valuable for educators, school managers and public policy makers, since violence in schools is a problem that deeply affects the educational system.

Thus, having the SAEB as an instrument for comparative analysis between the two years is of fundamental importance because, in addition to being standardized, the information can be compared between the years and serves as a guide for public policies.

It is good to remember the health situation that occurred in 2020, the global pandemic of the SARS COV-19 virus. This is, then, a game-changer for some outcomes. The year 2019 was a year before the pandemic, in which activities at school were ordinary and normal. While, in 2021, face-to-face activities were carried out with restrictions, it was the year that vaccination began and there was a partial return to classes and with many restrictions in the second half of the year. The implementation of the return to school was carried out with rules determined by each state, that is, with differences between states and according to their respective health policy.

Considering that it was in the second semester of 2021 that classes gradually became face-to-face, it cannot be said that the variation in acts of violence were, in fact, significant variations. However, one cannot fail to compare, since there was attendance in schools.

Another point that should be kept in mind is that there has been a change in the number of questions about violence. The questionnaire applied in 2021 was modified to include new types of violence which, according to INEP (Read-me, 2022), was revised after consideration of scientific articles in the area.



As will be seen, more questions were introduced about other possible acts of violence that occurred in schools. Behavioral points among students that were observed further away from the manager or teacher, as was the case with bullying, sexual harassment or discrimination. In addition to behavioral acts, invasions of the school area, vandalism and shooting were introduced.

Finally, schools cannot be identified between years, as they are with the General Data Protection Law (LGPD), incorporated into the Brazilian legal system through Law No. 13,709, of August 14, 2018. The School Board, despite being anonymous, in some cases made it possible to identify the school and, therefore, the principal. In the year 2021, such identification will no longer be possible. Therefore, it is not possible to identify whether or not the school changed the response group.

SAEB DATA ON VIOLENCE IN BASIC EDUCATION

Each School Board represents the school and will respond to the frequency with which it observed a certain act of violence in it. In this way, the Directors who answered the question will be divided according to their response to the frequency of occurrence. Which will tell how often acts of violence occurred in his school. This set of answers will be translated into percentages of the total number of respondents for each question, since the management can respond to some acts and not others. The action is repeated for each year (2019 and 2021) and each location (different states).

In 2019, for all of Brazil, 67,886 school principals were questioned and in 2021 there were 68332. However, this does not imply that everyone answered the questions about violence, the level of response will depend on whether or not there was an answer to each specific question. However, the average percentage of response for Brazil as a whole was 94.4%, considering the minimum number of respondents for each state in 2019 and in 2021 the average percentage of minimum respondents was 93.1%, despite having sent more questionnaires. Therefore, in 2021 there was a higher number of non-responses for a minimum number of respondents.

For the different states, the percentages of responding principals in relation to the minimum number of responses are above 90%, with the exception of the state of Roraima (88.3%) for the year 2019. The highest percentage of response was from Amapá (99.7%) for the year 2019. The statistics of interviewed managers, respondents and the percentages of minimum responses for each of the states of the Federation can be found in Table 1 below:

Table 1 – Number of Leaders Interviewed, Minimum Responses and Percentage of Responses by States

Região	UF	2019			2021		
		Total	Mínimo Resposta	% Resp	Total	Mínimo Resposta	% Resp
Norte 1	RO	668	637	95,4	678	634	93,5
	AC	375	371	98,9	405	376	92,8
	AM	1.378	1.271	92,2	1.401	1.270	90,6
	RR	240	212	88,3	232	211	90,9
	PA	3.228	3.193	98,9	3.469	3.198	92,2
	AP	317	316	99,7	354	329	92,9
	TO	812	744	91,6	793	740	93,3
Nordeste 2	MA	3.655	3.526	96,5	3.812	3.520	92,3
	PI	1.985	1.866	94,0	2.011	1.861	92,5
	CE	3.545	3.354	94,6	3.565	3.349	93,9
	RN	1.451	1.347	92,8	1.453	1.339	92,2
	PB	1.877	1.788	95,3	1.922	1.788	93,0
	PE	3.077	2.930	95,2	3.152	2.925	92,8
	AL	1.311	1.250	95,3	1.338	1.248	93,3
	SE	980	945	96,4	1.018	944	92,7
	BA	5.931	5.409	91,2	5.805	5.396	93,0
Sudeste 3	MG	6.326	5.879	92,9	6.328	5.861	92,6
	ES	1.225	1.152	94,0	1.222	1.151	94,2
	RJ	4.051	3.779	93,3	4.037	3.772	93,4
	SP	10.078	9.461	93,9	10.017	9.445	94,3
Sul 4	PR	4.276	3.972	92,9	4.209	3.964	94,2
	SC	2.292	2.203	96,1	2.307	2.203	95,5
	RS	3.948	3.633	92,0	3.927	3.626	92,3
Centro-Oeste 5	MS	853	803	94,1	856	801	93,6
	MT	1.217	1.122	92,2	1.194	1.118	93,6
	GO	2.214	2.104	95,0	2.243	2.096	93,4
	DF	576	549	95,3	584	547	93,7

Source: SAEB 2019 and 2021

With regard to the issues addressed in 2019 and 2021, they were carried out as follows: About the facts listed below, state the frequency with which they occurred this year, in this school. The types of violence were listed as: There was **drug trafficking** in the school; there was an occurrence of **robbery** with the use of violence; professionals were victims of **an attempt** on life; Students attended school carrying a weapon (**armed**); Students attended school under the influence of illicit drugs (**drug addicts**); Students attended school under the influence of alcoholic beverages (**drunk**); professionals were threatened by a student (**threats**).

In 2021, the set of questions about violence was expanded. After discussion and verification of a wide bibliography on the subject, questions were included on: Depredation of school property (**vandalism**); **Shooting** /stray bullet; **Invasion** of school space; **Discrimination**; **Bullying** (threats or verbal abuse); and, **Sexual harassment** .

The answers given by the Directors were not in the form of numbers, but on a scale that adopts the principal's perception of the frequency of occurrence. In other words, it was

an ordinal scale, in which answers should be given on how the manager perceives what happened in his respective school, a scale composed of the answers: **Never**, **Few times** or **Several times**.

Considering the valid answers, they were grouped according to the answer and the percentage was extracted for each of the frequencies, for each state and reference year. Therefore, they were presented in terms of the percentage of response given, and according to the frequency of events, for the state according to the event addressed for all the responding schools, in the specific year, remembering that the results are presented according to the percentages of *responding managers* and not the total of managers interviewed.

For the purpose of analysis, the percentage of "**Never**" answers was removed from all graphs, as the analysis focuses on acts related to violence, answered by the School Board, facts that *occur* in the school, in general and in that year.

An interesting point is that the answer "**Never**" has a high percentage and implies that violence does not occur in schools according to the manager's view. But, it is the one that can be obtained as a complement to 100% of responses.

It is not questioned, here, whether the answer given by the Director has a political or cognitive nature, since there was no action on the part of the research body to influence them, or the occurrence of influence from political parties or even that personal issues are considered in a way that is significant to the point of having an answer bias.

RESULTS

Considering then that there is a divider between the set of questions, the analysis will be divided into two presentations, a comparison between those equal questions between the years 2019 and 2021 and an analysis of the new questions of the year 2021.

COMPARISON BETWEEN YEARS

The management responds between facts that occurred that year and what was the certain frequency. It is also important to remember that at this stage only questions that belong to the same type of violence and that have the answer within the same scale parameters will be considered.

It is important to emphasize that the percentage is linked to the number of schools with a certain frequency of occurrence of that type of violence, answered by the Director. So, the analysis disregards, as previously said, the frequently "**Never**" answers because, supposedly, that type of violence did not occur.

The graphs show the seven types of violence consulted in both years, on the horizontal axis are the Federation Units and on the vertical axis are the accumulated percentages of responses. Therefore, each bar refers to the accumulated percentage of response for each type of violence, for each specific one and in each state. So, the higher the bar, the greater the occurrence of said violence, for that state in that specific year.

As can be seen in Graph 1 and its small graphs, whether for the year 2019 or for the year 2021, whatever the type of violence that occurred in schools, the sums of the percentages of occurrences Few and Several do not exceed 40%. That is, most states do not have such types of violence.

In the visual analysis, it is also highlighted that the Midwest region (states and the Federal District) has the highest cumulative percentage of violence in most of the types described.

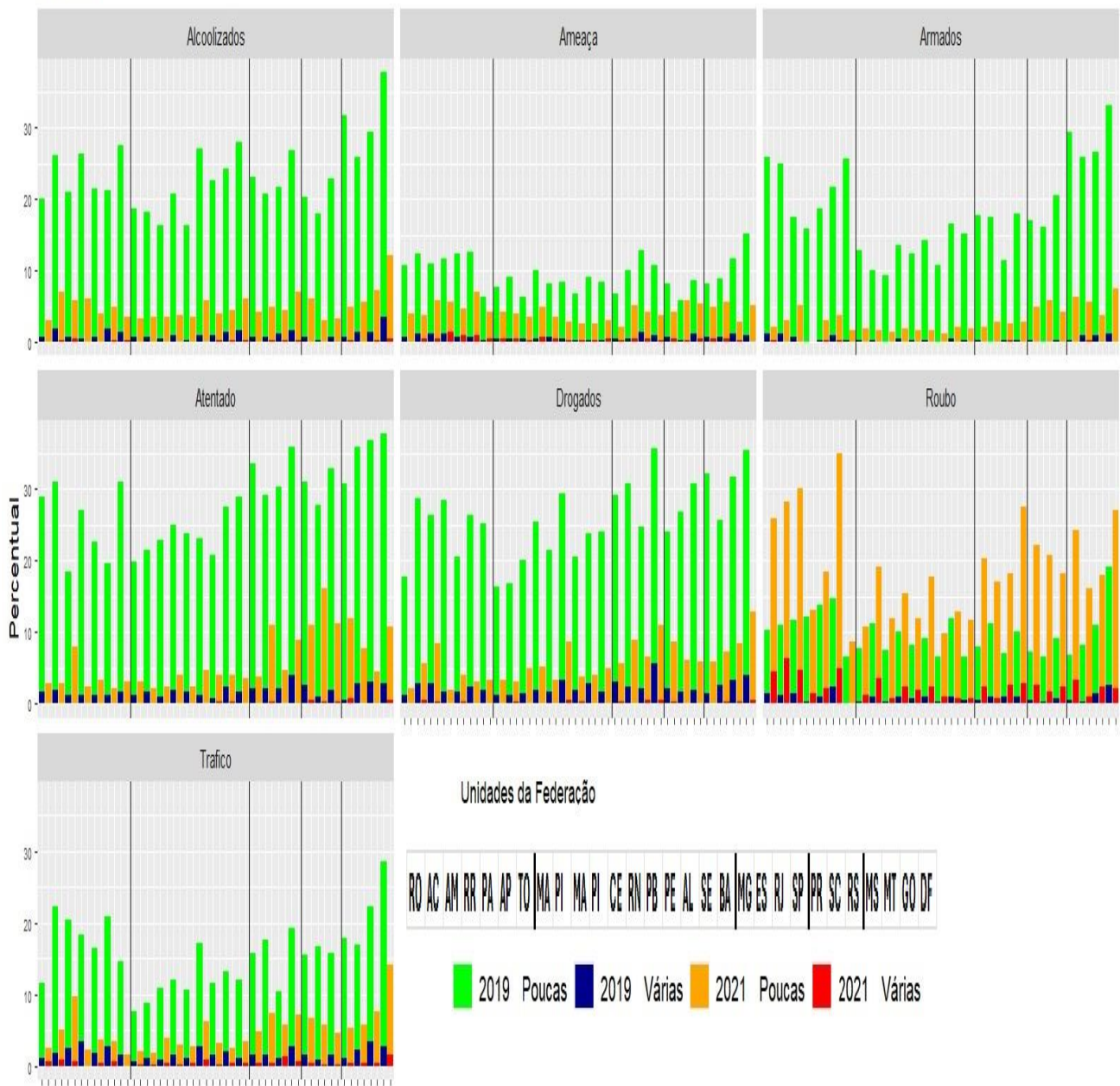
Another point to highlight, in the visual analysis, is that only for the type of violence Robbery, the frequency of occurrence was higher in 2021 than in 2019. Thus, it can be observed that for various types of violence, the columns referring to the year 2019 are always larger than the columns referring to the year 2021, respectively, for the various states. This means that in the comparison between the years, the year 2021 was less violent, that is, there is a decrease in violence when compared between the years and the analysis will be true with the exception of violence such as Robbery.

With regard to the comparison between years, the columns represent the accumulated percentage of percentage responses given by the frequencies Little and Several times for the years 2019 and 2021 according to the states in the order established in the legend. Thus, when comparing the sizes of the columns, it reflects the accumulated occurrence of events according to the frequency observed by the managers (Few + Several), for each referenced type of violence, in the different years and states.

Graph 1 – Types of Violence by State

Tipos de Violencia

Estados



Source: SAEB Microdata 2019 and 2021

With respect to the concern of public policies to combat types of violence with high frequency, whether in 2019 or 2021, violence of the types Attempt on Life (**Attack**), Students under the influence of Drugs (**Drug Addicts**) and Students under the influence of Alcohol (Alcoholized), especially with a large percentage in 2019, should be the focus of action.

It cannot be said that there was, in fact, a decrease in this type of violence given the conditions of the pandemic, which influenced the perfect functioning of schools. But, the



size of the column in 2021 is significantly smaller when compared to 2019. Therefore, it is important to note that there was a decrease.

Robbery-type violence, which was significantly higher in 2021, can reveal the impacts caused by the pandemic on school premises. However, it is important to remember that the question asked refers to the occurrence of robbery with violence, that is, the perception of the principals during the year 2021 was that there was an increase in criminal actions in the school, which may be the consequence of the low income level of school users (students or not) and not an increase in the robbery of school facilities due to non-use for part of the year.

Although violence by threats is an imminent risk factor, as observed in the last two events of violence – at the daycare center in Blumenau, SC and at the school in São Paulo, SP in 2023 – both events raise questions and discussions on the subject and the Government has started implementing security measures. It is clear that these were serious incidents and that the topic, in general, is now in the media spotlight.

However, it is very important that decision-making is considered for facing incidents of Student Threats, with constant combat and monitoring before any student carries out such a threat. Well, it is enough for a threat in any school to be made effective for there to be a calamity. Thus, preventing events of extreme violence such as those that happened is difficult, but feasible with monitoring.

Students under the influence of drugs (licit or illicit) is a problem that goes beyond the school gates, it is a public health case and should be treated as such.

Armed students at school held a percentage considered in 2019, however, even considering the pandemic, the percentage drops drastically in 2021, whether for attendance (Few times or Several times), or for location (Brazil or Pernambuco).

It is important to emphasize that in addition to the implementation of safety standards and the fight against threats, social public policies that combat the use of drugs (licit or illicit) in the school environment or in the vicinity of the school are even more difficult to implement.

However, the school administration can use awareness actions, since it can communicate with the students themselves through lectures, as the students or with the community; School Council; Parent-Teacher Meetings; Discussion projects on the subject, among others.

YEAR 2021

In 2021, INEP considered the inclusion of the following questions: **Depredation** of school property (**Vandalism**); **Shooting** /stray bullet; **Invasion** of school space; **Discrimination**; **Bullying** (threats or verbal abuse); and, **Sexual harassment** .

Topics developed based on the most recent bibliographic studies and with the perspective of the pandemic, which emotionally affected students and, in a way, the entire population. Thus, it is sensible to include these topics in the analysis of violence in schools.

Despite being based on the trend in the literature, it is important to emphasize that the issues arising from the reinforcement of policing – depredation and invasion – are public policies that must be implemented by the State. The psychological issues questioned – harassment, discrimination and bullying – are issues that involve a public policy aimed at raising awareness of the whole society, since the engagement of families and society is necessary to combat them.

Another argument for the inclusion of psychological issues would be the post-pandemic concern, in which there was a concern about social well-being and the new importance given to the student's emotional well-being.

The data were also presented according to all states, also using the same rule as before, but without comparison between years, only between locations. Graph 2 below shows the accumulated percentages of violence in schools, perceived by the principal in 2021.

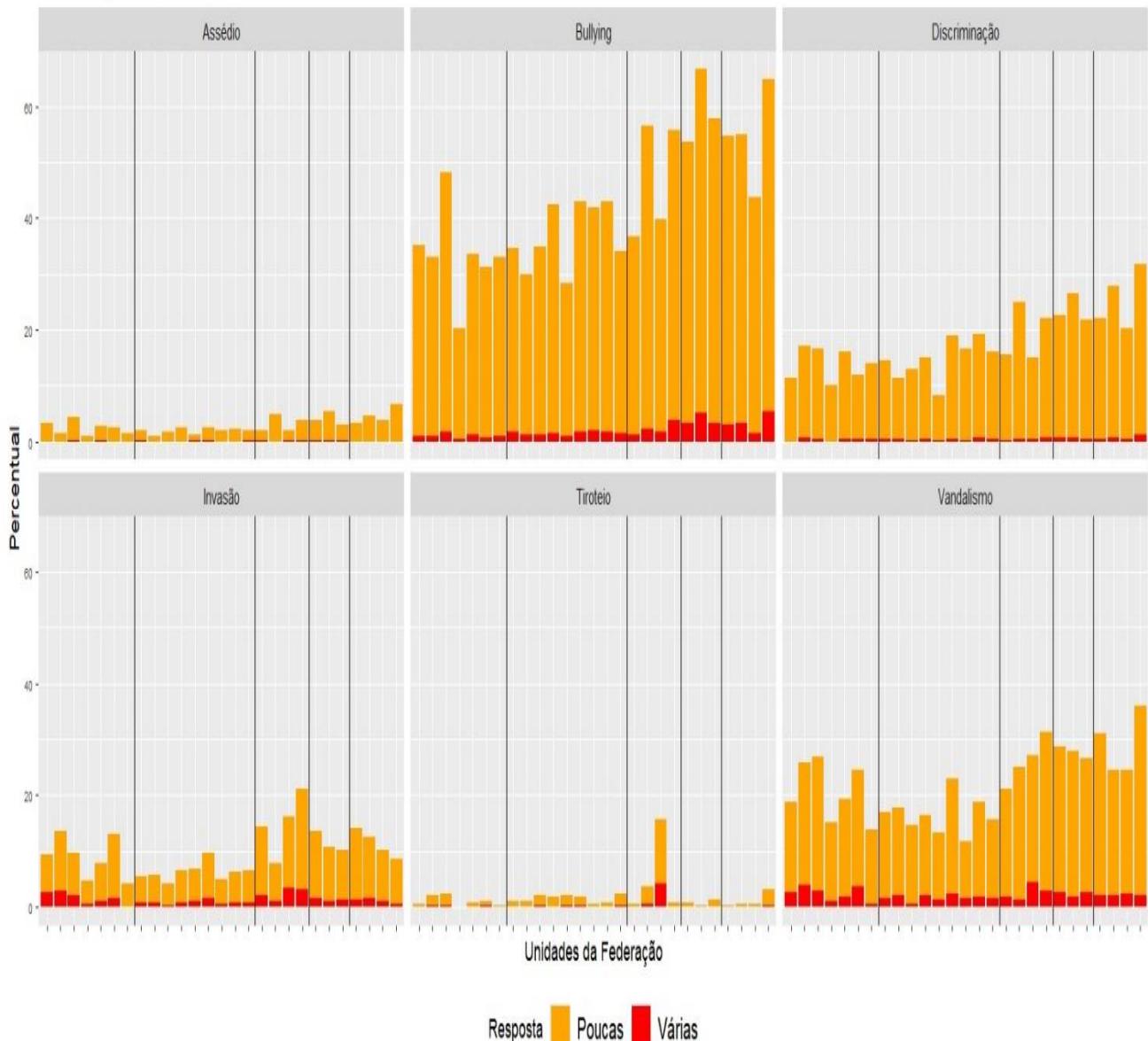
What is evident in this set of new information is the observance of sufficient numbers of incidents occurring Few Times in a large percentage of schools. In other words, it brings in its presentation concerns about violent acts that are observed and that were not previously questioned.

A second point of the visual analysis is the accumulated frequency for the new types of violence questioned for the year 2021. In particular, **Bullying**, **Vandalism** and **Discrimination stand out** and no less important will be the **Invasion** of schools. In general, the percentages of schools in which the acts occurred infrequently are significant and evidenced by the accumulated percentage.

In simple visual analysis, it is observed that the Sexual **Harassment** type is reported in a low accumulated percentage and in low frequency (**Few** times), with an accumulated percentage not exceeding 10%. The Federal District and Santa Catarina stand out with percentages above 5% and frequency of **Few** times. **It** often has a low percentage and is not observed in the graphs, but it exists in the states of Amazonas, Pará, Pernambuco, Paraíba, Bahia, São Paulo and Rio Grande do Sul.

Graph 2 – Specific Types of Violence in 2021 by States

Tipos de Violência
Estados, 2021



Fonte: SAEB 2021, Microdados

Source: SAEB Microdata 2019 and 2021

Such a result can be seen as short-sightedness on the part of directors, since, as indicated by Barbieri, Santos, and Avelino (2021), everyday actions are sometimes not noticed.

The Shooting is perceived with emphasis in the state of Rio de Janeiro, with an accumulated percentage above 15%, followed by Espírito Santo and the Federal District with accumulated percentages a little less than 5%.

The **invasion** of the physical spaces of the school is perceived more frequently in the Southeast and North regions. The state of São Paulo leads the occurrence, with an

accumulated percentage of just over 20%, Rio de Janeiro and Minas Gerais have accumulated percentages of around 15%. However, the frequency **of several** has a high percentage, which suggests the implementation of public monitoring policies to prevent the act of invading and protect the public good.

Discrimination is the third type of violence with high and worrying accumulated percentages. The sizes of the columns suggest that there is a greater occurrence in the states of the Southeast, South and Midwest, because, in the visual analysis, the columns rise more in those states. Note that the frequency **Several** times is also little or almost nothing observed, which turns on the light so that measures can be taken to prevent discrimination with social projects. The Federal District stands out from the others, with a percentage above 30%, followed by the states of Mato Grosso and Santa Catarina.

Vandalism is the second concern among the main types of violence addressed in this first round of questions. As can be seen, there is a significant percentage of frequency **Several** times and the accumulated percentage is evidently high.

Bullying is, in fact, a worrying type of violence in all states in the year 2021. Reaching levels of accumulated percentages above any other type of violence in 2021. The state of Santa Catarina and the Federal District are those with the highest accumulated percentage, above 60%.

When we become aware of this type of violence and its occurrence in all states, with higher percentages than other types of violence, the fight becomes important and should be considered a primary public policy.

Combating this type of violence is difficult, since it goes beyond the walls of schools and is accentuated on social networks. Considering that the fight against this type of violence is difficult to monitor and implement prevention measures, public policies are important for raising society's awareness in the fight against and in family education.

DISCUSSION

The results presented during this research bring us many reflections about school violence in the country, especially in relation to the view of school administrators. The reduction in some forms of violence between 2019 and 2021, such as attacks on life and armed students, indicates a considerable decrease in the most serious acts. However, it is necessary to take into account that the COVID-19 pandemic and the partial closure of schools may have influenced this scenario. Therefore, the supposed decrease in violent incidents must be carefully evaluated, as the pandemic scenario has significantly modified the functioning of educational institutions and the interaction between students.



However, the notable growth in thefts in schools in 2021, together with the new look proposed by the SAEB methodology, awakens to the high rates of mental violence. Especially when compared to the approaches previously researched. Bullying, vandalism and discrimination highlight the importance of a more careful look at violence that goes beyond physical aggression. Types of violence that affect the mind, particularly bullying, show that emotional and psychological issues among students, intensified by the pandemic, manifest themselves at an alarming level, requiring strategies that go beyond mere physical protection.

Social tools, based on community or family support, such as Social Capital, should be considered significant and explored from the perspective of solutions to the problems of violence. The participation of the school community, parents and administrators in awareness and conflict resolution initiatives is crucial to address these problems in a preventive manner.

Another aspect that deserves to be highlighted is the connection between the school environment and the external elements that directly influence the behavior of students. Drug use, alcohol consumption and violence outside the school environment suggest that the school is not an isolated place, but mirrors the tensions and social challenges of the community in which it is located. For example, the evaluation of the data shows that the states of the Midwest had a higher incidence of cases of violence, which may be linked to regional socioeconomic issues. This emphasizes the importance of public policies that connect the school to the community, encouraging the growth of social capital as a means of preventing violence.

In addition, the low rates of sexual harassment complaints, although alarming, suggest that this type of violence is still not being properly recognized or documented by school administrators. This indicates a possible underreporting, indicating the immediate need for more efficient training for education professionals, with the aim of improving the identification and management of these cases.

Thus, the evaluation of the SAEB data, despite showing progress in some sectors, also reveals considerable failures in the management and fight against more discreet forms of violence, which can silently harm the school environment. The research enables a constant dialogue on how educational institutions can improve themselves to face these new dynamics of violence, which go beyond the physical space and require innovative and unified strategies to ensure the well-being of students.

CONCLUSION

Violence in schools is a serious problem that affects the Brazilian educational system. Although there is a predominance of schools where violence is rare or non-existent, it is essential to recognize that the occurrence of violent acts, even in lower frequencies, is still worrying. The evaluation and monitoring of results are crucial steps to ensure the effectiveness of preventive strategies, hence the analysis of national data such as the SAEB.

In all cases, any violence is worrisome, but the new types of violence analyzed, especially in 2021, reveal that its monitoring and possibility of combat, involves the development of social capital, of the network that encompasses the various entities – school, parents and society.

The implementation of preventive approaches, based on the development of social capital, is essential to combat the scenario exposed in 2021 and create a safe, welcoming and conducive school environment for learning and, consequently, increasing human capital. Thus, a suggestion for future work is in the context of the School Council and in the development of thematic projects on the subject in actions of the board, information contained in the SAEB itself.

Still, the normal understanding for his fight against Bullying and discrimination is to assume that the Director must call the society around him and start carrying out social awareness projects, hence the importance of increasing social capital.

The fight against violence can be considered effective, since the occurrence decreased in the comparison between years. However, in part, such a decrease can be evidenced in future surveys, as there will be no influence from the pandemic. Therefore, continuous assessment allows the identification of strengths and challenges, providing relevant information for the improvement of preventive approaches.

With the knowledge of the worrying percentages for the Vandalism and Invasion types, it can be speculated that this could be derived from the closure of schools or the possibility that it was not *monitored* during the initial period of 2021, considering that schools were not open. This is a question that can also be clarified when questioning the next SAEB.

The motivation for the increase in social capital is of fundamental importance in the fight against violence, that is, by promoting collaboration between social entities – schools, families and communities – it will be possible to create a network of protection and support for students, making the school environment safer and healthier, promoting human capital.



In this sense, one of the indications for future work and within the SAEB context is the analysis of questions about the interaction of the manager with the community, with regard to the issues of the principal's experiences with other schools, the support of the community and the contributions of the family to the school.

Finally, there is a set of information, even within the SAEB, that can serve as a basis for future studies and that can prove to be real instruments of public policies that can be implemented by the school management by recognizing what other principals can do.


REFERENCES

1. Bandeira, P. (1999). *Participação, Articulação de Atores Sociais e Desenvolvimento Regional* (Texto para Discussão No. 630). Instituto de Política Econômica Aplicada.
2. Bandeira, P. (2003). Algumas hipóteses sobre as causas das diferenças regionais quanto ao capital social no Rio Grande do Sul. In S. M. D. S. Correa (Ed.), *Capital social e desenvolvimento regional* (pp. 15–60). Santa Cruz do Sul: EDUNISC.
3. Barbieri, B. C., Santos, N. E., & Avelino, W. F. (2021). Violência escolar: uma percepção social. *Revista Educação Pública, 21*(7). <https://educacaopublica.cecierj.edu.br/artigos/21/7/violencia-escolar-uma-percepcaosocial>
4. Barros, A. R. (2011). *Desigualdades regionais no Brasil: Natureza, causas, origens e solução*. Elsevier Brasil. Edição do Kindle.
5. Coleman, J. S. (1990). *Foundations of social theory*. Cambridge: Harvard University Press.
6. Coleman, J. S. (2000). Social capital in the creation of human capital. In E. L. Lesser (Ed.), *Knowledge and social capital: Foundations and applications* (pp. 17–41). Boston, MA: Butterworth-Heinemann.
7. Centro de Combate às Doenças - Centers for Disease Control and Prevention - CDC. (2021). Retrieved from <https://www.cdc.gov/violenceprevention/youthviolence/schoolviolence/fastfact.html>
8. Giordani, J. P., Seffner, F., & Dell'Aglio, D. D. (2017). Violência escolar: percepções de alunos e professores de uma escola pública. *Psicologia Escolar e Educacional, 21*(1), 103–111.
9. INEP – Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira. (2021). *Microdados do Saeb 2019*. Brasília: Inep. <https://www.gov.br/inep/pt-br/acesso-a-informacao/dados-abertos/microdados/saeb>
10. INEP – Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira. (2021). *Microdados do Saeb 2020*. Brasília: Inep. <https://www.gov.br/inep/pt-br/acesso-a-informacao/dados-abertos/microdados/saeb>
11. INEP. (2022). *Leia-me Microdados SAEB*. Diretoria de Avaliação da Educação Básica.
12. Langoni, C. G. (1973). Distribuição de renda e desenvolvimento econômico do Brasil: uma reafirmação. *Ensaio Econômico EPGE, 8*
13. Maldonado, M. T., & Micheli, D. (2021). *Escola sem conflitos: Competências socioemocionais para a prevenção da violência e mediação de conflitos*. São Paulo: Editora Moderna.
14. Mankiw, N. G., Romer, D., & Weil, D. (1992). A contribution to the empirics of economic growth. *Quarterly Journal of Economics, 107*, 407–428.



15. Mincer, J. (1974). *Schooling, experience, and earnings*. National Bureau of Economic Research. <https://EconPapers.repec.org/RePEc:nbr:nberbk:minc74-1>
16. Oliveira-Menegotto, L. M., Pasini, A. I., & Levandowski, G. (2013). O bullying escolar no Brasil: uma revisão de artigos científicos. *Revista Psicologia: Teoria e Prática, 15*(2), 203–215.
17. Olweus, D. (2018). *Bullying: como prevenir e controlar a violência nas escolas* (R. Eichenberg, Trad.). São Paulo: Editora Martins Fontes.
18. Olweus, D. (2013). *Bullying at school: What we know and what we can do*. Oxford, England: Blackwell (Wiley). ISBN 978-1118695807.
19. Organização Mundial para a Saúde. (2014). *Global status report on violence prevention*. United Nations Office on Drugs and Crime and United Nations Development Programme.
20. Psacharopoulos, G. (2005). Economic impact of education. In Meier, G. M. & Rauch, J. E. (Eds.), *Leading issues in economic development* (8th ed., pp. 189–193). Oxford University Press.
21. Putnam, R., & Goss, K. A. (2002). Democracies in flux: The evolution of social capital in contemporary society. In R. Putnam (Ed.), *Democracies in flux* (pp. 1–29). New York: Oxford University Press.
22. Romer, P. M. (1990). Endogenous technological change. *The Journal of Political Economy, 98*(5), S71–S102.
23. Sposito, M. P. (2001). Um breve balanço da pesquisa sobre violência escolar no Brasil. *Educação e Pesquisa, 27*(1), 87–103.
24. Schultz, T. W. (1961). Investment in human capital. *The American Economic Review, 51*(1), 1–17. <http://www.jstor.org/stable/1818907>
25. Solow, R. M. (1956). A contribution to the theory of economic growth. *The Quarterly Journal of Economics, 70*(1), 65–94. <https://doi.org/10.2307/1884513>
26. Silva, F. R., & Assis, S. G. (2018). Prevenção da violência escolar: uma revisão da literatura. *Educação e Pesquisa, 44*, 1–13.
27. UNICEF. (2021). Violência contra crianças nas escolas. United Nations Homepage. <https://www.unicef.org/protection/violence-against-children-in-school>
28. Wellman, B., & Frank, K. (2001). Network capital in a multilevel world: Getting support from personal communities. In N. Lin, K. Cook, & R. S. Burt (Eds.), *Social capital: Theory and research* (pp. 233–273). New York: Aldine de Gruyter.

**URBANIZATION AND LOCAL AND REGIONAL DEVELOPMENT OF
SOUTHEASTERN MEXICO**

 <https://doi.org/10.56238/sevened2024.029-023>

Javier Pérez Corona¹

ABSTRACT

In the multi-scale national urban scenario, the urbanization of the southeast region stands out due to the accelerated dynamics in a rural/dispersed and contrasting environment between metropolization and numerous ethnic localities and indigenous communities in precarious social and environmental conditions, but which have socio-territorial resources, attractive to investment in strategic sectors: oil, agribusiness and tourism services; along with infrastructure projects of mobility and transportation. Urbanization that rethinks development between forms of dispossession of common goods and the resistance of native peoples in their ways of life and territorial habitation. Local and regional development that puts in perspective to face the contradictions of developmentalism and alternatives from the subalternity. What characteristics redefine singular urbanization from rural/dispersed population centers and the forms of municipal development of indigenous communities of regional scope? To this end, the determinants of urbanization are examined with demographic dynamics and the structure of human settlements in agglomeration/dispersal areas and the social/ethnic profile, to identify development trends. A statistical review of the population and localities and conditions of access to common goods is carried out; together with planning/public works in community municipalities. Some results highlight trends of extended urbanization and persistence of concentration/dispersion, but with intermunicipal articulation due to infrastructural undertakings and some progress in local development, due to social/community cohesion.

Keywords: Urbanization. Local development. Municipality.

¹ National Polytechnic Institute
Mexico
ORCID: <https://orcid.org/0009-0006-4108-8573>
E-mail: jpcorona88@hotmail.com



INTRODUCTION

In the national metropolitan urban condition, the singular urbanization of the southeast region is manifested by the accelerated dynamics, in a predominant structure of rural and dispersed locations, but with a contrasting composition between metropolization centers and numerous localities of ethnic population and indigenous communities scattered in a territory of low population density. This large indigenous population represents the largest percentage of the national total (INEGI, 2020), and is a significant social component of the regional profile, characterized by precarious social and environmental conditions, with the lowest welfare indices, according to the indicators of the agencies in charge of evaluating Mexico's social policy (Coneval, 2022), but which have valuable natural and cultural resources attractive to economic investment in sectors strategic: oil, mining, soil, water, forests, heritage and archaeological zones. A propitious context for the implementation of State interventions in the definition of the modernization project and rural/urban social transformation, with territorial policies and the undertaking of infrastructure works for regional development and to promote urbanization, as ways of alleviating the lack of basic public services, collective facilities and infrastructure of the localities.

In a general approach to the problems of the southeast region and specifically to the object of study of urbanization in ethnic localities, it can be broken down into three levels: (i) at the general level, the modernization process implemented by developmentalist policies to promote urbanization and urban rural transformation with differentiated social and environmental consequences in the national unequal regional structure, which inscribes the southern region as the one with the greatest backwardness, manifested in the localities of indigenous communities. (ii) the regional dichotomy of the rapid advance of urbanization in the conditions of rurality and dispersion, in the particularities of the social and territorial profile of precarious localities, which put into perspective the question of the dilemma of development, between design for social change, or, to reproduce inequality, which has prevailed for decades. And, (iii) the social and territorial implications of the infrastructural undertakings of the regional development policy, with the acceleration of urbanization, in the adjacent ethnic localities, manifested in the dialectic of dispossession and resistance, which opens new scenarios and challenges in the structure, condition and organization of the territorial habitation of the dispersed indigenous peoples.

What characteristics redefine urbanization and regional development that is configured in the environment of contrasts of dispersed rural localities and in the sphere of influence of dynamic urban/metropolitan centers, which in its advance and deepening

transforms the common goods of the native peoples, and which is manifested in the dialectic of dispossession and resistance; and the alternatives of reformulating a development project for social change from the subordination and autonomy of the native peoples?

For this reason, it is argued that the prevailing conditions of the southeast redefine regional urbanization based on the contradictions manifested to a greater extent between the precariousness in the levels of well-being of the localities and native peoples, compared to the hegemonic urban centers, in the dialectic of dispossession and resistance for the use and appropriation of social and natural resources. In the rural, urban and metropolitan dispersion/concentration relationship, in the face of the definition of the social and territorial development project in the making. In short, the trend of a singular extended urbanization of multi-scale articulation is contemplated, with a strong presence of dispersed and rural localities within the framework of rururbanization in the ethnoregional context.

To this end, the purpose is to identify the trends that shape the singularity of urbanization in the environments of dispersed localities of ethnic population of indigenous communities in the southeast region, particularly in the sphere of influence of the deployment of infrastructural undertakings and the social and territorial consequences in adjacent municipalities, and the scenarios of alternative development from the subalternity.

This field of knowledge of urbanization studies represents an inexhaustible source of contributions for the understanding, discussion, intervention and analysis of the processes of socio-territorial transformation in different scenarios and realities. So useful that they allow us to elucidate the specificities of the study that concerns us due to the singularity of the rural/urban dynamism in ethnic localities, representative of the cultural wealth of the country, among the most important in the world, which must be preserved as heritage. A process that has led to theories of urbanization to constitute a scientific discipline, with the early contributions of Ildefonso Cerdá in elucidating the determining elements of the social need for the multi-scale construction of the habitable social space, based on the components of collective life of provision of services and mutual aid, with the house/shelter, neighborhood and land uses between dispersion and concentration (García Bellino, 2000). As well as the territorial transformation and social relations and contradictions in the socially and politically produced space by planning and urbanism, between rurality and urbanity at various scales of the space lived, perceived and conceived as a determinant of daily and cultural life, according to Lefebvre (2016). Also, in the perspective of the transformation with urbanization from the local to the regional, in the use of resources of social and mercantile value, Harvey (2007) refers to the spaces of accumulation by dispossession of common

goods, but that in its mission lies the dialectic of social resistance, derived from the contradictions of the process of production and distribution in capitalist urbanization. and that in the dimension of social reproduction this resistance is gestationed, as part of the formative process of political consciousness.

Broadening the view of the general aspect of urbanization from critical studies in the complexity of its scope of interpretation of the transformations of the space of the different social formations as productive potential and social reproduction, the elementary notion of urbanization is assumed as a process of change from dispersed to concentrated forms of inhabiting and vice versa. with implications in the set of dimensions of social and spatial life. In this perspective and condensation of the long theoretical and empirical scope of the urbanization process, Brenner & Schmid (2015) refer to urbanization as a multi-scalar process and global deployment as the totality of space that provides the basis for the thesis of planetary urbanization, characterized through the new expressions, broken down into seven theses. A position that questions the reductionistically established approaches of the so-called "urban era", used uncritically in the face of a complex reality in rapid and constant transformation in a differential way by the various actors, which makes it essential to reformulate its obsolete categories in order to understand the changes in the built environment and the epistemological foundations of critical theory and praxis. It identifies new forms of the urbanization process, manifested in concentrated, extended and differentiated, with the conviction of understanding urbanization as a collective project between appropriation and protest; or, between dispossession and resistance, which has been reiterated.

Also, within the framework of critical studies of urbanization and with greater emphasis on the organization and ordering of sites, specifically urban planning, García-Buitrago (2023), rethinks the process from the perspective of subalternity, in the reorganization of collectively built space, as opposed to the onslaught of urban policies to annul the liberating subaltern potential. In this sense, he inscribes capitalist urbanization as a mode of spatialization, in accordance with the imperatives of accumulation and the reproduction of consistent social formations of modern development.

Finally, assuming that this process of urbanization implies territorial organization, it is inscribed in the modernization project and in which the accumulation by dispossession of common goods underlies, but with the social resistance of the subordinate or subaltern population, in Gramsci's perspective, and which has promoted a strand dedicated to the studies of subalternity (Thomas, 2018), which refers to the heterogeneous set of dispossessed popular social classes, but with transformative potential. Foundations of the

strengthening of the current urbanization of a contradictory nature in the dialectic of dispossession/resistance; of change and transformation in the forms of appropriation of the social and of mercantile valorization in accumulation by dispossession (Harvey, 2007); but, in the process itself, there is an underlying opposition on the part of the subalterns, which in specific conditions of the localities of the southeast region emerges as "critical regionalism" opposed to the onslaught of urbanization modernization, with the vindication of the singular social meaning of the collectively built environment with the resistance to individualistic utilitarianism (Frampton, 1988).

In this urbanization, interventions of the planning of the development project are articulated, which systematizes territorial planning based on political power based on hegemony and consensus for transformation for reasons of public utility, following Gramsci (Modonessi, 2010). Political power for utilitarian transformation in areas of widening inequality, with the formation of political subjectivities of the insubordinate and the potential of emancipation for the self-determination of the right to social organization and the use of common resources, from autonomy, in accordance with the proposal of Modonessi (2010), referring to the conjunction of subalternity with autonomy to reformulate an alternative development project, from the deepening of social contradictions. This emancipation is condensed into two aspects, as organizational and ideological independence, in the prevailing social framework, or as a formative process of the emancipated society. This dilemma is central to the cultural and territorial problems of local and municipal autonomies in the exercise of the independence of peoples and the State. Scenario of the perspective of the studies of community localities that highlights their potential of regional scope with the articulation and coordination between autonomous and democratic municipalities in the face of modernity as a radical position (Bookchin, 2012), contributing to the discussion of alternatives to free development. The idea of autonomy as an emancipatory project is increasingly present in the current phase of modernization in organized protest convergence of indigenous peoples and communities of the south, in the agenda of social, territorial and cultural self-determination; in addition to the necessary anti-hegemonic epistemological reformulation (De Sousa Santos, 2023). This condition opens a broad debate on the scope of autonomy as an alternative project of transcendence, beyond the scope of community localities, in the regional and national scenario of urban and metropolitan predominance.

METHODOLOGY

The development of the work is based on a mixed approach of quantitative and qualitative order, by the collection of information through the review and comparison of population statistics from the last censuses, which allows the identification of the average annual growth rates at the local, regional and national scale; along with the territorial contrast, the deployment of population centers and the type of rural, urban or metropolitan profile, with the ranges of the number of inhabitants and the average density. And, qualitatively, by the review and documentary analysis of urbanization and territorial policies and agrarian, urban and regional development.

The study population that is considered representative of the region, in number of localities and municipalities with a rural and ethnic profile, which allows the identification of the singularities of the dynamics of urbanization in the dispersed localities and around the radius of influence of the main infrastructural undertakings of articulation with urban centers of greater regional hierarchy, through the availability of and access to basic public goods and services, to weigh the levels of social welfare against the ranges established by development measurement agencies in Mexico.

RESULTS AND DISCUSSION

The singularities that define urbanization in conjunction with the local and regional development of southeastern Mexico are manifested in the condition of the population and deployment in the structure of human settlements in the process of social and territorial formation, with the vicissitudes in the definition of a joint project, between the conflicting interests of the various social actors and the State. And, that in this approach to a distinctive regional urbanization implies elucidating some social and spatial aspects of special relevance, between the dispersed localities and the agglomerations of metropolitan scale in a disjointed rural urban system, which has implied interventions of regional development policies in the use of strategic natural resources with ambivalent results. A basic aspect for implementing development programs in the region is regionalization, which presents differences in delimitation. The current regional development program for the southeast refers to five entities: Campeche, Chiapas, Tabasco, Quintana Roo, and Yucatán, where the most important undertakings of the current territorial policy are deployed (Sedatu, 2022), among which two are noteworthy: The Mayan Train as an articulator of various complementary programs; and the project of the Interoceanic Corridor of the Isthmus of Tehuantepec, which are carried out in the southern part of the entities of Oaxaca and Veracruz, which are not included in the previous regional delimitation, despite their insertion

in the infrastructural framework as a system of the southeast that implies other criteria when regionalizing.

The importance of this region stands out for its natural, social, cultural and heritage diversity. It is made up of the entities already mentioned, but for the purposes of this work, the part of the aforementioned entities of Oaxaca and Veracruz is included, due to their integration into the dynamics of regional development, which were contemplated in previous programs (Sedatu, 2014). This region is one of the five most important nature reserves in the world for its richness and biological diversity. As well as the cultural relevance and ethnic population, the largest in the country; and of heritage wealth, due to the significant archaeological sites and zones of the civilizational legacy of the Maya and Olmec peoples (INAH, 2020). The relevance of Mexico's natural and cultural wealth is considered among the main in the world, both for the significant biosphere reserve located in the southeast, and for cultural and linguistic diversity. However, the part that draws attention is the contradictory condition of the region, due to the dialectic between the population with the lowest indices of social well-being and the wealth of natural, cultural and heritage resources.

The population that lives in this region represents 10% of the national total, with the highest concentration of indigenous population in the country, estimated at 3.6 million, and of this, 80% still retain the original linguistic diversity (INPI, 2017), but at risk of disappearing. It should be noted that in the interior of the region, in the State of Chiapas, a third of its population speaks an indigenous language, 28%; the same as in Oaxaca. However, despite its importance in ethnic diversity, more than 65% are in conditions of poverty (Coneval, 2022). This region has a population of more than 13 million inhabitants², and of this, 56% are in a situation of poverty, above the national average, estimated at 44%; and 27% of the localities lack public services and basic collective equipment (Coneval, 2018). In addition, with a disjointed rural and urban structure, made up of multiple localities, 271 municipalities and seven metropolitan areas, which give it the typology of dispersed location, where 92% of localities are rural and with 53% of its land socially owned in the ejido and communal mode. For this reason, the urban rural structure is one of disparities, dispersion/concentration and accentuated intraregional variations due to the profound differences between entities, as is the case of Chiapas, with rural population rates of 53%, compared to Yucatán and Quintana Roo, with low average rates of 18% (INEGI, 2020),

² Population referred to the five entities in the established regionalization, which does not include Oaxaca and Veracruz.

which contrast with the national average urban population index. 76%. A situation that in a national perspective reflects regional inequality.

Population by entity of the Southeast Region in 2020

Entity	Population in 2010	Population in 2020	Rural population (%)	Urban population (%)	Densities (h/km ²) (%)	Indigenous population. (%)
Campeche	822,441	928,363	27.5	72.50	16.03	5.68
Chiapas	4,796,580	5,683,657	52.53	31.57	44.07	47.17
Oaxaca	3,801,962	4,132,148	40.27	48.72	64.30	39.10
Quintana Roo	1,325,578	1,857,985	20.27	79.63	41.56	12.62
Tabasco	2,238,603	2,402,598	24.39	76.23	97.12	3.77
Veracruz	7,643,194	8,062,579	22.0	78.02	112.3	12.4
Yucatan	1,955,577	2,320,898	14.3	85.7	58.59	30.77

Source: Authors' elaboration with data from INEGI, 2010; 2020

What the attached population table shows are the accentuated contrasts in the rural and urban profile of the various entities in the region. Highlighting that the entities of Chiapas and Oaxaca maintain a profile of lower urbanization index, below the national average; and in the other entities, urban and metropolitan growth indicators are presented, considering that in the urban-rural system there are not yet significant changes in medium-sized cities, as would be expected in a dynamic of rural-to-urban transition. At the same time, the presence of the indigenous population continues to be significant, especially in states with a large rural population and lower rates of urbanization, and maintaining the highest ethnic profile at the national level.

These changes undoubtedly correspond to two important moments that have given a turn and impetus to the process of urbanization and acceleration in the southeast region in the modernization project. The first, with the reform of the Agrarian Law of 1992 (DOF, 1992), and the changes in the policy of land use from social to mercantile, with the reforms to Article 27 of the Constitution, together with the changes to Article 115, of the Constitution, of attributions to the municipalities to determine the use of the land of their jurisdiction and of rural and urban development policies. Initiatives to modify the regime of ownership of ejido and communal land to private to attract investments, particularly towards strategic sectors, with the promotion of the real estate, mining, oil and tourism services markets. In addition, what would be considered as a second moment and continuation of the previous one and with clear connotations of displacement and concentration of population in certain areas, with the promotion of the Sustainable Rural Cities project (Development Plan, 2010), with the purpose of addressing the dispersion of small rural localities in marginalization, through the concentration of the population in strategic places with public services,

housing, generation of employment, productive capacities and rational use of resources. Program limited to 5 cities and 32 rural villages, with limited results, due to the opposition of the communities to displacement. And, above all, with the action of the State in the creation of institutional normative conditions towards deregulation and competitiveness, within the framework of the framework of the political superstructure of territorial planning and ordering, with the Law of expropriation for reasons of public utility for the deployment of projects and public works, and the Program for the Certification of Urban Properties and Plots (Procede, 1992).

The Procede is an incisive instrument of social land dispossession to certify and regularize land tenure and the definition of property rights of the ejidos and agrarian communities of millions of peasants, who were allegedly in the irregularity of land tenure, and to provide them with property titles. A situation that calls into question the arduous and complicated process of agrarian distribution of previous governments. That is, the high percentage of the national land distributed under the principles of social use, 52% of the 196 million hectares that make up the national territory (De ita, 2019). The rejection of this program has acquired the greatest resistance in the southeastern region. Resistance in Oaxaca, Chiapas and Campeche, to a greater extent based on the valuation of social property in almost a third of the agrarian nuclei that have opposed participating in the program; except in the State of Quintana Roo, due to the high profitability of the land and the demand for developers of tourism and real estate services (De Ita, 2019).

In this context of changes in the social uses of natural resources to commodification, the vicissitudes of the process of dispossession of common goods are configured by underpinning the dynamism of urbanization towards larger-scale urban concentrations with metropolitan areas, in the unique formation that combines the dichotomy of spatial dispersion/agglomeration and productive activities of the population in the different subregions. between rural, urban and metropolitan localities, in the process of transformation. Specifically, with the intra-regional productive changes that reorganize the subregions into more profitable activities. In rural subsistence farming localities, agribusiness and monoculture are making their way, which increases production to meet the demand of new markets; In turn, the hydrocarbon reserve areas encourage the growth of the oil industry, and with the diversity of nature and culture, tourist services and the cultural industry are encouraged. Strategic sectors for the redefinition of the singularities of regional urbanization in its differentiated forms in the profiles of the largest urban agglomerations in relation to the numerous dispersed rural localities in transformation and with unequal relations and typologies, where formations of the type of rururbanizations in

agro-industrial areas could be conceived with the grouping of localities in their radius of influence; also, in an oil urbanization in correspondence with the dynamics of urban hydrocarbon centers; and, in regional urbanizations dedicated to the provision of tourist and cultural services. Trends in the concentration of the population of localities with rural population centers, but in a differentiated way, especially the indigenous peoples of the States of Chiapas and Yucatán, with a strong ethnic presence. Characteristics that together reconfigure the typology of urbanization. In addition to political intervention with regional planning based on the dichotomy of the rural urban system.

A typology of urbanization that acquires special significance with the State of Chiapas, due to the contrast and articulation of rural localities and metropolitan concentration. Entity characterized by the highest rate of rural population and the lowest degree of urbanization in the southeast region; in addition, with the highest indicators of precariousness and poverty in the country and with the largest national indigenous population (Coneval, 2022). It is made up of 124 municipalities in 20,951 rural and 206 urban localities and one metropolitan area, the state capital, Tuxtla Gutiérrez, although the city of Tapachula is considered to be in the process of metropolization, due to its proximity to another municipality, but, above all, due to its border location with a strong flow of immigrants. Tuxtla Gutiérrez has a population of 848,274 inhabitants, 15.5% of the total state population, and a low density of 82.8 inhabitants per hectare (Sedatu, 2023); and is made up of five conurbated municipalities. Characteristics that inscribe it in the typology of extended urbanization.

In addition, in the process of transformation and accelerated urbanization of the region as a whole, important projects and public works are carried out with infrastructure undertakings with a strong regional impact, within the framework of the current territorial policy, with the Planning Strategy, ENOT (Sedatu, 2022), and the Planning Program of the Southeast Region (Sedatu, 2023). Underlying these programs is the focus of addressing regional social and territorial backwardness with infrastructural undertakings and the restructuring of population centers that have an impact on urban-rural disarticulation. The first, through the corridor projects of the Isthmus of Tehuantepec, and the Mayan Train; and, the second, with the promotion of urban-rural systems. Both with the task of articulating dispersed localities and municipalities throughout the regional southeast (Sedatu, 2022).

The first undertaking is carried out in the relevant subregion of the Isthmus of Tehuantepec that covers the south of the entities of Oaxaca and Veracruz, where the oil ports of Coatzacoalcos and Salina Cruz stand out, characterized by unique geostrategic conditions of alternative interoceanic link to the Panama Canal; and, for its oil and mining

resources. It was preceded by important projects of regional and international scope, such as Plan Mesoamerica and Plan Puebla Panama, but which were not carried out. A sub-region with a population and territory of urban and rural contrasts, of agglomerated and dispersed population centers, where 834,000 people of social and ethnic diversity live, with a significant number of indigenous people, of whom 341,000 speak an indigenous language. A social condition that demands the necessary participation in the definition of the Isthmus of Tehuantepec Corridor project and that has given rise to environmental conflicts in the orientation of development for the improvement of the living conditions of peoples and communities; as well as the preservation of cultural heritage and the environment and natural resources. However, they have had little impact on their formulation based on the right conferred on them to decide the use of their natural and territorial resources.

Main Municipalities and Development Poles of the Trans-Isthmian Corridor of Tehuantepec

State	Municipality	Number of inhabitants (2015)	Number of inhabitants (2020)	Area in km2
Oaxaca	Matías Romero	39 820	39, 820	1,355.9
	Juchitán	98 043	98,043	911.6
	Tehuantepec	64 639	64,639	1,198.6
	Salina Cruz	89 211	89,211	131.9
Veracruz	Coatzacoalcos	319 187	319,187	311.9
	Minatitlán	157 393	157,393	2,117.6
	Cosoloacaque	129 527	129527	276.8
	Acayucán	87 267	87,267	655.9

Source: Authors' elaboration with INEGI census data, 2015 and 2020

The strategic importance of this corridor of the Isthmus of Tehuantepec consists of linking important cities and ports in the southeast with oil potential and reactivating the refinery system of this subregion, with the construction of the Olmeca refinery and the refurbishment of the others, together with the articulation of dispersed rural localities and municipalities. In addition, to deploy along the corridor a set of industrial poles, located in the listed municipalities. And, in the overall perspective, the emphasis of industrialization as a system stands out with the others of a rural nature with agro-industries and the budding tourist poles, Huatulco and Puerto Escondido, which together define the axes of development, underpinned by the communications and transport infrastructure that the region lacks and that is interpreted in the vision of the program as indispensable. With this, the industrialization policy that in the past was limited and resulted in a maquiladora productive plant of precarious low-paid jobs, and the acceleration of urbanization with the proliferation of informal settlements, without basic public services, is resumed. This is the case of the city of Villahermosa, capital of the State of Tabasco, whose accelerated

metropolitan urban growth has been determined by the oil industry with drastic social and environmental consequences. Expansion and conurbation with neighboring rural localities, on ejido and communal social land, and even ecological reserve, with the proliferation of precarious settlements in a polarized population agglomeration and the increase in the price of basic goods and services. A scenario that puts into perspective the challenges for the oil cities of the trans-isthmus corridor, but, above all, for rural localities that cede part of their territory and common goods for their realization, through various mechanisms to resolve controversies of the social condition of ejido to urban land, and in specific cases for the deployment of infrastructure works, the Real Estate Trust has been created. Fibras,³ so that communities participate as partners in the valuation of land for real estate development scenarios.

This situation has given rise to environmental conflicts, in the context of dispossession and resistance, due to the prevailing conditions in rural localities and the 79 municipalities in the sphere of influence of this interoceanic corridor and which constitute the main challenges of facing the demands of the population for food, housing, basic public services of water and drainage networks, education, health and infrastructure. An average of 45.5% of the population is in conditions of poverty and extreme poverty (Coneval, 2022). A context that puts into perspective the redefinition of the strategic focus of the enterprises in the discussion of the development project.

In relation to the second undertaking of the Mayan Train, with unique characteristics in antecedents and the prevailing conditions of regional social backwardness, the orientation of development through modernization with the promotion of urbanization for integration into all the regions of the country, through the promotion of projects and public works, precedents of the current undertakings, stands out. as reflected in the implementation of the Mayan Train, designed on abandoned railway lines and resumed at the scale of the new regionalization of the southeast and in coverage and articulation as an infrastructural system of mobility and transport of passengers and products of strategic sectors; and in tune with its concept of development, based on the needs and expectations of dispersed localities and urban agglomerations of various scales. In a route of 1555 kilometers, the five entities of the southeast are linked: Campeche, Chiapas, Tabasco, Yucatán and Quintana Roo; with a coverage of 42 municipalities and 181 localities adjacent to the corridor and distributed in subregions of the jungle, Caribbean and Gulf of Mexico

³ In the case of the infrastructure works of the Mayan Train, this Trust has been implemented as resources to face conflict scenarios with the ejidatarios and the communities of the surrounding towns for the right of way required by the deployment of the works (Fonatur, 2022).

type; serving as a link between the network of cities and population centers in oil, agro-industrial, and tourist areas, and the various ports and airports (Fonatur, 2020).

A distinctive feature in the layout of this regional railway corridor is the link between the main nodes and urban centers that drive urbanization, especially in the influence with adjacent population centers, as nodes of regional development. According to the strategy of Sedatu's Southeast Regional Development Program, it is structured as an urban rural system (SUR) (ENOT, 2022) in three areas that combine the articulation of localities, municipalities, and cities, through the communications and transportation infrastructure network, where the entrepreneurship system is inscribed. Based on the axes and nodes of the highest hierarchy constituted as poles of regional development of the different areas of the oil and tourism industry, following the developmentalist approach of strategic poles that have the conditions to attract investments to form diverse productive nuclei along the corridor, where urban agglomerations stand out, as indicated by the 34 stations and stops (see attached map).

This strategy shows the promotion of urbanization through the centralization of investments in places of greater hierarchy of influence in dispersed localities. However, in carrying out this undertaking, the social and natural resources of the localities in precarious conditions are used, with high rates, of 29.3%, of the population in poverty. However, it is important to specify that there are marked differences within the region in living standards between rural localities and urban centers, but, on the whole, they are on average above the national level (Coneval, 2022). This scenario puts into perspective the scope and limitations of this strategy, despite the fact that public works are carried out to mitigate the shortcomings of the localities within the framework of the Urban Improvement Program (Sedatu, 2022), persisting in sectoral interventions in the evident shortcomings: housing, public services, collective facilities, etc.

In summary, through these infrastructural undertakings, the general conditions for transformation are created by promoting modernization/urbanization in the concentration of investments of influence and use of the territory of rural localities in a changing scenario. But, in the face of dispossession, resistance and alternatives arise from the opportunities that arise for the use of local benefit, counteracting the deficiencies in infrastructure required of the localities, through the potential for the community organization of towns and municipalities, both internally and externally, with networks of mutual support in a system of municipalities that share needs and expectations of common goods.

The Infrastructural Corridor of the Mayan Train



Fuente: Fonatur, 2022

CONCLUSIONS

As a result of the approach to the study of urbanization and regional local development in southeastern Mexico, some aspects of special relevance for the reflection and analysis of the field of knowledge stand out in the interpretation of the transformation of the structure of dispersed and agglomerated human settlements, in the context of modernization of a developmental nature and not without contradictions. Modernization process deployed through urbanization in rural, urban and metropolitan transformation with differentiated social and environmental implications in the structure of regional human settlements, and to a greater extent in indigenous community localities. Developmentalism deployed for the profitable use of strategic natural and cultural resources, but, at the same time, resistance for the preservation of resources as the heritage of the localities in the dialectic that defines the singularities of urbanization and the scenarios of development of this region.

A first aspect of special importance is the reconceptualization of social and territorial transformation due to the conditions of rapid urbanization in the structure of rural localities dispersed in relation to the national metropolitan urban context, based on the internal conditions with the structure of community population centers and indigenous municipalities, as opposed to larger-scale urban conglomerates, hierarchy and dynamism. Contrasts that are deepened with territorial diversity and social, natural and cultural resources, and the processes of valorization in the dialectic of social or commercial use that imprint the trends of urbanization as a regional distinctive condition, as an ethnoregion of urbanization extended from and/or rurality or rururbanization; and manifest in places that have both strategic resources and the general conditions for profitability: oil cities, agro-industries, cultural and tourist industries. Therefore, the primary aspect is to question the prevailing urbancentrism that guides the practices of regionalization and the development project through urbanization/modernization of contradictory accentuation.

At the same time, the discussion is broadened with the questioning of the deep-rooted developmentalist vision of promoting urbanization through public works with infrastructural undertakings for regional development, in the context of the modernizing project of transforming the territory under criteria of use and profitability in an urbanization posture outside the conditions of the profile of strong presence of rurality due to the opposing dynamics of the set of dispersed localities that call into question the orientation of development. At the same time, urbanization is instrumentalized for regional transformation in the dialectic of the dispossession of resources, the common good and resistance from subalternity. In this process of accumulation by dispossession undertaken in a systematic way through a territorial policy of reconfiguring the superstructure of the legislative framework with reforms for the transformation of the social use of resources to commodification; and it is precisely towards the indigenous community localities and municipalities that the enterprises have been oriented and where the resistance to the advance of dispossession is manifested. A situation that puts into perspective the discussion of the action of the State among the hegemony through the policies that conceal with the consensus of the necessary public works of the population.

Also in this region, the internal singularities of the subregions stand out, where the diverse conditions of potentialities and limitations converge between dispersed rural localities in the process of expanded urbanization in the form of Rururbanization, clearly manifested in the State of Chiapas, the most rural in the southeast region in precarious conditions; different from that expressed in the oil areas of urbanization determined by the hydrocarbon industry; and finally, the extended urbanization of regional scope within the

framework of culture and tourism, with the system of archaeological sites and zones and coastal tourism around Cancun, in Quintana Roo, with accelerated urbanization and advance on common goods. A region that in its localities and municipalities presents to a greater extent the resistance to the dispossession of goods of common and social use in the onslaught of modernization and deepening of the developmental model and from which arises the necessary reformulation of its own development from subalternity.

An alternative development project based on subordination to the prevailing model of the commercial use of social and territorial resources, prioritizing local social needs by rethinking the ventures that emerged from collective consensus. In this sense, the conditions of the southeast and its development alternatives open possibilities to redefine a different regionalism, however, advancing to a process of change in the overcoming of the rooted developmentalist model implies facing serious challenges, and one of them is the ideological one of the modernist project underlying the various moments of the impulse to infrastructure works for regional development. but reproducing social inequality. However, the current conditions open the possibility of advancing changes that require social mobilization and organization in the design and implementation of projects and works for their own development.

It is especially important in the redefinition of the development project to reflect on the sense of modernization with urbanization present in the planning process in Mexico and that is expressed in the background of the projects and works of the southeast, in the perspective that has prevailed of profitability, of the maximum use of the potential of its strategic resources and of limited redistribution of benefits. This task is reflected in the low rates of the region, the one with the greatest backwardness in the country's social welfare indicators, a situation that implies taking into account the particularities of regional urbanization with the profile of urban and rural population centers, native peoples, communities and ethnic groups, with their ways of life and social organization. putting into discussion that modernization divided between social conditions with conflicting and different interests, and that is expressed in the background with the controversy around the infrastructure works in progress.

A central aspect of urbanization is the deployment of public works based on the principles of the social need of the localities and the instrumental sense of sectoral undertakings, which is their questioning of the possibilities of strengthening the regional and diverse productive plant with the oil industry and tourism, and that in addition to the deployment of the works of the infrastructural system articulated by the corridors of the Isthmus of Tehuantepec and the Mayan Train, they have been expanded to the scope of



enhancing the regional natural and cultural wealth with multiple findings of the rediscovery of the Mayan and Olmec civilization in the implementation of the important program of rescue of archaeological zones and promotion of the strategic tourism sector, but rethinking an alternative social and environmental approach that generates employment and reformulates the organic relationship of rural/urban society with nature.

Bear in mind the challenge of deepening progress by taking advantage of the opportunities offered by infrastructure projects in their social value and assume the works as the heritage of population centers to advance their promotion through the integration of a network of municipalities, which allows sharing resources in the perspective of strengthening the network of human settlements to face adversities and deepening the achievements in a prospective vision. In this perspective, rethink the notion of municipal autonomy, going beyond isolation and building a project extended to the whole region of a diversity of social actors, around the social identity values that strengthen the social fabrics.


REFERENCES

1. Brenner, N., & Schmid, C. (2015). Toward a new epistemology of urban? **City*, 19*(2-3), 151–182. Routledge.
2. Bookchin, M. (2012). **Rehacer la sociedad: senderos hacia un futuro verde**. Santiago de Chile: LOM Ediciones.
3. Coneval. (2022). **Informe de evaluación de la política de desarrollo social 2022**. <https://www.coneval.org.mx>
4. De Ita, A. (2019). Las reformas agrarias neoliberales en México. **Revista El Cotidiano*, 214*, 95–106.
5. De Sousa Santos, B. (2023). **Una epistemología del sur**. México: Siglo XXI editores.
6. Diario Oficial de la Federación (DOF). (1992). Decreto de Reforma de la Ley del Artículo 27 Constitucional de los Estados Unidos Mexicanos. DOF, enero de 1992. México.
7. Fonatur, Fondo Nacional de Fomento al Turismo. (2022). **Proyecto Regional Tren Maya**. México. <https://www.gob.mx/fonatur>
8. Frampton, K. (1988). Hacia un regionalismo crítico: Seis puntos para una arquitectura de resistencia. In H. Foster et al. (Eds.), **La posmodernidad**. México: Editorial Kairós y Colofón S.A.
9. García-Bellido, J. (2000). Ildefonso Cerdá y el nacimiento de la urbanística: La primera propuesta disciplinar de su estructura profunda. **Scripa Nova*, 4*, 55–78.
10. Instituto Nacional de Estadística y Geografía (INEGI). (2020). **Resultados del censo de población y vivienda 2020**. <https://www.gob.mx/inegi>
11. Harvey, D. (2007). **Espacios del capital: Hacia una geografía crítica**. Madrid: Editorial Akal.
12. Instituto Nacional de Antropología e Historia (INAH). (2023). **Programa de Mejoramiento de Zonas Arqueológicas (Promeza)**. México.
13. Instituto Nacional de los Pueblos Indígenas (INPI). (2017). **Indicadores de la población indígena de México**. <https://www.inpi.gob.mx/documentos>
14. Lefebvre, H. (2016). **La producción del espacio**. Madrid: Editorial Capitán Swing.
15. Modonessi, M. (2010). **Subalternidad, contradicción y autonomía: Marxismo y subjetivación política**. Buenos Aires: Prometeo Libros, CLACSO, UBA Sociales Publicaciones.
16. Plan de Desarrollo. (2010). **Programa Institucional del Instituto de Población y Ciudades Rurales 2009-2012**. Periódico Oficial, 246, 14 de julio de 2010.
17. Programa de Certificación de Derechos Ejidales y Titulación de Solares Urbanos (Procede). (1992). México.



18. Registro Agrario Nacional (RAN). (2001). *Historial Agrario*. México. <https://www.ran.gob.mx>
19. Registro Agrario Nacional (RAN). (2014). *Indicadores Básicos de la Propiedad Social*. <https://www.ran.gob.mx>
20. Thomas, P. (2018). Refiguring the subaltern. *Political Theory, 46*, 861–884.
21. Secretaría de Desarrollo Agrario, Territorial y Urbano (Sedatu). (2023). *Programa de Ordenamiento Territorial de la Región Sur-Sureste*. México.
22. Sedatu, Secretaría de Desarrollo Agrario, Territorial y Urbano. (2023). *Metrópolis de México 2020*. <https://www.gob.mx/metropolis>
23. Sedatu, Secretaría de Desarrollo Agrario, Territorial y Urbano. (2022). *Estrategia Nacional de Ordenamiento Territorial ENOT*. <https://www.gob.mx>
24. Sedatu, Secretaría de Desarrollo Agrario, Territorial y Urbano. (2014). *Programa de Desarrollo de la Región Sur-Sureste*. México.
25. Sevilla-Buitrago, A. (2023). *Contra lo común: Una historia radical del urbanismo*. Madrid: Alianza Editorial.

APPLICATION FOR WATER QUALITY ANALYSIS FOR TILAPIA FISH FARMING IN CAGES

 <https://doi.org/10.56238/sevened2024.029-024>

Vinicius Mastelini¹ and Mario Mollo Neto²

ABSTRACT

With the ability to ensure food and a source of income for the planet, fish farming and fishing, which are already widely practiced activities around the world, continue to grow all over the globe. The quality of the water for this type of activity is essential. The control of chemical and physical factors of the water can guarantee the success or not of the breeding. There are many ways to analyze water quality, however, not all of them are simple or easy to manage. The growing use of mobile devices has been seeking to facilitate this task, collaborating more and more with these and other activities. In order to corroborate this evolution, the "Water Quality Monitor" application was modeled and developed, with the objective of providing, in a simple, easy and accessible way, relevant information on water quality scenarios for raising Nile tilapia fish, in cage rearing. The application development methodology was based on the Rational Unified Process, focused on objects within the programming and structured by UML diagrams. The final modeling proved to be able to support the construction of an application to meet the expected requirements for the evaluation of water quality, which during its use, allowed the control of chemical and physical factors of the water, ensuring the success of the creation, or indicating mitigating solutions for the necessary corrections to the process, being later validated in a case study.

Keywords: Decision support. Quality assurance. Improvement of production process. Control of breeding facilities. Improved competitiveness.

¹ Master's Degree in Agribusiness and Development
São Paulo State University "Júlio De Mesquita Filho" Faculties of Science and Engineering
E-mail: vinicius.mastelini@unesp.br
ORCID: <https://orcid.org/0000-0002-1009-4501>
LATTES: <http://lattes.cnpq.br/2123850305761267>

² Doctor in Agricultural Engineering, State University of Campinas
São Paulo State University (UNESP), Faculty of Sciences and Engineering, Tupã
Department of Biosystems Engineering
E-mail: mario.mollo@unesp.br
ORCID: <https://orcid.org/0000-0002-8341-4190>
LATTES: <http://lattes.cnpq.br/6037463340047597>

INTRODUCTION

Fish farming and fishing are strategic activities, which, according to the Food and Agriculture Organization of the United Nations (FAO, a UN agency), can ensure healthy food on the planet. With the capacity to provide quality food and income generation (FAO, 2024).

Tilapia is one of the most captive-bred freshwater species in the world, and is considered the most important, with emphasis on Nile tilapia, which is produced in more than 100 countries, with an annual commercial production of more than 1,300,000 tons (EMATER-DF, 2009; SENAR COLLECTION 208, 2018).

For success in raising any species of fish and in any system, it is essential to attend to physical and chemical factors of the water (quality). It is said that raising fish, first of all, is "creating water" (CODEVASF, 2019).

According to Almeida (2012), one of the many ways to describe water quality is by listing, individually, all the substances contained in a sample. Such a relationship can generate common parameters, such as covering varied parameters, making it difficult to understand. One of the ways is the analysis of water quality indices that can be automated through the construction of an expert system.

Expert systems are usually associated with artificial intelligence (AI). They are developed with rules that reproduce the knowledge of an expert (or specialist) and used to solve specific problems (NILSON, 1982).

For expert-type systems, the knowledge base is not just a simple collection of information (data with data). It is a basis of rules and facts, which correspond to the knowledge of specialists, with the mastery of the subject (NILSON, 1982).

According to Mendes (1997), because it is a system endowed with intelligence and knowledge, the benefits of expert systems are several:

- Extend decision-making facilities to many people;
- Improve the productivity and performance of its users;
- Reduction of the degree of dependence that organizations maintain when they find themselves in critical situations;
- Tools suitable for use in training groups of people.

There are many factors that contribute to mobile devices (*tablets, notebooks, smartphones, etc.*) being increasingly used. The reduction in the cost of these types of equipment due to the gain in scale and new technologies, making them popular and accessible to all social classes is just one of them. In addition, the need for mobility and connectivity necessary today are met by them (NETO, 2010).

Among the most important, the smartphone stands out, which has become so popular that it is no longer a luxury item to be characterized as a basic necessity of life for a large part of the population. In a survey conducted by the Brazilian Institute of Geography and Statistics (IBGE), it was found that 80.4% of the Brazilian families interviewed use smartphones as the main means of accessing the *internet*, surpassing the use of computers, *tablets*, etc. (FONSECA and ALENCAR, 2016).

The development of mobile applications has facilitated the daily lives of many people, providing portability and flexibility for a wide range of businesses: home automation, health and well-being, cloud information storage, knowledge display, etc. Such characteristics are accompanied by a growing evolution in the number of mobile application developments aimed at solving (or at least facilitating) everyday problems (PORTO, 2012).

The methodology applied for the construction of the expert system of this research was that of the *Rational Unified Process (RUP)* which, according to Emanoele (2020) and Kruchten (2000), consists of a process work structure with the objective of the product and thus based on the model of the *Unified Modeling Language (UML)*, when talking about object-oriented programming. The same author points out that UML composes a language to define a sequence of artifacts and assist in the execution of the tasks of the system to be developed, through different types of diagrams and that even though RUP is used for complex projects and with extensive teams, it allows activities and artifacts to be carried out according to the team's choice, can be adapted to make the process more agile.

Thus, considering the above approaches, the development presented in this research is the modeling, construction and testing in a case study, of a specialist application for mobile devices, capable of receiving data on the main environmental variables that reflect on the quality of water for Tilapia fish farming, which allows the control of chemical and physical factors of the water, thus being able to guarantee the success of the creation, or indicating mitigating solutions for the necessary corrections to the process.

METHODOLOGY

MODELING

This section shows how the expert application "*Water Quality Monitor*" was modeled and developed.

For the static and behavioral structuring of the application, the Unified Modeling Language (UML) diagrams were used, whose specification can be found in (UML, 2024), "Class Diagram", "Case and Use Diagram" and "Sequence Diagram". According to

Rumbaugh (2004), UML is a visual modeling language, used to specify, visualize, build and document systems.

SYSTEM ARCHITECTURE

Classes are digital representations of real-world objects, they have attributes, behaviors, and relationships. The sample of a water analysis and its parameters are an example of a class and were created from a UML class diagram, which represents all the attributes and methods necessary to carry out the system analyses (UML, 2024).

UML's "case and use diagram" and its descriptions complement the modeling. They represent the behavior of the system and the responsibilities of its component actors.

DATABASE

Classes are digital representations of real-world objects, they have attributes, behaviors, and relationships. The sample of a water analysis and its parameters are an example of a class and were created from a UML class diagram, which represents all the attributes and methods necessary to carry out the system analyses (UML, 2024).

For the "*Water Quality Monitor*" application, the database was created following the structure of the "Analysis" class described above, in the System's architecture and according to indications from Silberschatz, Korth and Sudarshan (2010).

SYSTEM PROCESSES

The processes necessary for the operation of the System were modeled using UML sequence diagrams (UML, 2024).

LANGUAGE AND DEVELOPMENT PLATFORM

For the application coding process, the installation of the development environment (IDE), *Android Studio*, version *Chipmunk // 2021.2.1* (official GOOGLE tool), as well as the configuration of the *Dart language* (DEVMEDIA, 2023), and the *Flutter framework* (IOPSCIENCE, 2020) were carried out.

The expert application was developed entirely in the *Dart programming language* in conjunction with the *Flutter framework* and some of its component packages and tools (dependencies):

- *SQFLite*: database present in the programming language itself, with compatibility with mobile devices);
- *INTL*: "slider" type components, selection bar for entering values;

- **CHARTS:** "graph" type components, for displaying information.

GRAPHICAL FEATURES AND INTERFACES

The system's functionalities for performing the analyses were inserted in a set of graphical *interfaces* for smartphone screens that allow users to perform analyses with the possibility of storing, editing or creating new analyses with changes in the parameters of the system's input variables. The system was also modeled in order to issue mitigating recommendations for a better performance of the breeder, given the scenario presented for analysis.

CASE STUDY

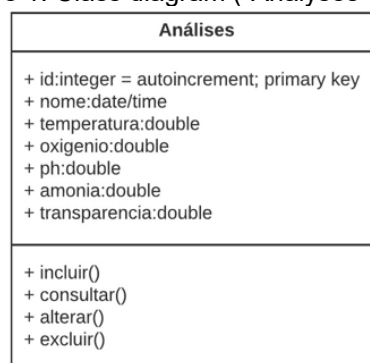
To carry out the tests in the specialist application "*Water Quality Monitor*", a new analysis was added and the values for the environment variables (temperature, dissolved oxygen, pH, ammonia, and transparency) were inserted, respecting the limit values raised in the systematic review of the literature, in Mastelini and Mollo Neto (2022), and which will receive the rules formulated in the MatLab tool of the algorithm developed and embedded in the construction of this application research.

RESULTS

SYSTEM MODELING

During the project, it was observed the need to create only one class to meet the functionalities of the specialist system "*Water Quality Monitor*", represented in FIGURE 1.

Figure 1: Class diagram ("Analyses" table).



Source: Constructed by the authors.

As shown in FIGURE 1, the "Analytics" table will contain all the necessary attributes of the expert application, namely:

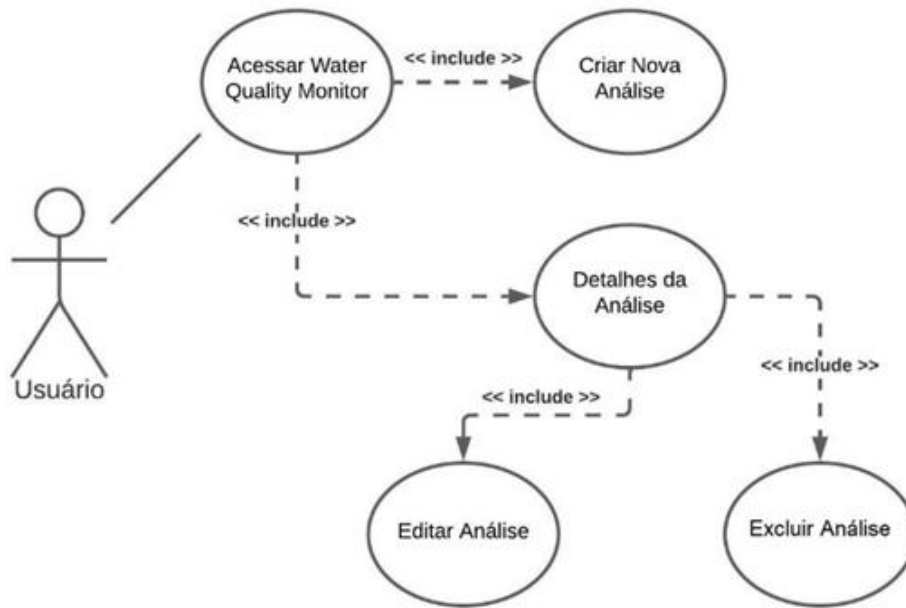
- ID: Attribute of the numeric type. Auto-incrementing and classified as the table's primary key (never repeats);
- Name: attribute of type date. Designed so that each analysis, in addition to its ID (which is hidden), has unique information visible, for user control, so each analysis will have the full date (dd/mm/yyyy) saved in its name plus the time 00:00;
- Temperature: Numeric type attribute. Field that will receive the value of the water temperature variable, which can be an integer or real value;
- Oxygen: numerical attribute. Field that will receive the value of the variable dissolved oxygen of the water, which can be an integer or real value;
- pH: Attribute of the numeric type. Field that will receive the value of the pH variable of the water, which can be an integer or real value;
- Ammonia: numeric type attribute. Field that will receive the value of the variable ammonia of the water, which can be an integer or real value;
- Transparency: Numeric attribute. Field that will receive the value of the water transparency variable, which can be an integer or actual value.

The "Analyses" table also contains, in itself, the methods:

- Include: it will be possible to add as many analyses as you wish;
- Consult: it will be possible to consult, at any time, analyses already carried out;
- Change: it will be possible to change the values of the environment variables;
- Delete: it will be possible to delete analyses that have already been recorded.

The "case and use diagram" in FIGURE 2 presents the procedures contained in the "Analysis" class modeled in FIGURE 1 and are the same ones available in the application as functionalities.

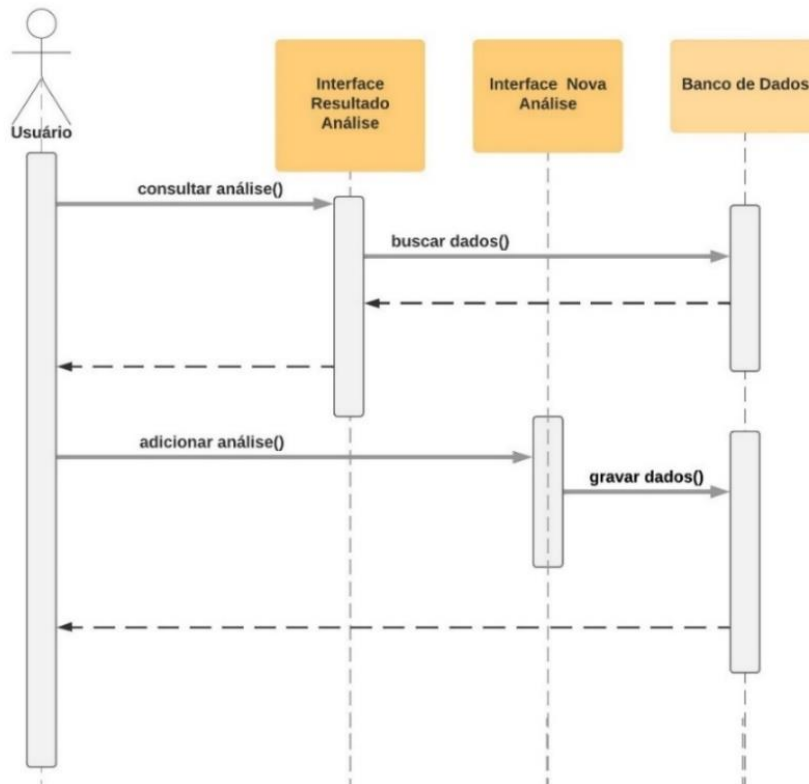
Figure 2: Case and use diagram – "Water Quality Monitor" application.



Source: Constructed by the authors.

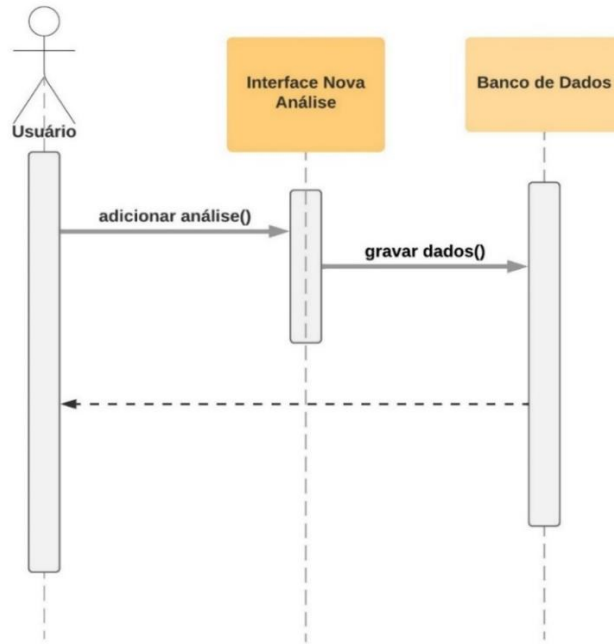
The "sequence diagrams" demonstrate the requests and responses that each interface of the application has, facilitating the understanding of the processes contained in it, as shown in FIGURES 3, 4 and 5.

Figure 3: Sequence diagram – repository interface.



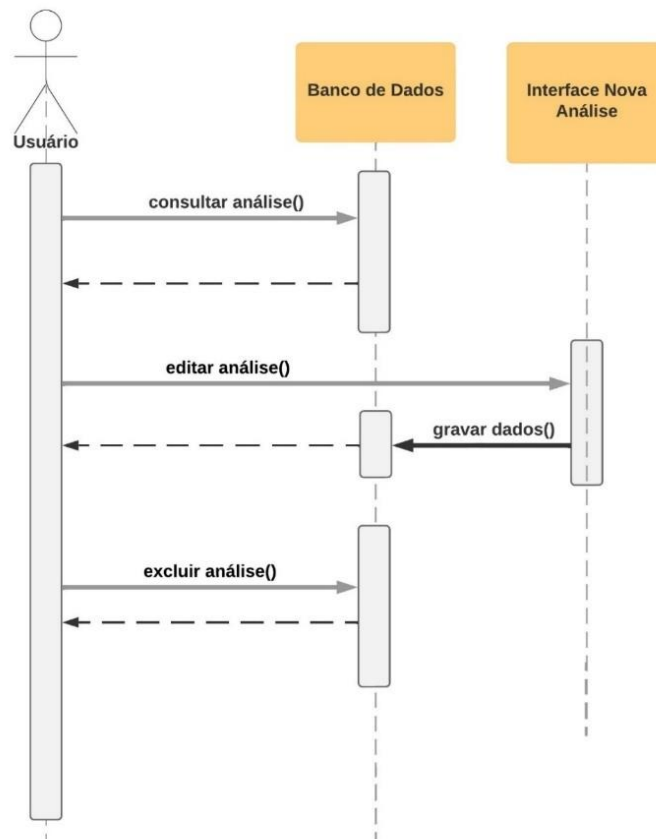
Source: Constructed by the authors.

Figure 4: Sequence diagram – new analysis interface.



Source: Constructed by the authors.

Figure 5: Sequence diagram – interface result analysis.



Source: Constructed by the authors.

FEATURES AND GRAPHICAL INTERFACES:

When running the specialist application "*Water Quality Monitor*", the user will access the initial interface of the application, containing the logo and name of the application, as shown in FIGURE 6. The *initial interface* is programmed with the "*splash*" functionality, which will automatically call the next *interface* (repository) after six seconds have passed.

Figura 6: *Interface* inicial "*Water Quality Monitor*".



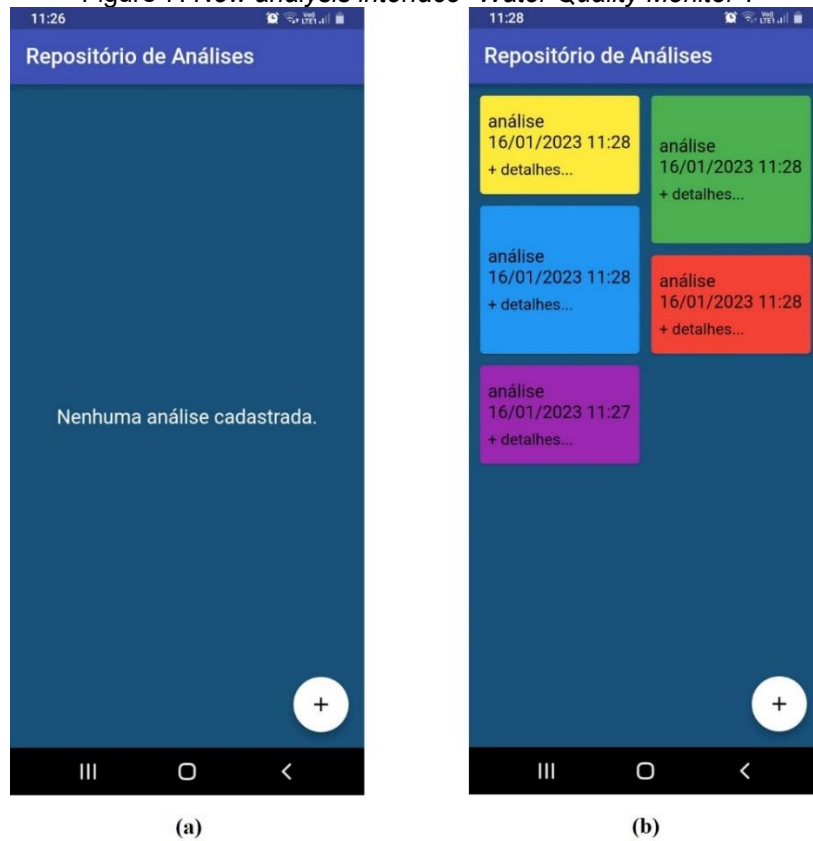
Source: Constructed by the authors.

The "*repository interface*" is the home of the expert application, which "calls" all the functions of the application. It is in this *interface* that it is possible to have access to analyses already performed and/or create a new analysis. Its functions are available in FIGURE 7.

The images in FIGURE 7 (a) show the *repository interface* without any registered analysis; and (b) show the *repository interface* with already registered analyses. In both it is possible to see the "+" button, for the action of adding a new analysis.

By clicking on the "+" option, the *new analysis interface* will be called. This *interface* requires the interaction of the user, who must enter the values of the ambient variables of the water (collected at that moment). The entry of values is performed by "*sliders*", which are slidable bars (prevent the entry of values different from those expected). Each variable has its "*slider*", which also has the information of minimum and maximum values at its ends.

Figure 7: New analysis interface "Water Quality Monitor".



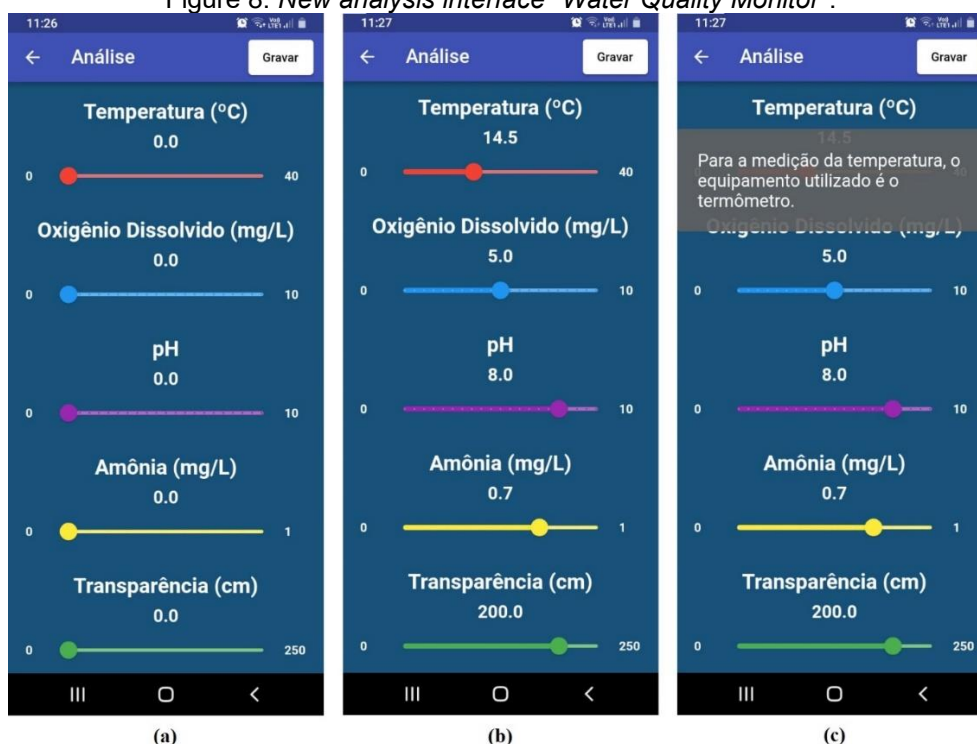
Source: Constructed by the authors.

The images in FIGURE 8 show the functionalities and options of the *new analysis interface* (a) shows the *interface* as soon as the user accesses it, in it, the values of the variables come by default, zero; (b) shows the *interface* that has already undergone user interaction, when clicking and sliding the "*sliders*" or bars, the values are highlighted in the field below the variable name; (c) shows another feature of this *interface*, when clicking (and holding) on the name of the variable, a dialog box is displayed, informing which measuring tool or instrument is used to collect data on that variable. In all images it is also possible to observe the "record" button.

By pressing this button, the application saves the data entered in the database, generating a new analysis that will be displayed in the *repository interface* (FIGURE 7). The user also has the option to return to the *repository interface* without launching a new analysis, just click on the icon with the "arrow" back.

Subsequent launch of a new analysis (or if it is necessary to consult the results of an analysis already launched), the user can access it through the *repository interface* (FIGURE 7), clicking on it, so the *analysis result interface* will be "called".

Figure 8: New analysis interface "Water Quality Monitor".



Source: Constructed by the authors.

The result analysis interface is where the data entered by the user, which are saved in the application's database, are confronted with the rules obtained in the algorithm developed in the work "*Control and management of water quality for Nile tilapia fish in net tanks based on fuzzy modeling*" by Mastelini *et al.* (2023), and presented to the user, also contains several functions and options. The summary of the rules built in MatLab for the algorithm can be seen in CHART 1, where it is possible to see the *analysis result interface* in FIGURE 9.

The application also provides the user with information about each variable, the *status* of each one and, in some cases, actions that can contribute to the control of that variable, along with graphs, which show the value of the variable (inserted in that analysis) and the values of its *status* (lethal, alert and ideal).

In image (b) it is possible to notice that the application has the interactive chart function, when clicking (and holding) on the desired column (in any column and chart), it will display information about that *status* (reference), so that the user is aware of these.

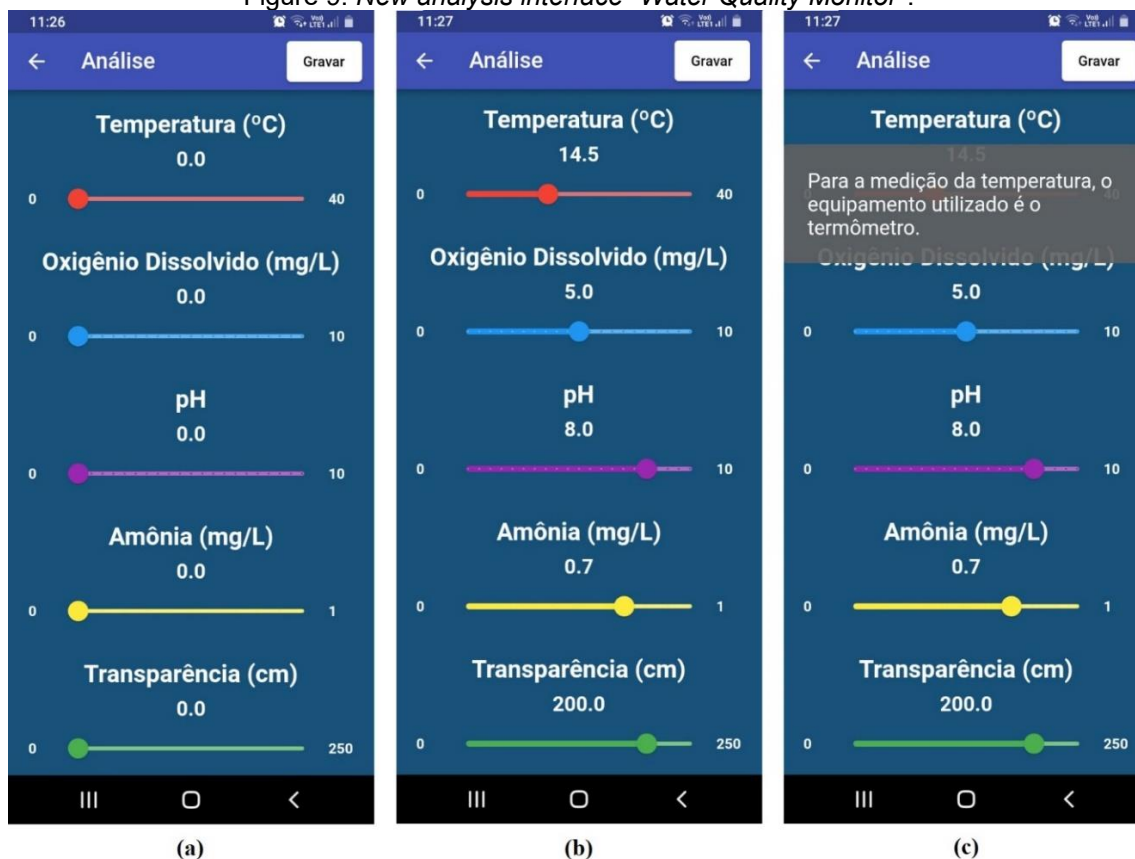
The analysis result interface also has the option to go back to the repository interface (FIGURE 7), "arrow" icon; edit analysis (new analysis interface, FIGURE 8), which will overwrite the data saved from that analysis in the database and the delete analysis option, which will permanently delete that analysis from the database.

Table 1: MatLab algorithm ruleset for water quality scenarios.

Rule	Scenario
If lethal temperature, or lethal oxygen, or lethal pH 1, or lethal ammonia.	Terrible Quality
If lethal temperature, or lethal oxygen, or lethal pH 1, or lethal ammonia.	Terrible Quality
If ideal temperature, and ideal oxygen, and ideal pH, and ideal ammonia and high transparency.	Optimal Quality
If ideal temperature, and ideal oxygen, and non-lethal pH 1, and non-lethal ammonia, and high, or medium, or low transparency.	Good quality
If ideal temperature, and ideal oxygen, and non-lethal pH 2, and non-lethal ammonia, and high, or medium, or low transparency.	Good quality
If alert temperature 1, and alert oxygen, and non-lethal pH 1, and non-lethal ammonia, and high, or medium, or low transparency.	Poor Quality
If alert temperature 1, and alert oxygen, and non-lethal pH 2, and non-lethal ammonia, and high, or medium, or low transparency.	Poor Quality
If alert temperature 2, and alert oxygen, and non-lethal pH 1, and non-lethal ammonia, and high, or medium, or low transparency.	Poor Quality
If alert temperature 2, and alert oxygen, and non-lethal pH 2, and non-lethal ammonia, and	Poor Quality

Source: Constructed by the authors.

Figure 9: New analysis interface "Water Quality Monitor".



Source: Constructed by the authors.

The images in FIGURE 10 (a), (b), (c), (d) and (e), show the user a summary of the quality of the water scenario of that analysis (chosen in the repository interface), bringing at

the beginning, the output variable (very bad; bad; good. excellent), variables resulting from the algorithm developed in the MatLab tool with Fuzzy logic, which directly reflect with the related values of the variables temperature, dissolved oxygen, pH, ammonia and transparency.

Figure 10: *Interface result analysis "Water Quality Monitor".*



Source: Constructed by the authors.

The application also provides the user with information about each variable, the *status* of each one and, in some cases, actions that can contribute to the control of that variable, along with graphs, which show the value of the variable (inserted in that analysis) and the values of its *status* (lethal, alert and ideal).

In image (b) it is possible to notice that the application has the interactive chart function, when clicking (and holding) on the desired column (in any column and chart), it will display information about that *status* (reference), so that the user is aware of these. The analysis result interface also has the option to go back to *the repository interface* (FIGURE 8), "arrow" icon; edit analysis (new analysis interface, FIGURE 9), which will overwrite the data saved from that analysis in the database and the delete analysis option, which will permanently delete that analysis from the database.

The *resulting* statuses of the water quality scenarios of the "*Water Quality Monitor*" application follow TABLE 2:

Table 2: *Status* of water quality scenarios.

Scenarios	
	Terrible Quality
	Poor Quality
	Good quality
	Optimal Quality

Source: Constructed by the authors.

MINIMUM SETTINGS

With the completion of the development of the specialist application, it was possible to test it for its optimization, using it on different devices (between *smartphones* and *tablets*), where it was possible to prove a satisfactory use in configurations already below those currently found in the market. With this, QUADRO 3 aims to provide the minimum recommended configurations of mobile devices for the correct functioning of the "*Water Quality Monitor*" application.

Table 3: Minimum settings.

Android OS Version:	9.0 (Pie)
RAM:	1GB
Storage:	16GB
Screen Size:	4.7

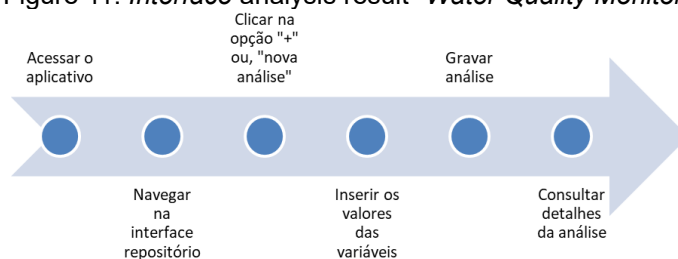
Source: Constructed by the authors.

CASE STUDY

To test and validate the operation of the application, a test scenario, taken from a real situation of a Tilapia farm in a net tank, was inserted into the system. The sequences of

processes and the values entered in this test follow the information in FIGURE 11 and TABLE 4.

Figure 11: *Interface analysis result "Water Quality Monitor".*



Source: Constructed by the authors.

Table 4: Variable values environment.

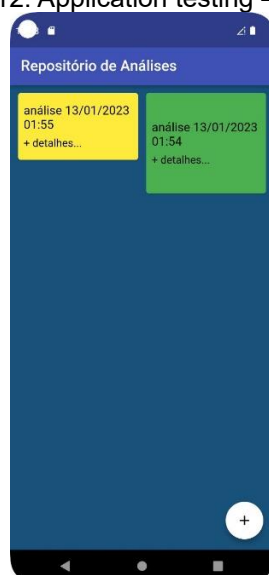
New Analysis	
Temperature	26
Dissolved Oxygen	5
ph	4.5
Ammonia	0.2
Transparency	158

Source: Constructed by the authors.

APP TESTING

The first step is to open the "Water Quality Monitor" application and wait for the repository interface to load (where all the analyses are located), then select the "+" option (new analysis), as shown in FIGURE 12.

Figure 12: Application testing – part 01.

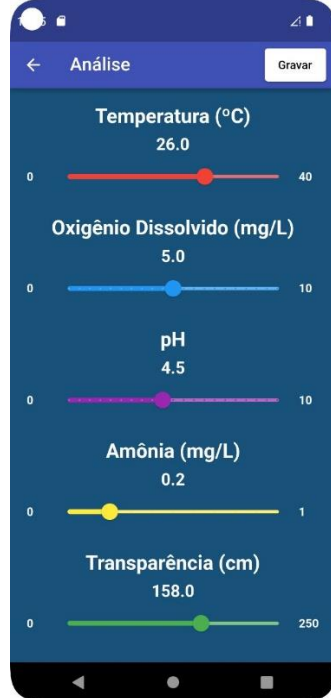


Source: Constructed by the authors.

When you activate the option in FIGURE 12, the "new analysis" interface will be displayed. In this step, the values classified in TABLE 2 will be inserted. At the end of the

data entry process, the "save" option must be activated, to save the analysis in the database and return (automatically to the *repository interface*), as shown in FIGURES 13 and 14.

Figure 13: Application testing – part 02.



Source: Constructed by the authors.

Figure 14: Application testing – part 03.

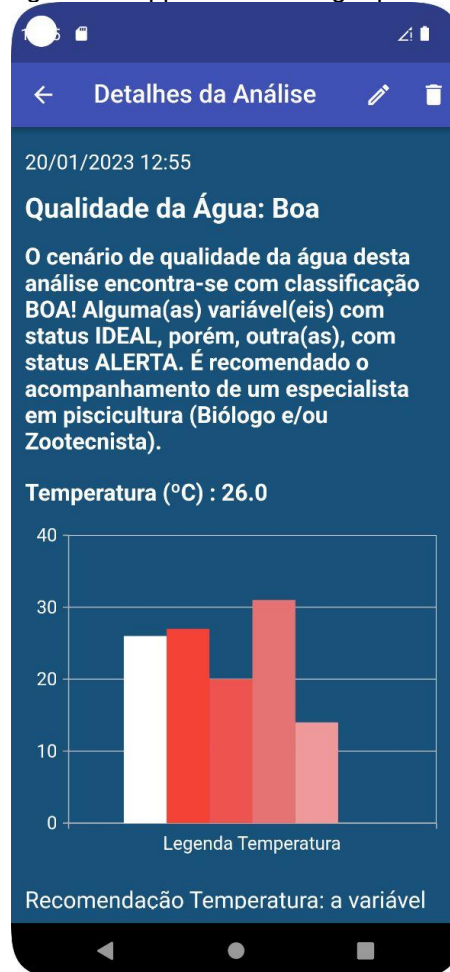


Source: Constructed by the authors.

If the previous process goes well, the newly inserted analysis will be displayed in the repository interface (the list is descending, that is, the last included analysis will be displayed first), as shown in FIGURE 14.

To consult the analysis (whether the last one entered or any other saved in the application's database), just click on the desired analysis and the application will call the analysis result interface, which will bring the information regarding the water quality scenario and its variables, shown in FIGURE 15.

Figure 15: Application testing – part 04.



Source: Constructed by the authors.

It is possible to see from FIGURE 15 that the result of the water quality scenario of the analysis created for the test was considered by the algorithm as Good.

The analysis *result interface* brings, in addition to the situation of the inserted scenario, relevant information from the context as a whole and also from the individual variables, such as the *status* that each variable is in (in that analysis), the possible *statuses* that each variable may have within the application (along with their reference values) and

how they can be treated, if necessary. To view, just "scroll" the screen, as shown in FIGURE 16.

Figure 16: Application testing – part 05.



Source: Constructed by the authors.

DISCUSSION

Easy to use, with friendly *interfaces* and good interaction, the specialist application proved to be a functional tool, delivering relevant and quality information to its users, as presented in the works of Neto (2010), Fonseca and Alencar (2016) and Porto (2012), on analysis of water quality scenarios for fish farming and individual details of each of the variables that the application considers, without the need for robust *hardware* and/or *internet* access, and with the possibility of mobility, as discussed in the works of Mendes (1997) and Nilson (1982).

Contributing to the identification and describing the characteristics of the variables that reflect on the water quality for the breeding of Nile tilapia, not only in terms of positive values, but also as an alert, the literature review also collaborated with information and details on the basic structure and differential between the methods of rearing in cages and excavated tanks (EMATER-DF, 2009; SENAR COLLECTION 208, 2018; CODEVASF, 2019; ALMEIDA, 2012).

It was possible to apply mathematical methods, such as Fuzzy logic and Mamdani's inference system in the MatLab tool, receiving the values of the input variables and applying rules to them, which finally delivered descriptive values of output variables, enabling the reading of the water quality scenario of that analysis. Thus creating, as a result, the algorithm that was embedded in the expert application developed by Mastelini and Mollo Neto (2022) and Mastelini *et al.* (2023).

Process improvements and the inclusion of new features are expected in future research to the specialist application, incorporating new possibilities for analysis through the improvement of modeling and analysis as provided by Emanoele (2020), UML (2024) and Rumbaugh (2004).

The registration process of the "*Water Quality Monitor*" application was also carried out:

Patent: Computer Program. Registration number: BR512023000989-0, registration date: 08/29/2022, title: "*WATER QUALITY MONITOR - FISH FARMING*", Registration institution: INPI - National Institute of Industrial Property.

CONCLUSION

The specialist application "*Water Quality Monitor*", modeled and developed in this research work, proved to be functional and capable of delivering what was proposed in its main objective, with fast and quality information about the water quality scenarios with their main environment variables. Thus confirming that the use of technologies such as *software*,



together with the knowledge of specialists, can corroborate an improvement in the analysis and planning processes, helping the creator, user of the solution, in decision making. In addition, it is easy to use, does not require powerful *hardware* and can be used in the field, as it is a mobile application and without the need for *an internet* connection.

ACKNOWLEDGMENTS

The authors would like to thank the Graduate Program in Agribusiness and Development (PGAD) at Unesp, Tupã/SP unit, for its support to the research.


REFERENCES

1. Almeida, R. A. S. (2012). *Índice de qualidade de uso da água subterrânea (e-IQUAS): uma metodologia de modelagem numérica flexível* (Tese de doutorado). Centro Int Energia e Ambiente (CIEnAm), Universidade Federal da Bahia, Salvador.
2. Emanoele, A. (2020). Descubra o que é RUP e veja como usar as 4 fases desse método na criação de softwares. Grupo Voitto. <https://www.voitto.com.br/blog/artigo/o-que-e-rup>
3. CODEVASF. (2019). *Manual de criação de peixes em tanques-rede*. Ministério do Desenvolvimento Regional (3ª ed.). Brasília, DF.
4. Serviço Nacional de Aprendizagem Rural (SENAR). (2018). *Coleção SENAR 208: Piscicultura: Criação de Tilápias em Tanques-Rede*. Brasília, DF.
5. DevMedia. (2023). Primeiros passos com a Google Dart. <https://www.devmedia.com.br/primeiros-passos-com-a-google-dart/32954>
6. EMATER-DF. (2009). *Criação de tilápias* (2ª ed.). Governo do Distrito Federal, Brasília.
7. FAO. (2024). Informe da FAO: A produção mundial de pesca e aquicultura atinge novo recorde histórico. FAO no Brasil. <https://www.fao.org/brasil/noticias/detail-events/pt/c/1696371/>
8. Fonseca, A. R., & Alencar, M. S. de M. (2016). O uso de aplicativos de saúde para dispositivos móveis como fontes de informação e educação em saúde. In *Anais do XIX Seminário Nacional de Bibliotecas Universitárias – SNBU*.
9. IOPscience. (2020). A Freights Status Management System based on Dart and Flutter programming language. <https://iopscience.iop.org/article/10.1088/1742-6596/1530/1/012020/pdf>
10. Kruchten, P. (2000). *The Rational Unified Process: An Introduction* (2ª ed.). Addison-Wesley.
11. Mastelini, V., & Mollo Neto, M. (2022). Indicadores de qualidade da água para criação de tilápias-do-Nilo em tanque-rede: uma revisão das práticas de análises de criação (2010–2021). *RECIMA21 - Revista Científica Multidisciplinar, 3*(12), e3122363. <https://doi.org/10.47820/recima21.v3i12.2363>
12. Mastelini, V., Ramos Queiroz, T., Almeida Gabriel Filho, L. R., & Mollo Neto, M. (2023). Control and management of water quality for Nile tilapia fish in net tanks based on fuzzy modeling. *Revista Brasileira de Engenharia de Biosistemas, 17*, 1197. <https://doi.org/10.18011/bioeng.2023.v17.1197>
13. Mendes, R. D. (1997). Inteligência artificial: Sistemas especialistas no gerenciamento da informação. *Ci. Inf., 26*(1), Brasília.
14. Neto, P. M. de C. (2010). Estudo do uso de dispositivos móveis pessoais em ambiente corporativo no âmbito da segurança da informação. Universidade do Sul de Santa Catarina, Santa Catarina.



15. Nilson, N. S. (1982). *Principles of artificial intelligence*. Springer Verlag.
16. Porto, F. (2020). Aplicativos mobile: definições, história e previsões. <http://tectriadebrasil.com.br/blog/mercado-de-midias-sociais-blog/aplicativosmobile-definicoes-historia-e-previsoes/>
17. Rumbaugh, J., Jacobson, J., & Booch, G. (2004). *The Unified Modeling Language reference manual* (2^a ed.). Addison-Wesley.
18. Silberschatz, A., Korth, H., & Sudarshan, S. (2010). *Database system concepts* (6^a ed.). McGraw-Hill Book Co.
19. Object Management Group (OMG). (2024). About the Unified Modeling Language Specification Version 2.5.1. Unified Modeling Language. <https://www.omg.org/spec/UML/>

EFFECTIVENESS OF BLENDED TEACHING OF PROBLEM-BASED LEARNING (PBL) AND ERROR-BASED LEARNING (ABE) IN GYNECOLOGY

 <https://doi.org/10.56238/sevened2024.029-025>

Ramón Miguel Vargas-Vera¹, Freddy Alberto Cabrera Patiño², Silvia Maribel Placencia-Ibadango³, Saul Alexander Alencastro Placencia⁴, Martha Verónica Placencia-Ibadango⁵, Adriana Leonor Sarango Bravo⁶,

¹ Dr.
Universidad Católica Santiago de Guayaquil
University of Guayaquil
Ecuador
E-mail: dr.ramonvargasvera@hotmail.com
ORCID: <https://orcid.org/0000-0002-1922-8983>

² MD
University of Guayaquil
Ecuador
E-mail: drfreddycabrera71@gmail.com
ORCID: <https://orcid.org/0009-0006-2622-3730>

³ Msc.
University of Guayaquil
Ecuador
E-mail: smpla5@hotmail.com
ORCID: <https://orcid.org/0000-0003-3164-1639>

⁴ MD
Universidad Católica Santiago de Guayaquil
Ecuador
E-mail: saulalexander20@hotmail.com
ORCID: <https://orcid.org/0000-0003-2930-6137>

⁵ Dr.
University of Guayaquil
Ecuador
E-mail: marthitaplacencia1975@hotmail.com
ORCID: <https://orcid.org/0000-0003-3967-6166>

⁶ MD
University of Guayaquil
Rural Doctor
Guayaquil Ecuador
E-mail: adriana.s.b.265@gmail.com
ORCID: <https://orcid.org/0009-0007-3780-7659>

ABSTRACT

The aim of this study was to determine whether combined PBL-ABE teaching was effective in gynecology students. Methodology A prospective and observational study was carried out with 200 gynecology students of the tenth semester and internships, who were randomly divided into two groups for the combined PBL-ABE system and the traditional group. Pre- and post-class surveys were conducted to assess their perceptions and experiences with the method. Results: In the pre-class questionnaire, the traditional system obtained significantly higher scores than the PBL-ABE group (75.34 vs. 70.43 and 35.43 vs. 23.34), $P = 6.39 \times 10^{-5}$). In the PBL-ABE group, basic knowledge and case analysis scores increased significantly, 72.23 vs. 68.51 and 31.23 vs. 30.24, respectively ($P = 0.612$). The ABP-ABE group improved much more than the traditional group; the ABP-ABE saw an increase from 70.43 to 72.23 compared to the traditional one from 75.43 to 68.51. On the other hand, in terms of time spent in class, the ABP-ABE system scored significantly lower than the traditional system ($P < 0.001$). Conclusion: PBL together with ABE can be an effective method to improve the performance and clinical skills of medical students and interns.

Keywords: Problem-based learning. Error-based learning. Traditional system. Lectures. Gynaecology. Practical clinical teaching. ABP. ABE.

⁷ Lcda.
Kinesiologist
Universidad Católica Santiago de Guayaquil
Ecuador
E-mail: jocy.alencastro@gmail.com
ORCID: <https://orcid.org/0009-0007-7759-0079>

⁸ MD
Universidad Católica Santiago de Guayaquil
Ecuador
E-mail: kalidvargas14@hotmail.com
ORCID: <https://orcid.org/0009-0008-3718-3329>

⁹ MD
Universidad Católica Santiago de Guayaquil - Ecuador
E-mail: drgefernandez@hotmail.com
ORCID: <https://orcid.org/0009-0004-3412-4252>

¹⁰ Lcda.
Nurse practitioner
University of Buenos Aires – Argentina.
E-mail: kattvargas88@gmail.com
ORCID: <https://orcid.org/0009-0008-3718-3329>

¹¹ Medical student
Catholic University of Guayaquil
E-mail: moisesedab@gmail.com
ORCID: <https://orcid.org/0009-0005-4185-1930>



INTRODUCTION

The normative education of health professionals is in line with the advancement of technology and scientific development in medicine, both locally and internationally. [1] [2] [3]. Medical careers are using a variety of strategies in the development of effective teaching methodology; to have a solid base of scientific knowledge and skills in medical students for the analysis of problems or cases that respond to the high demand of recent years, improving the gap in medical training. The traditional teaching system has been the learning method that medical education has adopted. Master classes have been the popular way of teaching, due to their effectiveness in transmitting knowledge, particularly due to the large number of students, however the research production presented by the master lectures are not effective for the learning of skills and critical thinking that is required in higher education such as medicine; This is because the traditional method is centered on the teacher who passively transmits knowledge to the student. [4] [5] [6] [7] [8]

Error-based learning (ABE) is an approach to teaching errors for the purpose of learning; teachers design errors for students to analyze and substantiate the causes of errors, and students acquire lasting and reasoned learning by correcting them. Problem-based learning (PBL) is defined as a learning strategy in which students develop autonomous learning skills and holistic thinking by solving problems through self-study, inquiry, and small group cooperation. This represents a pedagogical shift in the approach to teaching and learning. [9]

Compared to the traditional system, ABE focuses on outcomes that foster students' logical reasoning ability. Teachers ask students questions with errors using their observation, conclusion, and problem-solving skills. PBL is considered a method that allows divergent thinking that is oriented to problems by giving students the initiative in learning; therefore, it is the responsibility of students to voice their concerns and work in small groups to resolve them [10]

Research "on the effects of error generation on episodic memory" demonstrated that EBA is an effective strategy for problem-solving, such as the analytical skills of medical students and physicians [11] [12]. Compared to the traditional system, many systematic reviews showed high levels of satisfaction and active participation [13] [14]. But if PBL and EBA methodologies are used on their own, there are limitations [12] [15]. The EBA requires a lot of time for teachers to prepare for errors, accumulate enough materials to support clinical teaching, and formulate questions that students discuss, leading to students not actively participating and being exalted by the learning experience. PBL was not effective in curricula, which would improve knowledge foundations and clinical performance.



Computer-assisted learning (CAA), which does not replace traditional teaching, is one of the new tools suggested to facilitate the development of PBL. [16] [15]

PBL is student-centered and plays an important leadership role in the classroom, allowing you to have time to prepare problems and materials before each class, making it difficult for medical students. In addition, PBL induces initiative in students, but the lack of interest of teachers will make students understand the program, which affects the quality of the method. Therefore, the following hypothesis is raised: the combined teaching of PBL and EBA could improve the development of affective learning and the quality of learning of medical students.

The medical teaching literature indicates that there is no combined PBL-EBA method in medical education, especially in gynecology interns, which is a fundamental specialty dedicated to the study of women.

This research implemented the combined PBL-ABE teaching system in students of the tenth semester of medicine and gynecology interns in their pre-professional practices. He compared the method to the traditional teaching system. This study provides insights into assessing students' reasoning in a variety of areas, from basic knowledge to problem-solving; it also analyzes their perspectives, their competencies, their self-perception and their satisfaction during the PBL-ABE learning process.

METHODS

PARTICIPANTS

Prospective, randomized, and controlled research. From September 2022 to April 2023, tenth-semester medical students from the Faculty of Medical Sciences of the University of Guayaquil and gynecology interns from the Ceibos Norte general hospital in the city of Guayaquil were registered. All required obstetric diseases were treated. The students were randomly divided into two groups: one for the PBL-ABE teaching system and one for the traditional lecture-based teaching system. Students didn't know what their group assignments were in the classroom. The groups were divided into different schedules and those who received classes at the same time were divided ascendingly according to their identification. Therefore, each student received a number ranging from 1 to 200; odd numbers were recorded in the PBL-ABE system, while even numbers were recorded in the traditional system. The instructor and three attending physicians from the gynecology service supervised these groups. The Ethics Committee of the Ceibos Hospital north of Guayaquil approved the informed consent of all participants.



STUDY DESIGN

Because hypertensive disorders of pregnancy are considered the second leading cause of maternal death, we decided to use the combined ABP-ABE approach for this study. The ABP-EBA system program was organized as follows. The instructor prepared lecture videos and supplemental materials for the course prior to class. Students were provided with five reference articles related to the course topics, general diagnostic and treatment guidelines, and approximately 30-minute video materials on operating procedures. Each student was required to review these materials during free time outside of class. Before the start of the activities, a questionnaire with ten multiple-choice questions on hypertensive disorders of pregnancy was delivered.

The instructor introduced the topic and agenda of activities before the class session. Next, a problem of a patient with slides posing errors in the proposed instructions that focused on hypertensive disorders of pregnancy was presented. Second, under the direction of the instructor, students discussed in small groups. In discussions, participants are asked relevant questions with errors and asked to search for answers on the internet or in library databases. Third, the group leader gave the presentation to review the most important points of the lesson and give the group the answers that were solved and those that were not resolved. Finally, the instructor summarized the class and tweaked the challenging questions that came up in the discussion. At the end of these activities, students were asked to answer a post-class questionnaire that contained the same questions about hypertensive disorders of pregnancy as the pre-class questionnaire. Finally, they were asked to complete a ten-question questionnaire about their perceptions and experiences with the combined PBL-ABE classroom.

Later the traditional system was organized. Instead of watching videos or reading lengthy articles, they were asked to review a preview of the course. They were also asked to answer the pre-test questionnaire with the 10 multiple-choice questions that were used in the PBL-ABE system. The traditional teaching method used to teach students the content taught by the teacher with a full explanation of theoretical knowledge that was not divided into small groups to discuss the problem. After the classes, they were asked to answer the same questionnaire as the PBL-ABE group.

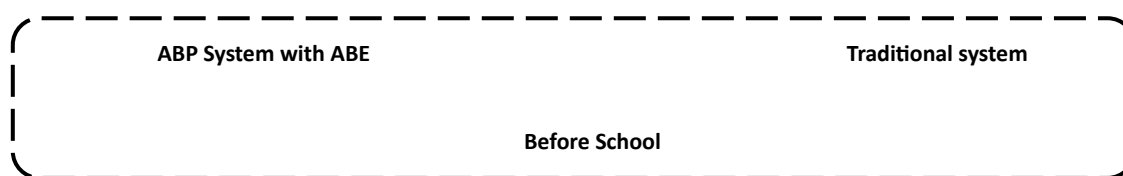
All students received an informed consent form, were told to participate in questionnaires and surveys on a voluntary basis. The results of the quizzes and survey had no impact (positive or negative) on students' grades or performance because ID numbers were used instead of real names. Students completed the questionnaires and survey

independently of their classmates and the teacher. A graphical description of the study design is shown in Figure 1.

DATA EVALUATION AND STATISTICAL ANALYSIS

Pre- and post-course tests were conducted to assess what students learned in the Hypertensive Disorders in Pregnancy course. The question set includes basic theory questions (10 points) and problem analysis questions (10 points). All of the questions are based on Bloom's taxonomy, which classifies cognitive activities into six hierarchical levels, namely memory, comprehension, application, analytical skills, evaluation, and creativity. The categories "Remember" and "Understand" were combined into a single category called "Basic Theoretical Knowledge". Entries in any other category are considered "Clinical Case Analysis". [17] [18]

After the course, students in both groups were asked to complete the same anonymous questionnaire to assess their perceptions and experiences. The post-course questionnaire includes 10 questions, which included questions on motivation, comprehension, student-teacher interaction, free time during the course, end-of-course test, communication and communication skills, clinical reasoning ability, self-study skills, teamwork, skills, and knowledge absorption. The endpoints were based on a previous study. Depending on the level of improvement, the scores are divided into 5 levels, from 1 (poor) to 5 (excellent). Unlike the other areas recorded, for the free time consumed, 1 represents the lowest time consumption, while 5 indicates the most time. The reliability of the questionnaire was evaluated with Cronbach's alpha coefficient, which was 0.872. [17]



For each system, the time students spent preparing before class is measured. In the PBL-ABE system, students' preparation time was recorded by watching lecture videos and reading materials related to the course, as well as by searching for additional materials on the Internet. Meanwhile, in the traditional model, students use pre-recorded time to review textbooks.

We compared the effectiveness of PBL-ABE with traditional teaching methods for all tenth-semester and boarding students. In addition, to avoid biases related to different types

of students, we also observed two teaching methods with tenth-semester students and interns in subgroups.

We sum the total scores and then compare the scores produced by both systems using a t-test of independent samples. We also compared the data generated by the system before and after the lesson using a paired sample t-test. To compare proportions, the chi-square test was used. All statistical analyses were performed with SPSS version 20.0 (Chicago, USA). United States of America). Alpha was set at 0.05 and P values below 0.05 were considered significant. The charts were created using RStudio, the "ggplot2" library was used to create the bar graph where the average result is shown, and the dplyr library, which allows you to manipulate and sort the data into data frames, ensuring that everything is organized.

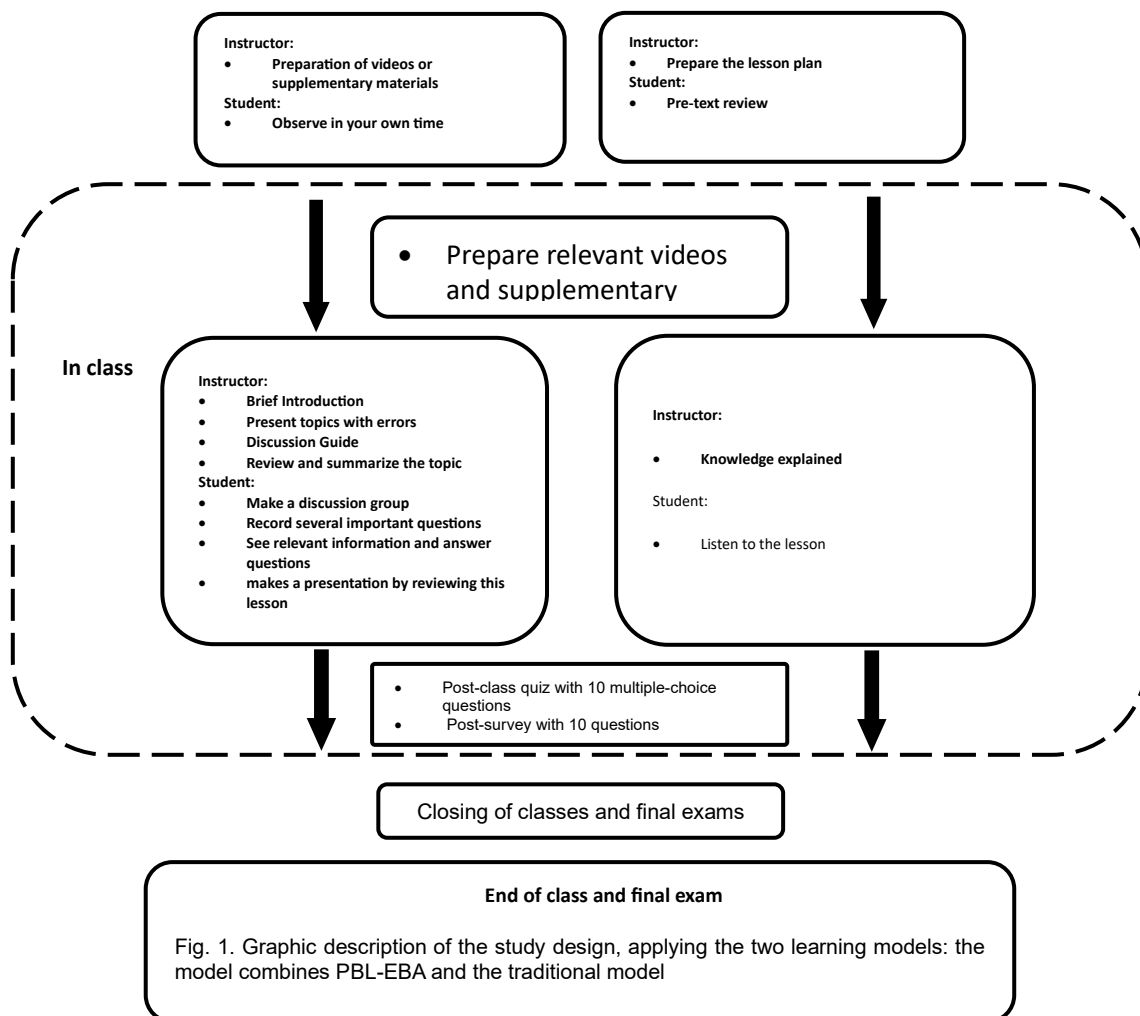


Fig. 1. Graphic description of the study design, applying the two learning models: the model combines PBL-EBA and the traditional model

RESULTS

FEATURES AND BASIC INFORMATION

From September 2022 to April 2023, a total of 200 students will enroll; 100 in the tenth semester in obstetrics and 100 in the obstetrics and gynecology internship. Of these, 100 students were assigned to the PBL-ABE system (50 students in the 10th semester and 50 boarders) and 100 to the traditional system (50 students in the 10th semester and 50 boarders). 17 students were excluded from the PBL-ABE group: 11 students withdrew before the course, despite having signed an informed consent, and 6 students were excluded for having incomplete values in their questionnaire. The average age of the students was 22.49 ± 1.443 years. By gender, 100 students are female, or 50%. Table 1 compares the initial characteristics of students in the PBL-ABE system and the traditional system.

Felling 1. Basic characteristics of all participants

Item	ABP-ABE System (N=100)	Traditional system (N=100)	Statistics	P-Value
Degree			X ² =0.001	0.981
Tenth semester	50	50		
Medical Interns	50	50		
Gender			X ² =0.525	0.469
Man	55	45		
Woman	45	55		
Age	22.49+1.443	22.49+1.443	T=0.850	0.396

There were no significant differences between the two systems in terms of gender, age, or grades ($P > 0.05$). In addition, tenth-semester students and interns of the traditional system did not show statistical significance in terms of demographic characteristics compared to the PBL-ABE system, in Table 2. The average time spent on pre-class preparation in the ABP-ABE systems and the traditional system was 107.23 ± 14.512 and 95.60 ± 15.631 , respectively ($P < 0.001$).

Table 2 Comparison of test scores between ABP-EBA and the traditional group

Items.	System ABP-ABE (N=100)	System Traditional (N=100)	T	P-value
Pre-Class Total Score	70.43 ± 12.23	75.34 ± 12.3	-2.83	0.0051
Basic Knowledge Score Pre-Class	45.23 ± 15.32	68.35 ± 13.3	- 11.39	2.28×10^{-23}
Case Analysis Score Pre-Class	23.34 ± 12.4	35.43 ± 13.2	-6.67	2.43×10^{-10}
Total post-class score	72.23 ± 12.5	68.51 ± 11.32	2.205	0.028
Basic Knowledge Score Post-Class	48.25 ± 13.23	39.51 ± 13.3	4.65	5.82×10^{-6}
Case Analysis Score Post-Class	31.23 ± 14.2	30.24 ± 13.4	0.507	0.612

The comparison of test scores between the ABP-ABE and the traditional pre- and post-class system; the mean pre-class test score and the basic knowledge and case analysis scores were 70.43 ± 12.23 ; 45.23 ± 15.32 ; 23.34 ± 12.4 respectively.

While, for the traditional system they were 75.34 ± 12.3 ; 68.35 ± 13.3 ; 35.43 ± 13.2 , respectively. It is notable that the pre-class test scores of the traditional system were significantly higher than those of the ABP-ABE system ($P < 0.05$). After class, the mean total post-class test score and basic knowledge scores for the PBL-ABE group increased significantly, from 72.23 ± 12.5 ; 48.25 ± 13.23 ; respectively ($P < 0.05$), with the exception of the post-class case analysis score which could not find significant differences in its means. 31.23 ± 14.2 ; 30.24 ± 13.4 ($P < 0.05$) (Fig. 2).

Fig.2 Comparison of pre- and post-class scores: Traditional vs ABP-ABE
Comparación de puntuaciones previa y post clase: Tradicional vs ABP-ABE



Similarly, in the traditional system, the mean total score decreased significantly from 75.34 ± 12.3 to 68.51 ± 11.32 ($P = < 0.05$); likewise, basic knowledge and case analysis scores also decreased significantly from 68.35 ± 13.3 to 39.51 ± 13.3 and from 35.43 ± 13.2 to 30.24 ± 13.4 respectively ($P < 0.05$). Meanwhile, the mean total score and basic knowledge scores in the PBL-ABE system did not find significant differences in their means 70.43 ± 12.23 to 72.23 ± 12.5 and 45.23 ± 15.32 to 48.25 ± 13.23 , while for the

case analysis the scores increased significantly from 23.34 ± 12.4 to 31.23 ± 14.2 ($P = <0.05$). (Tables 3 and 4) 4.31×10^{-5}

Table 3: Comparison of the pre- and post-class scores of the Traditional System

Items.	Pre-Class Scoring	Post-class scoring	T	P-value
Total	75.34 + 12.3	68.51 + 11.32	4.08	6.39×10^{-5}
basic skills	68.35 + 13.3	39.51 + 13.3	15.33	1.70×10^{-35}
Case Analysis	35.43 + 13.2	30.24 + 13.4	2.75	0.006

Table 4: Comparison of pre- and post-class scores of the PBL System

Items.	Pre-Class Scoring	Post-class scoring	T	P-value
Total	70.43 ± 12.23	72.23 ± 12.5	-1.02	-1.02
basic skills	45.23 ± 15.32	48.25 ± 13.23	-1.49	-1.49
Case Analysis	23.34 ± 12.4	31.23 ± 14.2	-4.18	-4.18

Table 5 assesses students' opinions based on self-perceived competence and competence between the PBL-EBA group and the traditional group; We found that students' motivation to learn, content comprehension, student-teacher interaction, self-assessment, communication skills, and clinical judgment; thinking ability; self-study skills; teamwork skills and the ability to absorb knowledge in the PBL-EBA group were significantly higher than in the traditional system ($P < 0.05$) (Table 5). The score representing students' free time during class (time spent doing work before and after class) was significantly lower in the PBL-ABE group than in the traditional group ($P < 0.05$) (Table 3).

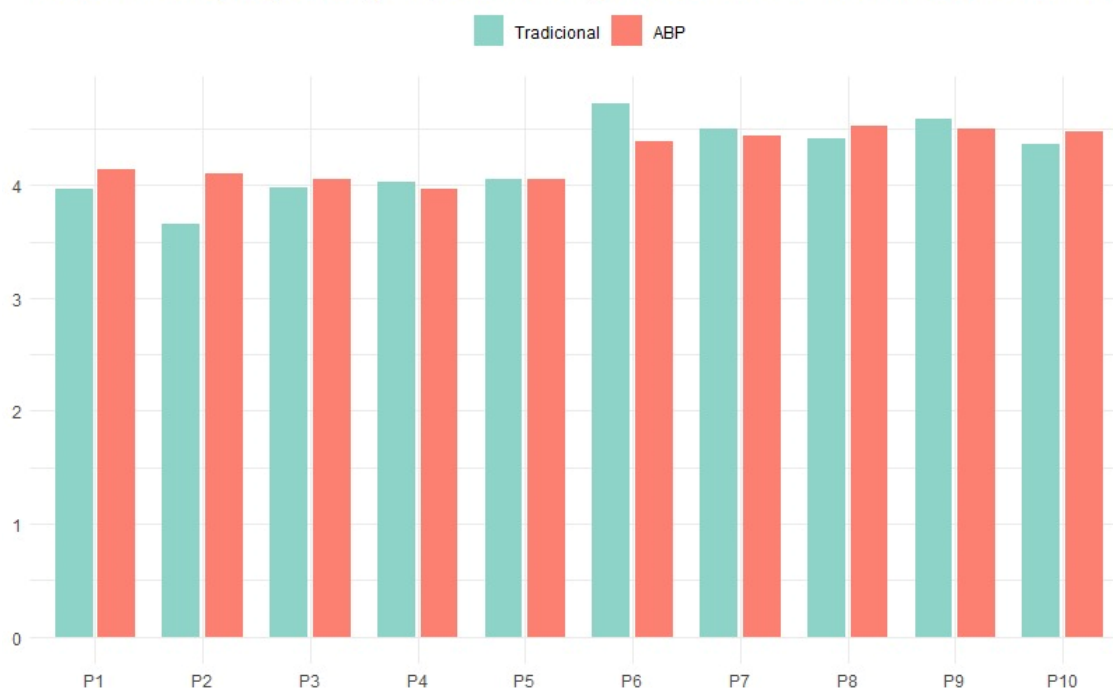
Academic satisfaction in both groups was assessed using follow-up tests, which were considered satisfactory if they obtained 80 points. In the PBL-ABE group, the skills of comprehension, communication, clinical reasoning, self-study, teamwork and knowledge acquisition obtained more than 80 points, a figure higher than that of the traditional group. However, there were no statistically significant differences between the two groups. (Table 5 and Figure 3).

Table 5: The comparison of perspectives and self-perceived competence in the PBL-EBA system versus the traditional system (for all participants)

Item	ABP-ABE System (N= 100)	Traditional system (=100)	T	95% confidence interval	P-value
The teachers motivated me to do my teaching activities better.	4.72 ± 0.64	3.97 ± 1.04	6.14	(0.50,0.99)	5.91 x 10 ⁻⁹
My teachers explained the contents clearly in lectures and other theoretical activities.	4.39 ± 0.96	4.14 ± 1.005	1.79	(-0.024,0.52)	0.07
Carry out, at the direction of the teacher, bibliographic research activities, case discussions or other teaching activities using the English language	4.5 ± 0.80	3.66 ± 1.19	5.85	(0.55,1.12)	2.30x 10 ⁻⁸
The professors assigned me independent work (homework) to do collectively with other students in my course.	4.44 ± 0.92	4.1 ± 0.85	2.7	(0.09,0.58)	0.007
During practical activities in the hospital ward or other health care scenarios, I have had the accompaniment of my professors.	4.41 ± 1.00	3.98 ± 0.93	3.14	(0.16,0.69)	0.001
The types of teaching activities and their distribution in the subject were sufficient for the achievement of my practical skills.	4.53 ± 0.86	4.06 ± 0.93	3.71	(0.22,0.71)	0.0002
During the course I had opportunities to develop the professional skills that corresponded to the objectives of the teaching program.	4.59 ± 0.71	4.03 ± 0.91	4.85	(0.33,0.78)	2.57x 10 ⁻⁶
I applied the knowledge acquired in Medical Embryology, Microbiology and Parasitology in the theoretical and practical activities of this subject.	4.50 ± 0.85	3.97 ± 0.91	4.25	(0.28, 0.77)	3.21x 10 ⁻⁶
This subject helped me learn to self-evaluate myself and other students.	4.36 ± 1.04	4.06 ± 0.97	2.10	(0.019,0.58)	0.036
The subject contributed to developing my problem-solving skills.	4.48 ± 0.87	4.06 ± 1.03	3.11	(0.15,0.68)	0.002

Fig.3. We observe the perspectives and self-perceived competencies with PBL-EBA compared to the traditional model

Comparación de perspectivas y competencia auto percibida en el sistema ABP-ABE vs Tradicional



DISCUSSION

The traditional education system is the most economical and effective means of providing theoretical education. However, this system is not suitable for advanced medical students to develop communication skills and clinical reasoning. With the advent of the Internet, information has grown rapidly and personal computers and mobile devices have turned e-learning into a tool in higher education, allowing medical students to obtain useful information in a short time. Think and ask questions; Getting new information is an important part of education. In this process, PBL and ABE teaching strategies, which differ from traditional teaching methods, aim to facilitate health and encourage students to actively move from "what I learned" to "what I want to learn." [19] [20] [21] [22] [23]

Most studies focus specifically on PBL and EBA compared to traditional education systems, and some studies have demonstrated the advantages of PBL or EBA. For example, PBL created an approach to small group learning characterized by broader communication between faculty and students to achieve individual learning goals, while ABE emphasized that staff prepare clinical case reports and documentation to help students develop holistically. and effective clinical skills. The student learns theoretical techniques. Taking into account these individual strengths, this study combined PBL and ABE teaching methods so that they could complement and enhance each other. [24] [25] [26] [27] [28] [14] [29] [30] [31]

We study the effectiveness and acceptability of the teaching method integrating PBL-ABE in the subject of obstetrics and gynecology compared to traditional teaching systems. We recognize that integrated PBL-ABE training has not yet been implemented in obstetrics and gynecology courses. In our study, the overall score of the case analysis and the pretest in the traditional system was much higher than the score in the ABP-ABE system (75.34 vs. 70.43 and 35.43 vs. 23.34), this shows the advantage of the pretest. Because students in the traditional education system memorize basic knowledge from textbooks.

In contrast, students in the PBL-ABE group had no study materials and were close to clinical practice. Therefore, it is believed that the difference in pre-test scores between the two systems is not due to the quality of the study materials. But due to the different characteristics of teaching methods, the traditional method possesses more knowledge through book memorization.

Students in the PBL-EBA system reviewed material throughout the course without detailed case analysis or discussion topics, and comparing the total course scores as well as case analysis, showed that the PBL-EBA group achieved significantly better results than the traditional group (72.23 vs. 68.51). and (31.23 vs. 30.24). This explains the effectiveness of the PBL-ABE training model. The mean total score and basic knowledge score were not significantly different on average between the two systems ($P < 0.05$); The use of the combined PBL-ABE teaching system helps to reduce students' free time compared to the traditional system, which indicates its effectiveness in the application of medical chairs ($P < 0.05$).

All questions in the questionnaire are based on Bloom's taxonomy, which is used in educational research to classify learning activities into different cognitive levels, from basic memory to higher-order learning objectives such as memory, comprehension, application and analysis of skills, assessment, and creativity. Texts are the primary source of basic knowledge and require students to read and memorize. Meanwhile, problem analysis requires students to analyze events in the context of real-life medical situations, using the knowledge gained to solve real-life medical and clinical problems. The results of the ABP-ABE system score analysis show that the clinical case analysis score is much better than the basic knowledge score, which means that the ABP-ABE integrated knowledge model can develop communication, creative thinking, and knowledge skills. This is very similar to the general goal of medical education. [32]

Based on an analysis of students' perspectives and skills, measured through surveys in both systems, it was found that students in the PBL-ABE group were more likely to model using a balanced approach between study and work. Positive effects of the PBL-ABE



teaching model on students have been recorded in extracurricular areas such as comprehension, communication skills, clinical reasoning, self-study skills, collaboration skills, communication skills, and knowledge acquisition.

Although previous studies have attempted to implement PBL or ABE training models in teaching in different types of universities, very few studies have focused on integrating PBL-EBA training in obstetrics and gynecology. Ginzberg et al. He applied problem-based teaching and case-based learning (PBL-ABC) in medical students' discussions of cost-related health issues, demonstrating that problem-based teaching and case-based learning (PBL-ABC) are effective ways to interact with public health. Another study implemented an ABP-ABC teaching method in six lessons to improve students' leadership skills without taking time away from academic training. In addition, Naing et al. It combines flipped classroom and PBL into one hyperthyroidism course, thereby improving student learning and outcomes. [33] [12] [17] [34] [20] [8]

This study was similar to the studies mentioned above, suggesting that mixed methods improve learning outcomes in students. In terms of the time required, we agree with Ginzburg, but we disagree with Naing et al. In addition, we differ from all previous studies by being a study conducted on the different skills that students can acquire by incorporating the PBL-EBA teaching method in the process of analyzing different types of small groups. It includes students enrolled in the tenth semester and gynecology interns. In summary, this study investigates the effectiveness of the ABP-ABE integrated teaching method in improving overall understanding of the professional environment, student-teacher interaction and communication skills, student-teacher communication skills, clinical reasoning, and self-study skills. Cooperation and understanding skills. It should be noted that EBA eliminates the need for explicit error removal procedures, which benefits people with significant memory impairment [34] [8] [35]

This study is similar to the studies mentioned above, suggesting that mixed methods improve student learning outcomes. In terms of the time needed, our study had some limitations. First, we analyze the results of a chair from the boarding school department, which may vary in the facilities. Second, there was no blinding procedure in this study, so some bias in the analysis was inevitable preventing teachers from blindly observing students' leadership qualities that is influenced by self-efficacy and the development of interpersonal relationships. Third, our study was based on a gynecology course; In the future, it is proposed to carry out multicenter randomized trials with large samples, with different chairs and long-term follow-up.



CONCLUSION

The PBL-ABE teaching method can be effective in improving the clinical skills and learning capacity of medical students, particularly those of gynecology. This method made it easier to prepare before class and provided immediate feedback. In addition, the ABP-ABE integrated teaching method improved student understanding, student-teacher interaction, communication skills, clinical thinking skills, self-study skills, cooperation, and the ability to absorb knowledge.

THANKS

Thanks are made to the Ceibos Norte General Hospital and the teaching department for allowing this research work to be carried out, as well as special thanks to Eng. Miguel Ángel Bravo Rosales for his contribution in the statistical analysis of the results obtained



REFERENCES


1. Jaros, S., & Beck Dallaghan, G. (2024). Medical education research study quality instrument: An objective instrument susceptible to subjectivity. **Med Educ Online**, 29, 2308359. <https://doi.org/10.1080/10872981.2024.2308359>
2. Khouzam, H. R. (1999). Graduate medical education should not be overtaken by managed care. **West J Med**, 171, 221–222.
3. Frankford, D. M., & Konrad, T. R. (1998). Responsive medical professionalism. **Academic Medicine**, 73, 138–145. <https://doi.org/10.1097/00001888-199802000-00011>
4. Gil, Y. M., Hong, J. S., Ban, J. L., Kwon, J.-S., & Lee, J.-I. (2023). Dental students' perception of their educational environment in relation to their satisfaction with dentistry major: A cross-sectional study. **BMC Med Educ**, 23, 508. <https://doi.org/10.1186/s12909-023-04485-w>
5. Schlegel, E. F. M., Cassara, M., Olvet, D., & Fornari, A. (2023). Developing clinician-educators: A qualitative analysis of structured reflections from participatory teaching in the final year in an integrated medical school program. **Med Sci Educ**, 33, 107–117. <https://doi.org/10.1007/s40670-022-01712-9>
6. Dietrich, H., & Evans, T. (2022). Traditional lectures versus active learning – a false dichotomy?
7. Wilson, J. A., Pegram, A. H., Battise, D. M., & Robinson, A. M. (2017). Traditional lecture versus jigsaw learning method for teaching Medication Therapy Management (MTM) core elements. **Curr Pharm Teach Learn**, 9, 1151–1159. <https://doi.org/10.1016/j.cptl.2017.07.028>
8. Naing, C., Whittaker, M. A., Aung, H. H., Chellappan, D. K., & Riegelman, A. (2023). The effects of flipped classrooms to improve learning outcomes in undergraduate health professional education: A systematic review. **Campbell Systematic Reviews**, 19. <https://doi.org/10.1002/cl2.1339>
9. Oderinu, O. H., Adegbulugbe, I. C., Orenuga, O. O., & Butali, A. (2020). Comparison of students' perception of problem-based learning and traditional teaching method in a Nigerian dental school. **European Journal of Dental Education**, 24, 207–212. <https://doi.org/10.1111/eje.12486>
10. Aguilera, A. (2017). El pensamiento divergente: ¿qué papel juega la creatividad? **Investigación y Consultoría Organizacional**, 1–7. <https://doi.org/10.6084/m9.figshare.5212429>
11. Hough, J. (2016). Mistake were made. **Harvard Ed Magazine**.
12. Cyr, A. A., & Anderson, N. D. (2018). Learning from our mistakes: Effects of learning errors on memory in healthy younger and older adults. In C. Haslam & K. R. (Eds.), **Current issues in neuropsychology. Errorless learning in neuropsychological rehabilitation: Mechanisms, efficacy and application** (pp. 151–163). Routledge/Taylor & Francis Group.

13. Adhikari Yadav, S., Poudel, S., Pandey, O., Jaiswal, D. P., Malla, B. P., Thakur, B. K., et al. (2023). Performance and preference of problem-based learning (PBL) and lecture-based classes among medical students of Nepal. **F1000Res**, 11, 183. <https://doi.org/10.12688/f1000research.107103.3>
14. Li, Z.-Z., Lin, H., Xu, Y.-M., Man, Q.-W., Wu, T.-F., Shao, Z., et al. (2024). Application of PRI-E—a combined learning method in oral and maxillofacial oncology education. **Sci Rep**, 14, 8127. <https://doi.org/10.1038/s41598-024-58878-y>
15. Al-Madi, E. M., Al-Bahrani, L., Al-Shenaiber, R., Al-Saleh, S. A., & Al-Obaida, M. I. (2020). Creation and evaluation of an endodontic diagnosis training software. **Int J Dent**, 2020, 1–5. <https://doi.org/10.1155/2020/8123248>
16. Colliver, J. A. (2000). Effectiveness of problem-based learning curricula. **Academic Medicine**, 75, 259–266. <https://doi.org/10.1097/00001888-200003000-00017>
17. Sierra-Figueroa, S., Díaz-Perera-Fernández, G., Pernas-Gómez, M., Viciado-Tomey, A., Damiani-Cavero, J., & Blanco-Aspiazú, M., et al. (2014). Cuestionario sobre experiencias de los estudiantes al cursar la asignatura Propedéutica Clínica y Semiología Médica. **Educación Médica Superior**, 28.
18. Morton, D. A., & Colbert-Getz, J. M. (2017). Measuring the impact of the flipped anatomy classroom: The importance of categorizing an assessment by Bloom's taxonomy. **Anat Sci Educ**, 10, 170–175. <https://doi.org/10.1002/ase.1635>
19. Cantillon, P. (2003). ABC of learning and teaching in medicine: Teaching large groups. **BMJ**, 326, 437. <https://doi.org/10.1136/bmj.326.7386.437>
20. Zhan, H.-Q., Zhang, X.-X., Qin, R., Fei, J., Dong, G.-Y., & Hao, J.-H. (2023). Application of integrated problem-based learning combined with lecture-based classroom teaching in undergraduate medical education: An effective teaching model in a medical school in China. **Medicine**, 102, e34792. <https://doi.org/10.1097/MD.00000000000034792>
21. Goh, C. E., Lim, L. Z., Müller, A. M., Wong, M. L., & Gao, X. (2022). When e-learning takes centre stage amid COVID-19: Dental educators' perspectives and their future impacts. **European Journal of Dental Education**, 26, 506–515. <https://doi.org/10.1111/eje.12727>
22. Hendricson, W. D. (2012). Changes in educational methodologies in predoctoral dental education: Finding the perfect intersection. **J Dent Educ**, 76, 118–141.
23. Schaefer, S., Dominguez, M., & Moeller, J. (2018). The future of the lecture in neurology education. **Semin Neurol**, 38, 418–427. <https://doi.org/10.1055/s-0038-1667042>
24. Burgess, A., Bleasel, J., Hickson, J., Guler, C., Kalman, E., & Haq, I. (2020). Team-based learning replaces problem-based learning at a large medical school. **BMC Med Educ**, 20, 492. <https://doi.org/10.1186/s12909-020-02362-4>
25. Wang, B., Jin, S., Huang, M., Zhang, K., Zhou, Q., Zhang, X., et al. (2024). Application of lecture-and-team-based learning in stomatology: In-class and online. **BMC Med Educ**, 24, 264. <https://doi.org/10.1186/s12909-024-05235-2>



26. Megee, P. C., Uhley, V., Grogan, J., & Silverman, A. (2024). Foundational and clinical science integration in a team-based learning module modeling care of a patient with dyslipidemia. **MedEdPORTAL**. https://doi.org/10.15766/mep_2374-8265.11397
27. Rehman, R., Ahmad, S., Nasir, S. P., & Ali, R. (2024). Acceptance of team-based learning by students and faculty: A pilot study. **Pak J Med Sci**, 40. <https://doi.org/10.12669/pjms.40.5.8515>
28. Sterpu, I., Herling, L., Nordquist, J., Rotgans, J., & Acharya, G. (2024). Team-based learning (TBL) in clinical disciplines for undergraduate medical students—a scoping review. **BMC Med Educ**, 24, 18. <https://doi.org/10.1186/s12909-023-04975-x>
29. Merritt, E., McNulty, M. A., & Byram, J. N. (2024). Integrated case-based learning session for breast and upper limb anatomy. **MedEdPORTAL**. https://doi.org/10.15766/mep_2374-8265.11399
30. Refai, D., & Thompson, J. L. (2011). The significance of problem-based learning in the development of enterprise skills for pharmacy students in UK. **HEI**.
31. Kolahdouzan, M., Mahmoudieh, M., Rasti, M., Omid, A., Rostami, A., & Yamani, N. (2020). The effect of case-based teaching and flipped classroom methods in comparison with lecture method on learning and satisfaction of internship students in surgery. **J Educ Health Promot**, 9, 256. https://doi.org/10.4103/jehp.jehp_237_19
32. Alshurafat, H., Alaqrabawi, M., & Al Shbail, M. O. (2023). Developing learning objectives for forensic accounting using bloom's taxonomy. **Accounting Education**, 1–17. <https://doi.org/10.1080/09639284.2023.2222271>
33. Macho-González, A., Bastida, S., Sarriá Ruiz, B., & Sánchez Muniz, F. J. (2020). Aprendizaje basado en errores. Una propuesta como nueva estrategia didáctica. **JONNPR**, 6, 1049–1063.
34. Ginzburg, S. B., Schwartz, J., Deutsch, S., Elkowitz, D. E., Lucito, R., & Hirsch, J. E. (2019). Using a problem/case-based learning program to increase first and second year medical students' discussions of health care cost topics. **J Med Educ Curric Dev**, 6, 238212051989117. <https://doi.org/10.1177/2382120519891178>
35. Anderson, N. D., & Craik, F. I. M. (2006). The mnemonic mechanisms of errorless learning. **Neuropsychologia**, 44, 2806–2813. <https://doi.org/10.1016/j.neuropsychologia.2006.05.026>

BEYOND RHETORIC: CHALLENGES AND OPPORTUNITIES FOR THE
DEVELOPMENT OF THE AMAZON

 <https://doi.org/10.56238/sevened2024.029-026>

Ilsa Maria Valois Coelho¹, Raquel Marques² and Elizabeth Ferreira Cartaxo³

ABSTRACT

The Amazon region is environmentally and socially diverse from other Brazilian regions, but it has been the target of inconsistencies in the implementation of public policies that negatively interfere with the development of the state, with harmful effects mainly for the capital Manaus. The great importance of the Amazon rainforest for the sustainability of the planet and the frequent attacks on natural wealth, motivate this work that seeks to alert to problems such as rural exodus, overpopulation of urban centers and the consequent negative effects on the quality of life of the population, problems connected to desertification and degradation of the Amazon environment. These themes have been addressed by renowned scientists and many national and international publications denounce the economic interests involved in public policies that masquerade as "developmentalist". This article talks to these experts, concluding about the extreme difficulty of overcoming the populist policies that have culturally marked the history of the region. It also reflects on the modernization and development policies of the State of Amazonas, highlighting the contradictions and reflecting on the consequences of this development model, which conflicts with the preservation of the region's natural resources.

Keywords: Development. Public Policies. Urban Centers. Regional Diversities. Migration. Forest. Natural resources.

¹ Doctor in Analytical Chemistry from the Federal University of Amazonas

Universidade Nilton Lins

Manaus – Amazonas, Brazil

E-mail: ilsavalois@gmail.com

ORCID: <https://orcid.org/0000-0001-7169-4896>

² Master's Degree in Society and Culture of Amazonas from the Federal University of Amazonas

Universidade Nilton Lins

Manaus – Amazonas, Brazil

E-mail: rsmarques@niltonlins.br

ORCID: <https://orcid.org/0000-0001-7799-2683>

³ Doctor in Energy Planning

Federal University of Amazonas

Manaus – Amazonas, Brazil

E-mail: elizcartaxo@gmail.com

ORCID: <https://orcid.org/0000-0003-4342-7584>

INTRODUCTION

Throughout the twentieth century and even at the beginning of the twenty-first century, we have witnessed numerous harmful effects on the environment, caused by the incessant search for growth and development, but disconnected from regional and socio-environmental issues. The exploitation of populations, the destruction of historical heritage, the concentration of wealth, the excessive production of all kinds of garbage, the increase in the frequency of environmental disasters, the unregulated use of pesticides, the destruction of forests and the pollution of ecosystems are legacies of harmful policies that have resulted in the loss of individual and planetary quality of life. (Araújo, 2003)

The concept of development as synonymous with progress led to the predominant developmentalist ideology in the world and still contaminates underdeveloped and developing countries to the point of believing that their progress is conditioned by the devastation of natural resources (Araújo, 2003). Not even the increasingly frequent studies that reflect the emergence of a new environmental awareness, both at the national and international levels, can be effective in curbing exploitative interests. There is technology to monitor and control the damage so as not to compromise life on the planet. However, as Mozeto (2001) states, no monitoring program will achieve these objectives without valuing environmental science and without demanding and specialized demands from society.

In view of the above and turning our attention to the Brazilian reality, we must emphasize the diversity between regions and the consequent need for equally differentiated environmental policies. However, environmental public policies require the use of large budgetary resources and, in developing regions, actions that encourage degradation are prioritized. This generates many contradictions, whose solutions do not result only from efforts to produce laws, decrees and other normative acts. In Amazonas, for example, in addition to institutional and budgetary weaknesses, economic forces resist compliance with existing environmental standards, favoring progress associated with unbridled urban growth.

These are complex issues that justify addressing the two issues that are very well interconnected in the state of Amazonas and whose connections are addressed in this article: the forest and the city, because to the extent that one reduces its wealth, the other expands its borders under the force of the interests of capital. Manaus, inserted in the middle of the Amazon forest, is experiencing this very intense process of urban expansion that results in environmental and socio-spatial exclusion.

It is also intended to share the importance of making the fulfillment of the Sustainable Development Goals (SDGs) a reality, where "Protecting, restoring and promoting the

sustainable use of terrestrial ecosystems, sustainably managing forests, combating desertification, halting and reversing land degradation and biodiversity loss" (SDG Goal 15), is certainly focused on the reality of the Amazon region. (UN, 2024)

With this in mind, it is intended to discuss ways to develop the state of Amazonas with inclusive policies, which try to stop the advance of the city over the forest, which do not degrade the forest, water resources and, at the same time, bring development and employment to the population of the entire region. This means exploiting natural resources, generating income for the forest dweller without destroying the wealth of the biome. It is a necessary challenge for new and future generations.

This research sought data in theses, dissertations and articles published in specialized journals, as well as in official publications published on several websites, including the IBGE database, the Project for Monitoring Deforestation in the Legal Amazon by Satellite (PRODES), FAS (Sustainable Amazon Foundation), IDESAM (Institute for Conservation and Sustainable Development of Amazonas) among others. Some authors of books with environmental themes and specific to the Amazon region were also consulted and cited.

SOCIO-SPATIAL DIVERSITY

With most of its territory located in Brazil, although it extends over eight other countries (Peru, Ecuador, Colombia, Venezuela, Bolivia, Guyana, Suriname, and French Guiana), the Amazon rainforest is the largest rainforest in the world and plays an important role in maintaining the planet's climate. Contributing to this function is the fact that the hydrographic network of the region is composed of the largest hydrographic basin in the world, corresponding to 45% of the Brazilian territory.

It seems natural, therefore, that the river influenced the process of occupation of the Amazon and that the process of development of this northern part of the country was associated with river navigation, stimulated by the extraction of wealth from the forest. In fact, initially, at the time of the first navigations, the demand for fuel (charcoal and firewood) led to the creation of communities and cities called "wood ports". These communities served to supply the fuel, thus favoring the establishment of some farms on the banks of the rivers. Subsequently, when rubber became the raw material increasingly sought after by industries around the world, the latex trade gained momentum, producing major transformations in the city of Manaus, the largest in the state of Amazonas (Alkmin, 2000; Valois Coelho, 2012).

It is known that the extraction and production of rubber are not intensive activities in terms of change in land use, however, the flow of migrants and the formation of urban centers were largely responsible for the transformations that occurred in Amazonian cities, especially in the state capital. During this period, the city of Manaus was granted the status of metropolis, and its expansion was carried out under the incentive to the deforestation of the surrounding forest. In addition, the rubber barons, as the latex exploiters in the Amazon were called, also exploited the cheap labor of the rubber tappers who, attracted to the Amazon by the desire for progress, were maintained through an inhumane system of debt slavery (Hall, 1991; Valois Coelho, 2012).

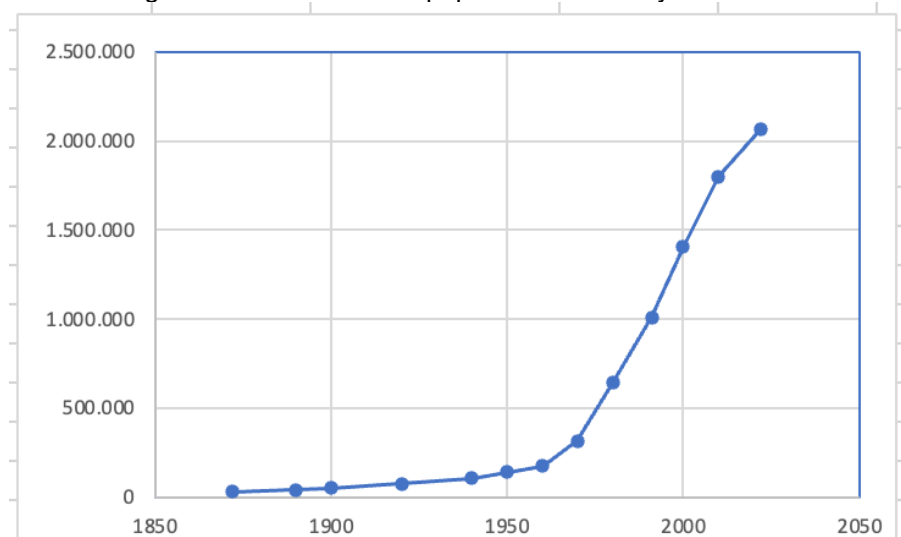
After the golden period of rubber, the exploitation of nature and the Amazonian man continued throughout the policies of acceleration of development that followed, accentuating the contrast between rural and urban life in the region. These contrasts have been much more serious in the city of Manaus than in other municipalities in the state, because although the city is in the heart of the Amazon rainforest, deforestation, asphalt paving and modern buildings increasingly contribute to altering the movement of air masses, variations in temperature and rainfall and the very physiognomy of the city. "Much of the pollution of the streams and the loss of biodiversity was/is caused by the dynamics of the city's urban expansion." (Nogueira et. al., 2007, p. 5430)

This problem can be observed in several cities around the world, where developmental policies have aggravated the phenomenon of migration, population concentration in unsuitable areas, precarious infrastructure and accentuated urban poverty. In Manaus, several policies aimed at the development and occupation of the region have intensified this phenomenon.

The Manaus Free Trade Zone, in particular, was a specific policy for the development of Amazonas that had a great impact on the growth of the city. There was an increase in income and employment, in population growth, but it also represented the beginning of an enormous urban concentration and wealth. In particular, it helped accelerate the process of innerland/capital migration, changing the pattern of regional settlement and intensifying the pace of urbanization. Throughout this process, Manaus grew over the surrounding forest and lost vegetation cover with evident damage to infrastructure, the emergence of diseases, social exclusion and environmental degradation.

The result of the disorderly population growth of the city of Manaus has been adverse, as can be deduced from the latest IBGE Censuses (Figure 1).

Figure 1: Evolution of the population of the city of Manaus



Source: Data obtained from the IBGE CENSUS and adapted by the authors.

It is noteworthy, when observing figure 1, that Manaus began the accelerated growth process in the 1960s and 1970s, exactly the period in which the Manaus Free Trade Zone was created (1967), progressing from then on, with a greater inland-capital migratory flow, attracted by the industries installed in the capital. It is understandable that cities offer the possibility of a better life, but the benefits are not universal. Many of those who migrate from rural to urban areas find unfavorable living conditions, adding to the contingent of slum dwellers and homeless people who, living in subhuman situations, have no other option but to exhaust the resources of the environment. Specifically in Manaus, the migration problems were probably the result of public policies that did not favor the settlement of people in the interior. On the contrary, they promoted the overpopulation of urban centres, with the consequent negative effects on the quality of life in both urban and rural areas. (Valois Coelho, 2012)

The result has been doubly damaging to the development of the State: on the one hand, an underdeveloped rural area, lacking in services, cries out for actions that capitalize on the potential of nature in favor of a better life for its inhabitants; on the other hand, the populations of urban centers, especially those of the state capital, live with invasions, inadequate housing, unemployment, violence, malnutrition and environmental degradation, among other evils. In conclusion, the city of Manaus presents contradictions that reveal the continuous process of human action capable of modifying the city's natural landscape, apparently dissociated from the green. (Valois Coelho, 2012)

It is said that the impacts are not only visual, they interfere with the climate, intensify regional and socio-environmental inequalities and make the lives of Amazonians full of obstacles and tribulations. Unequivocally, there is the physical impossibility of constant



growth, resulting in the need to impose limitations on development and the urgency of seeking a possible balance. Especially if we consider that this growth is aggravated by the increase in poverty resulting from socioeconomic imbalance and the constant and unsustainable reduction of forest resources.

The hot and humid climate of Amazonas also differs from other regions of the country in that it has high humidity and temperatures almost all year round. Abundant rains occur with seasonal frequency, episodes of floods that flood and fertilize the land and episodes of drought that complicate the daily life of the Amazonian caboclo who feeds on fishing and communicates through the numerous waterways. These characteristics are due to the geographical position of the region (close to the equator) and the presence of large rivers and humid tropical forest, which is very important for the carbon cycle. Another extraordinary climatic difference, in relation to the other Brazilian regions, is the speed of the wind, which, in this equatorial corner of the planet, does not move as in other places of temperate climate, hinders the dilution of pollutants and, consequently, agglomerates higher concentrations in the atmosphere. (Valois Coelho, 2012)

With respect to public policies directed at the Amazon region, these differences need to be taken into account. These are differences that make Brazil a continental country with different landscapes, climates, population distribution and wealth, consequently, the different regions cannot be the target, equally, of uniform policies, such as a package distributed equally to the entire national territory. Policies must take into account the unequal regions of the country and, in this regard, the Amazon region must also be seen in its cultural and environmental diversity, considering its geographical position and the historical exploitation of its apparently inexhaustible riches.

Ultimately, the development of the state cannot copy the same devastating process that destroyed the world's forests. Here, the numerous attempts to promote "economic growth" were based on the riches of the Amazon and its potential for the implementation of rhetorical, fanciful and deceptive projects driven by greed and the desire to amass fortunes.

Instead, the development of the Amazon should aim at a balance between the preservation of natural resources and the real needs of the people of the region, avoiding the cauldron of social and environmental problems that removes real opportunities for development from municipalities in the interior of the Amazon, leaving them equally vulnerable to environmental and human degradation. The integration of the Amazon with the rest of the country has repeatedly proved to be a geopolitically incorrect and misleading attempt, as it disregards the regional specificity and the unique ethnic and cultural diversity of its people. (Fraxe, 2009)

On the other hand, Amazonians are required to understand the environmental value of this diversity and the ecological importance of its preservation. The same man who is responsible, to a greater or lesser extent, for the problems that the city faces, urgently needs to become aware of the reality that affects him with the same intensity with which he is affected.

HOUSING POLICIES AND THE DESTRUCTION OF STREAMS

Manaus was fortunate for nature with the numerous watercourses that crisscross the city and make up one of the densest and most complex urban watersheds in the world. However, a look at the history of Amazonas leads to the conclusion that the heyday experienced during the period of rubber exploitation dressed the city of Manaus with the false cloak of the "belle époque" and the natural beauties gifted by nature represented, and still represent, an obstacle to development.

The planning of the city of Manaus, at the end of the nineteenth century, disregarded the landscapes that nature offered, favoring urban projects copied from European countries. Neighborhoods were created by opening paths in the middle of the forest that, like the streams, came to represent an obstacle to progress so admired by colonizers and colonized. In addition, the Amazon rainforest is astonishingly large to justify the idea of the infinity of natural resources contributing culturally, to the mistaken thought that these "gifts of nature" would be inexhaustible. Because there was an abundance of resources and exaggerated dimensions, the conscious concern with saving nature was not justified. (Valois Coelho and Cartaxo, 2004)

The history of Manaus, which is told through the ages by several historians, demonstrates a strong hostility to nature, culminating in actions harmful to fauna, flora and other natural riches and negatively impacting the quality of life of Amazonians, especially the most vulnerable. Especially after the installation of the Manaus Free Trade Zone (1967), the urban population continued to grow at very high rates, attracting the population from the interior of the state and also from the south of the country and abroad. The domains of asphalt and concrete were expanded; allotments and housing complexes were inserted in "urban voids", as highlighted by Silva and Deus. (Silva and Deus, 1993; Azevedo, 2006)

Without real estate interest, the igarapés did not correspond to the image that the market had of the city and, under these conditions, they were gradually filled in, or polluted (those that remained) and their banks transformed into large favelas. Over time, the indiscriminate use of water, the absence of basic sanitation (the main cause of river

contamination) and the increase in the excluded population that settled there, ended up producing large pockets of poverty embedded in the central area of the city. (Azevedo, 2006)

In the case of these populations that settled on the banks of the streams, in addition to environmental, urban and landscape degradation, one must consider the unsatisfactory living conditions they experience, as they are naturally impacted by the ebb and flow during the periods of flood and ebb of the river, and also suffer the effects of the lack of basic sanitation, sanitary conditions, etc. (Silva and Deus, 1993)

Responsible for the drainage of the urban area of Manaus, the streams in the center of the city that have not been filled are all polluted, serving only as a means for the proliferation of diseases (Silva and Deus, 1993). Such a process of degradation was not insensitive to the public power, which eventually intervened in reality, with the objective of controlling nature, conditioning it to the purposes of economic power. In this context, nature and man alternated as objects of those interests, and the rhetoric of political discourse had the function of convincing the population and justifying social projects that were not committed to the effectively vulnerable population itself. Projects totally unrelated to the reality of the tropics that, as a result, ended up causing environmental degradation, depredation of ecosystems, water pollution, in addition to various public health problems.

For all this and for what was exposed in the first topic of this work, it can be stated that the pollution of the igarapés is mainly the result of the process of urban evolution and the rapid growth of the city of Manaus, which caused environmental changes, affecting the water courses and causing progressive degradation. But it is also the result of a notorious hostility between the City and Nature, a hostility that is evident when we walk through the city center and peripheries, and that has roots in cultural, economic, political and historical issues. As an example, in addition to the rapid and disorderly process of city growth, one can add the choices for urban infrastructure to the detriment of green areas. These choices point to the association of the forest and watercourses as obstacles to economic development and to the idea that environmental and preservationist legislation hinder the use of natural resources for the prosperity of the city. Thus, as the city "remodels" itself, the natural elements disappear and give way to the (de)built environment that creates an artificial space, far from the Amazonian and tropical roots. This historical practice also suggests an attitude of contempt for nature, embodied in public policies that encourage attacks on Amazonian biodiversity and encourage the degradation of this unique space on the planet. (Rocha, 2020)

Allied to these issues, the absence of basic sanitation aggravates the problem of pollution of the streams. "Sewage is rich in organic matter and nutrients" that feed microorganisms. When sewage is discharged untreated into the stream, or river or lake, ecosystems become unbalanced, increasing the population of microorganisms and increasing the consumption of dissolved oxygen in the waters. In this way, "microorganisms that do not need oxygen to survive and that release smelly gases develop." If treated properly, sewage can be discharged into water bodies without causing environmental damage. However, on the banks irregularly occupied by stilt houses (houses on stilts) where the construction of cesspools is impossible, it is common for fecal waste to be thrown directly into the streams. In these circumstances, given that the supply of organic matter is very large, contaminated sewage facilitates the transmission of waterborne diseases. (Silva and Deus, 1993, p. 39)

It is true that social problems resulting from these practices are also huge. If it is impossible to ignore that population growth without planning put pressure on the city environmentally and altered its physical space, since a large part of the pollution of the streams and loss of biodiversity was/is caused by the dynamics of the city's urban expansion, it is also possible to note, due to the reality described here, an enormous social diversity. Valued areas that boast a high concentration of income contrast with areas where the lack of opportunities and healthy living conditions reflect the exclusion and social segregation that prevail in the capital of Amazonas. (Walnut *et. al.*, 2007)

A model proposed by the government to solve the problems generated by urban densification in the city of Manaus and, mainly, on the banks of the streams that cross the city, was the Social and Environmental Program of the Igarapés of Manaus – PROSAMIM. Sold as a "new" proposal, to improve the living conditions of that population that inhabits the vicinity, bank and bed of the streams, it also conveyed the idea of "revitalization" which means promoting sanitation, desilting and rational use of the land in that space. (Azevedo, 2006)

Positive repercussions on the city's appearance under pressure from the government lobby led the media not to value the failures, among them the "garbage dump, the grounding of streams and the felling of native trees". Little vegetation, a lot of asphalt and a lot of concrete reinforce one of our most serious problems, which is the drainage of rainwater. Another argument that brings content to the discussion is the issue of the revitalization of the streams, an item that is part of the program, but which ultimately meant exclusively the removal of people who lived on floating boats or in houses on the banks of

the streams, to other places. It is clear, once again, that for the market, these people are the ones who personify environmental degradation. (Nogueira et. al. 2024, p. 115)

PROSAMIN did not invest in the environmental quality of the streams and decided to channel streams, fill areas for the construction of roads and waterproof the soil, models already considered outdated by environmental science. It is important to raise these issues and seek a dialogue about the importance of the Amazon's environmental resources for the sustainability of the planet, but also for the population that inhabits the region. This avoids contributing to the atmosphere of hostility towards environmental preservation.

DEFORESTATION AND ECONOMIC INCLUSION OF TRADITIONAL POPULATIONS

It is undeniable that the Amazon has a more than symbolic importance on the world stage and in this sense, thinking about the relationship between traditional populations and the environment meets this importance in a very positive way, as it promotes the inclusion of these peoples in the economic dynamics of the country, reconciling environmental conservation with social inclusion, food security and income generation for these populations. In addition, it contributes to the reforestation of degraded areas, is part of the Sustainable Development Goals, rescues and conserves biodiversity, and also contributes to removing CO₂ from the atmosphere, bringing solutions to current climate change (De Lima et. al., 2022)

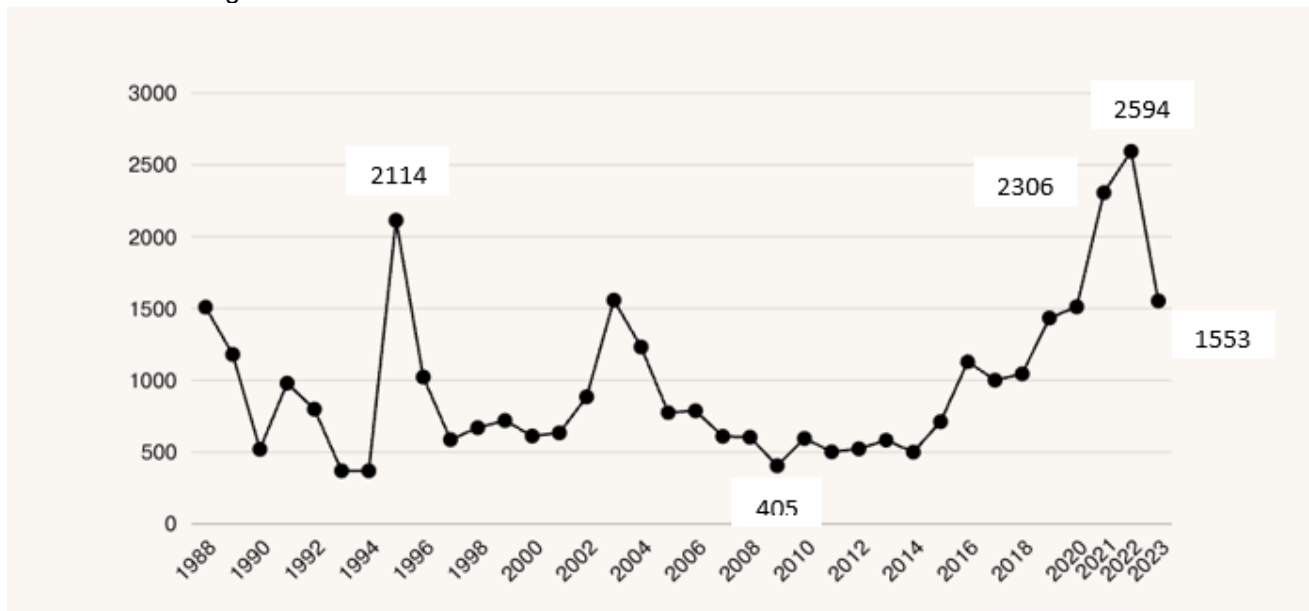
The fulfillment of goal 15 of the SDGs (Sustainable Development Goals), "Protect, recover and promote the sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and biodiversity loss" is closely related to the preservation of the Amazon environment. This environment was and still is disturbed by disorderly occupation and the increase in deforestation rates and changes in land use, causing fragmentation of forests. Fragmented forests (fragments of deforestation) are more susceptible to fire and, under these conditions, the fires spread for long kilometers because the less humid, less dense and more flammable forests do not offer resistance to the spread of fire. (Copertino et. al., 2019)

The Monitoring of the Brazilian Amazon Forest by Satellite (PRODES) is one of the monitoring systems used by the National Institute for Space Research (INPE). PRODES makes use of images sent by the Landsat satellite and produces estimates of deforestation rates for the Legal Amazon (Acre, Amapá, Amazonas, Goiás, Mato Grosso, Pará, Rondônia, Roraima and Tocantins) in order to support inspection and control agencies.

Based on data released by PRODES, figure 2 below highlights the historical evolution of deforestation in Amazonas, where it is possible to observe that in 2023 there

was the first significant reduction in deforestation since 2018, but even so, the rates are much higher than those of 2009.

Figure 2 – Historical evolution of deforestation rates in the state of Amazonas



Source – Graph prepared with the help of Canva. Data were obtained from the PRODES/INPE Project, 2024 (<http://www.obt.inpe.br/OBT/assuntos/programas/amazonia/prodes>).

For this reason, it is essential to reduce deforestation in the Amazon rainforest, but it is also necessary to recover already degraded areas, as scientific data show that the region has been exposed to rising temperatures, extreme droughts, and criminal deforestation, the rates of which may be accelerating the process of "savannization" of the rainforest. This process may become irreversible, that is, the Amazon may be very close to a tipping point (point of no return), resulting in new CO₂ emissions into the atmosphere and significantly altering rainfall patterns, food production, and water and energy security. (WRI Brasil, 2022 (a,b); Valois and Cartaxo, 2022; Flores, 2024).

When we talk about the recovery of degraded areas, we are also dealing with economic development, as the Amazon has wealth that can be transformed into an export product, generating more jobs and more income for rural populations. Indigenous people, riverside dwellers, extractivists and small rural producers, many of whom have no access to credit, no training and no chance to participate in the market, need to be included in an effective effort to create a sustainable economy. (Biderman, 2024)

Restoring degraded areas means new opportunities for the inclusion of new agroforestry products in the market, such as native or exotic tree species. It is also possible to rescue traditions of consumption of several species that have disappeared from the market, such as some native fruits, of enormous cultural value. Finally, it can also open up

opportunities for new markets such as bioeconomy, circular economy, carbon market or environmental services in general. These cropping systems are better resistant to climate change and take advantage of resources with lower costs and reduced use of inputs. By putting into practice environmentally correct projects for some products such as flour, pirarucu, guarana, nuts, bananas or some fruits that are already practically extinct, the bioeconomy can guarantee support to the communities that live on the banks of streams and rivers. (De Lima et. al., 2022; FAS, 2022)

An example that worked with the sustainable use of the Amazon's resources was controlled fishing that took the pirarucu out of the threat of extinction. The sustainable management of this resource has allowed pirarucu, an Amazonian delicacy, to become a source of income for 217 families living in 11 communities of the Mamirauá Sustainable Development Reserve (RDS), with a gross revenue of more than R\$ 423 thousand in 2021 alone. (FAS, 2022)

Finally, the priority given to the construction of roads, buildings and other structures has led to the reduction of spaces for green areas and afforestation. To reverse this situation, it is understood that effective public policies aimed at increasing urban afforestation, such as tree planting programs in public and private spaces, can contribute to the recovery of the city's wooded areas. It is essential that measures are adopted that promote sustainable urban planning, the dissemination of information about the importance of green areas for the quality of life of the population and the implementation of policies for afforestation and preservation of green in the city.

THE CONTROVERSIAL PAVING OF BR 319 AND THE AMAZON RAINFOREST

Another unsustainable activity that fostered the degradation of forest areas in the Amazon was the construction of highways. In this regard, some mistakes of the past have been perpetuated in the present. The Environmental Impact Study and Environmental Impact Report (EIA/RIMA) required for these projects does not reflect the main impacts of these projects, such as the environmental cost of deforestation that goes far beyond highway routes, and the migration that inevitably occurs when access is facilitated. (Fearnside, 2006)

In the past, at the time of the construction of the BR-010 highway known as Belém-Brasília, the EIA-RIMA was not yet required, a document created only in 1981 through Law No. 6,938/81 (Brasil, 1981).⁴ Defended as the solution for the integration of the Amazon

⁴ This law, based on items VI and VII of article 23 and article 235 of the Constitution, establishes the National Environmental Policy, its purposes and mechanisms for formulation and application, constitutes the National Environmental System (Sisnama) and establishes the Environmental Defense Registry. (Brazil, 1981)

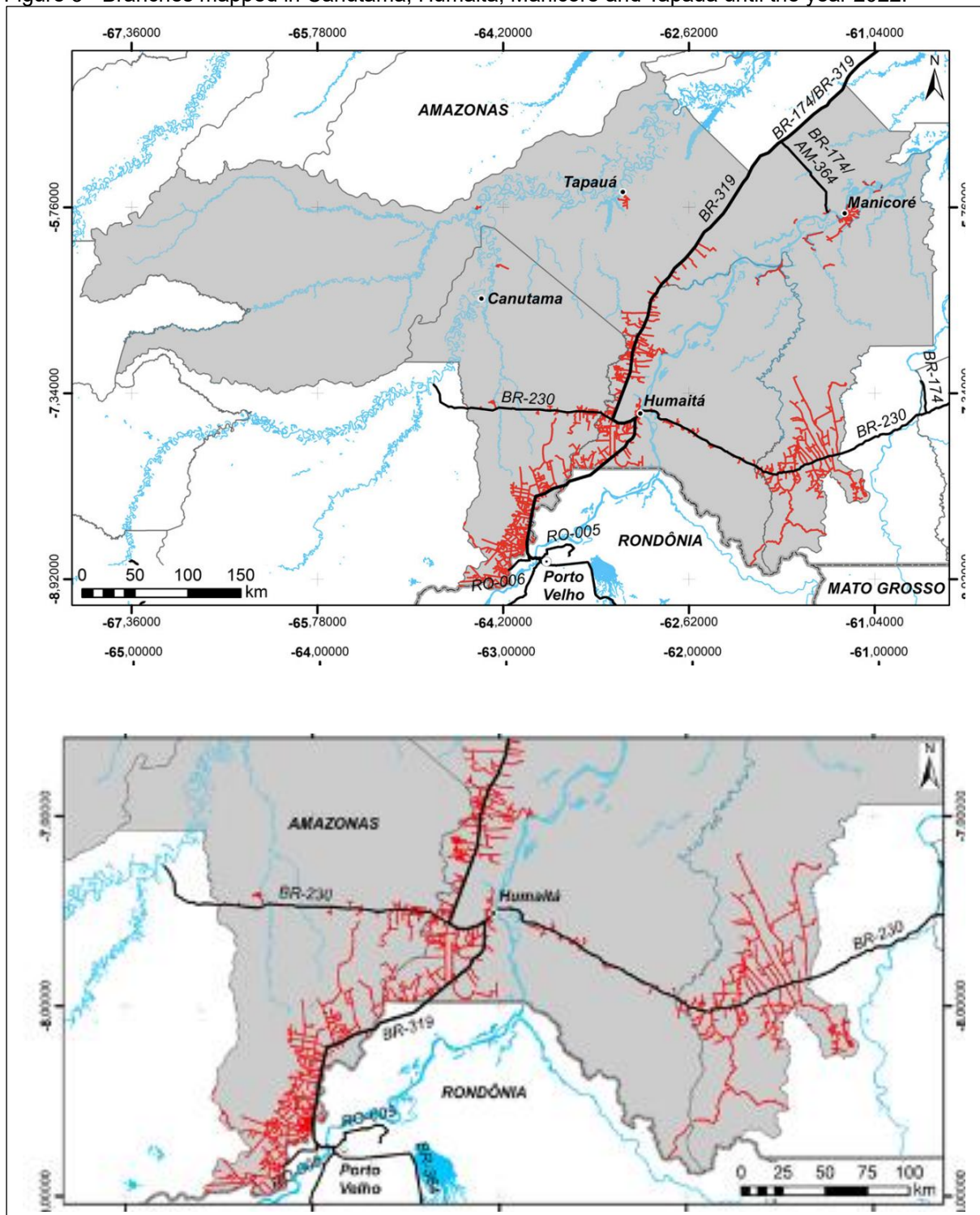
region with the rest of the country, the construction of the Belém-Brasília highway (BR-010) and the consequent migratory flow that the road attracted to the region, clearly showed the phenomenon of transformation of land into merchandise. Inspired by the interests of the automobile industry and not by the desire to colonize the interior *per se*, the road was mainly responsible for the acceleration of the occupation process that occurred from then on. It is estimated that it attracted 174,000 migrants in the period 1960-1970 in an unplanned and disorganized way. (Hall, 1991; Valois Coelho, 2007)

In the state of Amazonas, the BR-319 inaugurated in 1976, was also inspired by the interests of the market, also stimulated as a solution for the integration of the state of Amazonas and the connection of the city of Manaus with the other regions of Brazil by land⁵. There is, in this logic, a destructive process of the forest that opens the way for deforestation, land grabbing, inadequate use of the region's soil for pasture, monoculture, etc. The population is divided between those who want the paving of the road, currently in precarious traffic conditions, and those who are against the paving work. What is proposed by the "developmentalists" is the reconstruction of the highway that today is partially taken over by the forest. (Lima and Araújo, 2023)

On the other hand, environmental science counters arguments against deforestation that could reach 150 km from the sides of the road and hurt a region that is still preserved, threatening the forest that needs to be kept standing to generate environmental services. Deforestation reduces the availability of forest resources that could serve as a source of income for traditional communities, as long as investments are directed in this direction. Also of concern is the opening of branches within the indigenous territory. The branches known as "fish bones" are always opened with the arrival of farmers, ranchers, hunters, etc., when roads are paved in the Amazon. All this means an increase in predatory occupation, as the impacts of a highway like BR-319 go far beyond the area that is close to the road. The branches, almost always illegal, cut through the forest from the main highway and form a design that resembles that of a fishbone. (Lima and Araújo, 2023; Fearnside, 2022; Albuquerque, 2023)

⁵ The BR-319 highway connects the capital of Amazonas, Manaus, to the capital of Rondônia, Porto Velho. Its route is just over 870 km long and runs through a large portion of the Purus-Madeira interfluvial region. (Observatory, BR-319)

Figure 3 - Branches mapped in Canutama, Humaitá, Manicoré and Tapauá until the year 2022.



Source – <https://observatoriobr319.org.br/>

The study prepared by the BR-319 Observatory pointed to an increase in the network of branches of 5.8 times greater than the length of the BR-319 itself. The study detected that the network grew from 4,752 in 2021 to 5,092 in 2022, mainly in the municipalities of Canutama, Humaitá, Manicoré and Tapauá, in the state of Amazonas. The main vectors of this growth are: land grabbing, deforestation and forest degradation. (IDESAM, 2023)

With the help of the branches, about 21,600 hectares of forests were deforested in the BR-319 region during 2020, and this number has increased progressively in subsequent years. In 2021, according to the BR-319 Observatory, deforestation grew more than double, reaching 45,300 hectares and in 2022 alone, 48,000 hectares of deforestation were recorded. (Observatory BR-319, 2023)

What is missing to improve the communication problem of the state of Amazonas is not highways, what is missing is logistical planning that leads to considering waterway transport as an important alternative that meets the very vocation of the Amazon region where the river commands life. The highway, if paved, in addition to the environmental impacts that will affect the forest, streams, lakes and populations, will not solve the problem of communication with the large developed centers, because the distances will remain large, as continental as the state of Amazonas. One must also consider the forest's capacity to absorb carbon and its task of curbing climate change, very precious factors that justify the fight against deforestation in a region of continuous forest that the BR-319 highway crosses. (Fearnside, 2020)

Controlling deforestation is essential to avoid the impacts of forest loss, a task that depends on human decisions. Today this task is in the hands of the current generation that needs to get involved with passion, because it is definitely a collective commitment to the future that can no longer be postponed.

CONCLUSION

The idea that nature is infinitely capable of regenerating itself and providing unlimited resources is a myth that has been perpetuated over time, without taking into account the limits and fragility of ecosystems. Short-term economic interests that lead to the intensive exploitation of natural resources disregard the long-term consequences of environmental degradation and the depletion of these resources. "Sustainability" is spoken of as a remedy for environmental ills, but sustainability is not only linked to the environment. It also involves economic activities whose impact on the environment can be dramatic, all the more so because the Brazilian economy has always been marked by a very high degree of concentration of income and wealth and has left strong wounds in society characterized by high levels of inequality and unsustainability. (Valois Coelho and Cartaxo, 2004)

There is, apparently, a conflict between environmental preservation and progress, but it needs to be faced quickly and urgently because in regions like Amazonas, nature plays a relevant role in the climate and in the local ecosystem. In fact, in places with a hot climate such as the capital of the state of Amazonas, the presence of green areas, such as

parks and tree-lined streets, is crucial to mitigate the hardships of the heat, to improve air quality, protect biodiversity, and provide spaces for coexistence and leisure for the population.

Throughout the Amazon region, the close relationship between cities, streams, forest, and indigenous communities is a complex and multifaceted relationship, generally poorly understood by urban authorities and planners, whose vision of progress prioritizes economic development over environmental quality and disregards the importance of natural resources and the traditional ways of life of local communities. It is possible to verify the difficulty in understanding environmental concepts, the interconnections between them and the limitations of ecosystems in the population itself.

To change this reality, it is essential to promote an intense campaign on the finiteness and importance of natural resources, as well as on the need for sustainable practices for their use. Environmental education, the strengthening of conservation policies and the rational use of resources, and the appreciation of biodiversity are fundamental to combat mistaken and disconnected ideas, while promoting environmental preservation.

In this article we address the mutual relationship between city and forest that urgently needs to be faced beyond the immediatist vision of the market, establishing the regional differences that should be determinants of the way of life and production in the region. There is no way to escape this reality that is imposed by nature itself: the river is the way.

The importance of the balance between socioeconomic progress and environmental preservation for the sustainable development of the region is emphasized, through initiatives that promote the conscious use of natural resources, the appreciation of indigenous culture, and integrated urban and environmental planning in order to contribute to inclusive progress. It is necessary to create new paths of development; Society, local authorities, companies and organizations must act collaboratively and responsibly to find innovative and sustainable solutions that reconcile development with quality environmental and human life, respecting the cultural diversity and natural wealth of the Amazon region. Awareness, environmental education, and engagement of the population are key to promoting positive change and building a more resilient and sustainable future for Manaus and the Amazon region as a whole.


REFERENCES

1. Albuquerque, R. A. de. (2023). Risco de desmatamento na BR-319 já era previsto há duas décadas, mas processo de licenciamento continua. *Observatório do Clima*. Disponível em: <https://oc.eco.br/risco-de-desmatamento-na-br-319-ja-era-previsto-ha-duas-decadas-mas-processo-de-licenciamento-continua/>. Acesso em 28.07.2024.
2. Alkmin, J. T. D. (1997). *Potencial de Cogeração no Estado do Amazonas* (Dissertação de mestrado). Repositório UNIVEI – Campus 1: Itajubá PPG – Programa de Pós-Graduação: Mestrado - Engenharia Mecânica.
3. Araújo, J. de. (2003). Estado, Educação e Cidadania: Vetores de Reflexão em Busca da Sustentabilidade na [NOVA] Ordem. *Educação Ambiental em Ação*, (6), 17 de setembro.
4. Azevedo, R. V. (2006). Revitalização dos igarapés: Para quem. In *Anais do XV Congresso Nacional do CONPEDI*, Manaus.
5. Biderman, R. (2024). Por que é importante manter a floresta em pé, e quais soluções podem ser implementadas para garantir isso? In *Cadernos Vale a Pena Perguntar: Meio Ambiente e Desenvolvimento*. Fundação FHC. Disponível em: <https://fundacaofhc.org.br/repositorio/cadernos-vap-meio-ambiente-e-desenvolvimento-web.pdf>. Acesso em 28.07.2024.
6. Brasil. (1981). Lei nº 6.938, de 31 de agosto de 1981. Dispõe sobre a Política Nacional do Meio Ambiente, seus fins e mecanismos de formulação e aplicação, e dá outras providências. Disponível em: https://www.planalto.gov.br/ccivil_03/leis/l6938.htm. Acesso em 28.07.2024.
7. Copertino, M., Piedade, M. T. F., Vieira, I. C. G., & Bustamante, M. (2019). Desmatamento, fogo e clima estão conectados na Amazônia. *Ciência e Cultura*, 71(4), 04-05.
8. De Lima, R. M. B., De Souza, C. R., Matschullat, J., & Da Silva, K. E. (2022). Recuperação de áreas degradadas ou alteradas na Amazônia. *Embrapa Amazônia Ocidental*. Disponível em: <https://ainfo.cnptia.embrapa.br/digital/bitstream/doc/1143156/1/Doc157.pdf>. Acesso em 18.07.2024.
9. Fearnside, P. M. (2006). Desmatamento na Amazônia: dinâmica, impactos e controle. *Acta Amazônica*, 36, 395-400.
10. FAS. Fundação Amazônia Sustentável. (2022). Bioeconomia: a importância potencial do Amazonas. Disponível em: https://fas-amazonia.org/blog-da-fas/2022/04/06/bioeconomia_do_amazonas/. Acesso em 28.07.2024.
11. Flores, B. M. et al. (2024). Critical transitions in the Amazon forest system. *Nature*, 626(7999), 555-564.
12. Fraxe, T. de J. P., Witkoski, A. C., & Miguez, S. F. (2009). O ser da Amazônia: identidade e invisibilidade. *Ciência e Cultura*, 61(3), 30-32.
13. Hall, A. (1991). *Amazônia: desenvolvimento para quem?* Rio de Janeiro: Jorge Zahar. 304p.

14. IBGE. (2015). *Biblioteca*. Disponível em: <https://biblioteca.ibge.gov.br/biblioteca-catalogo.html?id=440452&view=detalhes>. Acesso em 25.07.2024.
15. IBGE. (2024). *CNEFE. National Register of Addresses for Statistical Purposes*. Disponível em: https://censo2022.ibge.gov.br/panorama/?utm_source=ibge&utm_medium=home&utm_campaign=portal. Acesso em 17.07.2024.
16. IDESAM. (2023). Estudo aponta que rede de ramais na porção sul da BR-319 é quase seis vezes maior que a própria rodovia. *Instituto de Conservação e Desenvolvimento Sustentável do Amazonas*. Disponível em: <https://idesam.org/noticia/estudo-aponta-que-rede-de-ramais-na-porcao-sul-da-br-319-e-quase-seis-vezes-maior-que-a-propria-rodovia/>. Acesso em 28.07.2024.
17. INPE. (2024a). Como se monitora o desmatamento da Amazônia. *Instituto Nacional de Pesquisas Espaciais. Ministério da Ciência, Tecnologia e Inovações*. Disponível em: <http://www.inpe.br/faq/index.php?pai=6>. Acesso em 22.09.2024.
18. INPE. (2024b). PRODES-Amazônia. Monitoramento do Desmatamento da Floresta Amazônica Brasileira por Satélite. *Instituto Nacional de Pesquisas Espaciais. Ministério da Ciência, Tecnologia e Inovações*. Disponível em: <http://www.obt.inpe.br/OBT/assuntos/programas/amazonia/prodes>. Acesso em 20.09.2024.
19. Lima, L., & Araújo, A. C. (2024). Uma BR-319 no meio do caminho. Reportagem disponível em: <https://amazoniareal.com.br/especiais/br-319/>. Acesso em 22.07.2024.
20. Mozeto, A. A. (2001). Química atmosférica: A química sobre as nossas cabeças. *Cadernos Temáticos de Química Nova na Escola*. Edição especial – maio.
21. Nogueira, A. C. F., Sanson, F., & Pessoa, K. (2007). A expansão urbana e demográfica da cidade de Manaus e seus impactos ambientais. In *XIII Simpósio Brasileiro de Sensoriamento Remoto*, Florianópolis, Brasil, 21(26), 5427-5434.
22. Nogueira, C. B. C., Lisboa, G. E., & Evangelista, T. L. (2024). PROSAMIM sob o prisma ambiental-penalista: Uma análise jurídico-política da situação do tratamento da água dos igarapés nas regiões de assentamento precário ambientalmente vulneráveis. *Revista Ibero-Americana de Humanidades, Ciências e Educação*, 10(3), 102-123.
23. Observatório BR-319. (2023). Nota Técnica, Nº 04 - Julho 2023. Abertura e expansão de ramais em quatro municípios sob influência da rodovia BR-319. Disponível em: <https://observatoriobr319.org.br/wp-content/uploads/2023/07/Nota-Tecnica-OBR-319-n04-Julho-2023-parte02-v5.pdf>. Acesso em 20.09.2024.
24. ONU. (2024). *Nações Unidas, Brasil. Objetivos do Desenvolvimento Sustentável (ODS)*. Disponível em: <https://brasil.un.org/pt-br/sdgs>. Acesso em 28.07.2024.
25. PRODES-Amazônia. (2024). *Monitoramento do Desmatamento da Floresta Amazônica Brasileira por Satélite. Observação da Terra – INPE*. Disponível em: <http://www.obt.inpe.br/OBT/assuntos/programas/amazonia/prodes>. Acesso em 20.09.2024.

26. Rocha, S. (2024). Manaus, uma cidade hostil à natureza. In **AmazonasATUAL**. Disponível em: <https://amazonasatual.com.br/manaus-uma-cidade-hostil-a-natureza/>. Acesso em 25.07.2024.
27. Silva, E. N. dos S., & Deus, C. P. de. (1993). A expansão de Manaus como exemplo de Processo de extinção dos igarapés. In **Bases Científicas para Estratégias de Preservação e Desenvolvimento da Amazônia** (pp. 25-42).
28. Valois Coelho, I. M., & Cartaxo, E. F. (2004a). O consumo e o desperdício de energia elétrica e sua relação com a distribuição de renda. In **IV Congresso Brasileiro de Planejamento Energético**, Itajubá. Anais. Itajubá: Universidade Federal de Itajubá-UNIFEI. CD-ROM.
29. Valois Coelho, I. M., & Cartaxo, E. F. (2004b). Universalização da energia elétrica: uma análise política da distribuição de energia e da sua importância socioambiental para o Amazonas. In **Proceedings of the 5th Encontro de Energia no Meio Rural**. Disponível em: <http://www.proceedings.scielo.br/pdf/agrener/n5v2/123.pdf>. Acesso em 28.07.2024.
30. Valois Coelho, I. M. (2007). **As possibilidades da educação ambiental para a redução do desperdício de energia elétrica na cidade de Manaus** (Dissertação de mestrado). Universidade Federal do Amazonas, Centro de Ciências do Ambiente, Programa de Pós-Graduação em Ciências Ambientais e Sustentabilidade na Amazônia.
31. Valois Coelho, I. M. (2012). **Estudo dos níveis de concentração de óxidos de nitrogênio em área urbana da capital amazônica por analisadores automáticos** (Tese de doutorado). Universidade Federal do Amazonas, Curso de Pós-Graduação em Química Analítica.
32. Valois Coelho, I. M., & Cartaxo, E. F. (2022). Amazon cities and climate change. **International Journal for Innovation Education and Research**, 10(11), 189.
33. WRI Brasil. (2022a). Nova economia para a Amazônia. **Programa de Clima**. Disponível em: <https://www.wribrasil.org.br/projetos/nova-economia-da-amazonia>. Acesso em 21.07.2022.
34. WRI Brasil. (2022b). 5 fatos importantes e tendências que vão marcar a agenda ambiental no Brasil em 2022. **WRI Brasil**. Disponível em: <https://www.wribrasil.org.br/noticias/5-fatos-importantes-e-tendencias-que-vaomarcara-agenda-ambiental-no-brasil-em-2022>. Acesso em 21.07.2022.

GOVERNANCE AND MUNICIPAL MANAGEMENT: A LOOK AT THE HUMANIZATION AND CITIZENSHIP OF THE POPULATION OF PALMAS FROM THE PERSPECTIVE OF PUBLIC ADMINISTRATION

 <https://doi.org/10.56238/sevened2024.029-027>

João Manuel de Souza Will¹

ABSTRACT

This article deals with an excerpt from the research *Municipal Governance: A Challenge for Innovative Management of the Sustainable City of Palmas -TO/Brazil*. The study aims to identify and analyze the challenges faced by the management practices of the city hall. The methodology consisted of the development of a qualitative approach with a survey of the literature and research developed prior to this study. The bibliographic analysis and documentary analysis indicated that the city of Palmas has been using a variety of instruments for municipal administration in order to govern the city. Planning was an essential instrument for the following government actions: formulation and implementation of public policies at the municipal level; the evaluation of public management performance and sustainable management. This work was based on documents related to research and bibliographic works that discussed the issue of governance from the creation of the city until the 2000s. During this period, public policies did not significantly meet the needs of the low-income population, there was privilege of those with greater purchasing power with regard to urban organization and housing construction. In the years following up to 2021, problems were identified through government actions, giving rise to planning to alleviate the situation of social segregation created by previous public administrations. Conclusion, the main difficulties presented, such as budget, insufficiency of resources, accompanied by issues of performance of actions, fell on the lack of efficiency and effectiveness in the use of financial resources, in the management practices of the municipal administration in serving the population with lower purchasing power and in society in general. This generated the challenge for meeting the goals related to the construction of quality housing and meeting the needs of the vulnerable population, as well as with the resolution of issues of education, health, security and urban mobility.

Keywords: Governance. Management. Humanization. Citizenship. Public policies.

¹ Associate Professor III at the Federal University of Tocantins.

Master's degree in Rural Administration and Rural Communication from the Federal Rural University of Pernambuco (1989).

Bachelor's degree in Business Administration from the Federal University of Rio Grande do Norte (1989).

Doctor in Curriculum Development from the University of Minho, Portugal (2015).



INTRODUCTION

The city of Palmas (TO) is located in the North Region with 34 years of existence, led the ranking of sustainable capital in 2020, ranking 11th among Brazilian capitals, pointed out by the Sustainable Development Index of Cities (IDSC-BR). However, many challenges need to be faced to minimize the problems of large cities that have begun to emerge, such as: poverty, homelessness, crime, deficit of public health care, among others.

However, the city's governance aims to contemplate the areas of health, education, income, housing, social assistance, color and gender equality, access to water and basic sanitation, energy, public safety, among others. Considering this status of Palmas, what do the studies carried out so far say and what are the challenges faced by municipal governance to insert and maintain Palmas in this leadership position among the Brazilian states?

This article aims to explain the study on governance and management of Palmas/TO between 2020 and 2024, a research linked to the Administration coordination of the Federal University of Tocantins. Thus, the city's management was taken as a parameter with regard to the measurement of planning, public management performance and institutional, social, environmental and economic sustainability. In the UN's conception, governance must be effective for sustainable development, so that in all countries public institutions at different levels are inclusive and participatory and accountable to the population (BRASIL, 2018).

In recent years, due to the pressures they receive from society, municipal governments have been assuming new responsibilities and new postures regarding public policies that affect the quality of life of the population, especially the poorest citizens, who increasingly demand the attention of the public power to their needs such as health, education, housing, transportation, work and income. Many innovative experiences, especially those that enable popular participation and create public spheres of negotiation, have signaled the ability of local governments to act in areas that they previously did not consider to be the competence of the government, however, the new posture has allowed management with good results.

It is important to understand how the city's public management has been promoting and managing social services such as health, administrative management, economic policies, housing, infrastructure, and the environment, among other services that ensure the sustainability of the city or may become obstacles that need to be overcome. From the initial study, it is possible to register the first impressions of how the municipal government has been proceeding, registering a scenario of aspects related to management in the face of governance challenges.



In view of the situation, the question was asked what is the governance model and how is sustainable management implemented by the city hall in the city of Palmas de Tocantins in the face of the challenges faced?

Considering that municipal governance occurs as a process of dialogue between the municipality and the organized civil society, aiming at the definition and implementation of public policies for local sustainability, in this initial part, the study has been guided by the following objectives: to identify and analyze the main management instruments for the execution of the municipal policy of the city of Palmas to raise and evaluate the main challenges in the management of public space and in the implementation of public policies. theme of humanization and citizenship.

Considering the breadth of the investigation, the study at this stage presents a cut of bibliographic and documentary research, allowing the confrontation of data according to the size of the research.

REFLECTIONS ON THE BASIC CONCEPTS OF THE RESEARCH

The theoretical models of Public Administration are the basis for supporting the investigation, considering the models of modern public management; governance, post-bureaucratic administration and economic theory. The discussion is made in view of the different patterns of interaction between society and national and international government institutions. Some concepts related to the decision-making system at the municipal level, the mechanisms of decentralization and the municipalization of public policies, which contributes or not to greater participation of citizens, transparency, the public responsibility of municipal governments in the management of public affairs, taking into account public services and goods.

To respond, the categories investigated, governance; municipal management; public sector and government actions, the theoretical framework for the study in order to sustain the information, adopted a theoretical framework with works by authors such as: Cruz (2001); Certo (2003); Rocha (2003); Chiavenato (2003); Wood (2005) and other theorists related to the object of study.

In this context, governance can be understood as the management of the course of events in a social system, as the sum of the various ways that individuals and institutions, public and private, have to plan and manage the common affairs of the city. For Azevedo and Anastasia (2002, p.80) governance "are the forms of dialogue between the State and organized groups in society, with regard to the process of defining, monitoring and implementing public policies".



The public sector is understood to be one that presents an organizational system of extreme complexity in its dynamics in the relationship with society, as it vertically crosses the various levels of action of organizations and governments: local, regional, national and global.

GOVERNANCE AND PUBLIC MANAGEMENT

The relations between public management and citizens have been impacted by constant technological, social, economic and political development, in the face of innovations and improvement of public management.

Municipal management, like any management at other levels of government, works from the delegation of powers. According to Hungarian (2020), the delegation of powers from society to its elected representatives (rulers) legitimizes public institutions to delegate powers to senior management, managers, and employees. This relationship between citizen and municipal public management can be affected in the Administration process, due to the bureaucracy that hinders and/or hinders the guarantee of the rights and interests of the population.

However, when resorting to the Public Governance Policy Guide (Brasil, 2018), it is recommended that governance is important to promote the social and economic development and well-being of any society and its population. Governance can be the ability to establish goals and develop programs, allowing the achievement of the objectives proposed for society or a specific group, while management refers to the principles related to the functions of planning, organizing, directing and controlling the application of actions aimed at achieving the proposed objectives.

In this sense, Governance can be linked to the sustainable management of public businesses and the concept of urban sustainability understood as a social system, as the sum of the various ways that individuals and public and private institutions interact to plan and manage the common affairs of the city, providing economic and social development.

Public governance in Brazil has been an instrument of the federal government's standardization, article 2 of Decree No. 9,203, of December 22, 2017, establishes its definition: "I public governance - a set of leadership, strategy and control mechanisms put in place to evaluate, direct and monitor management, with a view to conducting public policies and providing services in the interest of society" (BRASIL, 2023).

In the governance and management of society, the main focus is the integration of planning and action, in order to involve the three sectors: public, private and organized civil society; the analysis of the impact of human development and the democratization of



relations. In the case of cities, the democratic participation of citizens and the strengthening of public services will be discussed.

A municipal governance structure is made up of a network of bodies and sectors that establish relationships with each other, such as departments, ministries, government agencies, universities, commercial companies, NGOs, churches, and different sectors of society.

Governance is a highly complex issue because it involves a range of variables and a country of continental dimension such as Brazil, with a system of government at the level (federal, regional, state and municipal).

GOVERNMENT ACTIONS

The actions of evaluating, directing and monitoring are the three main actions of public governance. Evaluating means the integral analysis of social, economic, and technological scenarios, based on three aspects, according to Hungarian (2020), on social needs, the availability of financial resources, and the results of public policies delivered by public institutions. Directing refers to the coordination and integration of public policies and services based on the evaluation carried out. In this type of action, the values, goals and indicators that guide the execution of public managers are prioritized. Monitoring is the follow-up of the execution of programs and planned actions, comparing indicators, planned goals and expectations of stakeholders with the results achieved.

Management can be understood as responsible for planning, developing, executing and monitoring activities in accordance with the direction defined by the governance body, in order to achieve the proposed objectives.

Principles of Governance

Public governance varies according to the context and its functions, but there is something in common, the principles, in Brazil, highlighted by Decree Law No. 9,203/2017 (BRASIL, 2023) in article 3. I Responsiveness; II Integrity; III Reliability; IV Regulatory improvement; V Accountability and Accountability; VI Transparency.

According to Hungarian (2020) Responsiveness refers to the meeting of citizens' needs by public institutions. Integrity is related to consistent alignment and adherence to common values, principles, and ethical norms, to sustain and prioritize the public interest over private interests in the public sector (HUNGARIAN, 2020; OECD, 2017). The OECD recommends that integrity be fulfilled through commitment, accountability, strategies and standards.



Reliability is understood as the ability of institutions to minimize uncertainties for citizens in the social, economic, and political context. Regulatory improvement concerns the development and evaluation of policies and normative acts in a transparent process.

Accountability and accountability is related to public bodies and managers through their actions, decisions, conducts, competencies and actions developed with public resources. Transparency is characterized by the need to access all information produced by the public organization in order to maintain control over public management.

PUBLIC ADMINISTRATION

Public administration throughout history has taken on a new configuration, in Brazil it is understood as the management of public interests through the provision of public services. For Madeira (2010) it is the implementation of public policies contemplated in the Federal Constitution.

Also according to Madeira (2010) and MS (2019), Public Administration can be interpreted as the administrative activities performed by a set of organs, legal entities and state agents to ensure collective interests and provide services in order to meet the needs of the population of a region or place.

The new capitalist production model has been influencing public administration, which does not constitute a monopoly of the executive power. according to Madeira (2010), the executive is responsible for the administrative function of the State. In Brazil, public administration has been carried out by two forms of action, direct and indirect (Madeira, 2010; Matias-Pereira, 2022; MS, 2019).

Direct public administration is composed of bodies directly connected to the federal, state and/or municipal sphere, directly linked to the head of a certain governmental sphere. Such bodies do not have their own legal entity (the legal entity belongs to the union, or to the State, or to the Municipality), nor their own assets and their expenses depend on the public budget according to a certain implemented policy. This type of administration provides or executes public servants.

Indirect public administration is one linked to other entities with its own legal entity, its own assets and expenses deducted from its own budget. Recognized as Autarchies, public companies, mixed-capital companies and foundations. (MADEIRA, 2010; MATIAS-PEREIRA, 2022; MS, 2019).

METHODS AND TECHNIQUES

This qualitative research had as instruments the articles, monographs, dissertations (called texts) and the documents existing in the city of Palmas, forming a framework enabling the visualization of the texts and documents analyzed. The research was linked to the government policy of the city of Palmas and the government actions of the City Hall related to governance and management. The results of the reports were related to the implementation and monitoring of actions, with a view to meeting the sustainability dimension of the city's management. The following table presents the information of the survey.

Table 1. Research design

Activities		Duration Months	Dependency
A	Revision of the classics of Public Administration, new public management" (NGP) and contemporary public management model.	6	-
B	State of the art: Review of the work carried out in the area of State Theory, governance and municipal management of Palmas. selection and critical analysis of the bibliography	6	-
C	Survey of the methodological framework: selection of data collection and analysis methods.	6	-
D	Analysis, synthesis and reporting of the first results	6	ABC
Total		12	

Source: Author (2024).

This analysis is not intended to repeat or reproduce the data presented by texts or documents. With regard to the texts, the important thing was to articulate the various perspectives on the issue of humanization and the citizenship established in the city in the short journey through time and history of Palmas; In relation to the documents, it focuses on the analysis of the objectives and indicators of the programs related to the Sustainable Development Goals (SDGs) in the humanization and citizenship axis, proposed in the governance and management of the PPA 2022-2025. Such analysis is related to the object of study of this research (Municipal Governance: a Challenge for Innovative Management of the Sustainable City of Palmas -TO/Brazil).

The content analysis method was used following the necessary steps for the development of the investigation. In the first stage, 20 texts were selected (articles and dissertations and a collection of articles in book form) with discussions of research developed between 2012 and 2023 and three documents (The PPA; the Guidelines for the construction of the PPA 2022-2025 and The results report for 2022) allowing content analysis.



Considering Morgado's (2012) discussions about this type of analysis, the contents are those conveyed by the social and academic communication, the texts contribute to the formation of public opinion or in the case of academic texts that communicate the result of research or experiences, using a scientific language based on scientific knowledge.

In the case of this investigation, the academic texts and documents selected were those with logical validity and adequacy to the objectives of the research. Category analysis was the technique used, with the information systematized in tables through the objective coding of each text and document read and categorized, recording the definition of the categories and the definition of the units of analysis (unit of registration and unit of context).

RESULTS AND DISCUSSION

BACKGROUND RESEARCH

The twenty texts analyzed in the bibliographic research address the main governance instruments, through issues of management of plans and projects, linked to the creation of Palmas.

The researches addressed in the analyzed texts presented the discussion on the creation of the city and the management of public space and the governance of Palmas, in the late 1980s and early 2000s, with regard to the distribution of urban space and environmental sustainability. It was found that problems created in the urban planning management process emerged, with the separation of social classes, underlying the issues of environmental and social sustainability and democratic management.

What the research addressed in the analyzed texts express.

The main governance instruments plans, projects and actions appear in the analyzed bibliography, the analyses highlight issues related to the management of the city since the creation of Palmas, such as: the occupation of urban space, demographic control, economic, environmental and social sustainability and the basic rights of citizens, including housing and infrastructure. The initial management and those of later years constituted the bases of public administration with situations that have become challenges for public management in recent years. The texts highlighted the themes presented in chart 2.

Table 2. Main management instruments for the execution of the municipal policy of the city of Palmas.

Texts	Indicators of management tools					
	Planning Measurement	Performance evaluation of public management	Sustainability			
			Institutional	Environmental	Social	Economic
T1	✓	✓				
T2	✓	✓	✓	✓	✓	
T3	✓	✓	✓	✓	✓	
T4		✓	✓	✓	✓	
T5		✓	✓	✓	✓	
T6		✓	✓	✓	✓	
S7		✓	✓	✓	✓	
T8	✓	✓	✓	✓	✓	
T9	✓	✓	✓	✓	✓	
T10			✓	✓		✓
T11						
T12						✓
T13		✓	✓			
T14		✓	✓			
T15		✓	✓		✓	
T16		✓	✓		✓	
S17		✓	✓		✓	
S18		✓	✓			
S19		✓		✓	✓	
T20	✓	✓	✓		✓	

Source: author (2024).

The discussion about the creation of the city and the management of public space and the governance of Palmas, in the late 1980s and early 2000s, with regard to the distribution of urban space and environmental sustainability in the process of execution and management of urban planning, the problems emerged, in view of the distortions of the city's management actions, such as: the separation of social classes, environmental and social sustainability issues and democratic management that were not complied with in the public administration process.

Fragments of the Planning of Palmas: From Creation to the 2000s.

The categories addressed express the discussion of the initial planning of Palmas and the actions arising from the strategic and tactical planning, discussing the issue of the city's settlement policy and the participatory master plan and the urban plan. Thus, From the initial stage of the construction of the city until the 2000s, planning, environmental policy, social policy, and economic policy were management instruments, but a gap was created in the issue of effectiveness, transparency, and participation.

Table 3. Planning and management of public space.

Indicators	Description
Public space and demand for quality space Planning measurement	<p style="text-align: center;">Initial planning for the 2020s</p> <p>The creation and structuring of Palmas were based on the exclusionary logic of urban space; Palmas' settlement policy present in urban planning caused inequality and a series of urban, social and environmental problems;</p> <p>Territorial occupation of Palmas has distanced itself from the Urban Plan.</p> <p style="text-align: center;">Palmas settlement policy</p> <p>Control of the space occupied in the face of the increase in the population of internal migrants;</p> <p>The planning for the management of the municipal policy of the city of Palmas concerning the Settlement Policy has distanced itself from Urban Planning. It was based on commercial relations, with commercial transactions of the city's lands.</p>
	<p>Measurement of public space management instruments</p> <p>Diagnosis for the construction of the city's strategic planning, the following instruments were created:</p> <ul style="list-style-type: none"> • Urban plan in the search for problem solving; • Traditional instruments of urban planning to reduce social inequalities; • New configuration of macrozoning from the Statute of the City of Palmas; <ul style="list-style-type: none"> • Proposals for Special Zones of Social Interest (ZEIS); • The ZEIS is used with the intention of the municipal executive to make social inclusion. <ul style="list-style-type: none"> • Proper use of the property as an instrument of social inequality; • The function of the instruments to make real estate accessible to the population and provide the public authorities with conditions to implement housing programs; • Spatial planning strategy; <p>However, the practice of creating territorial planning instruments linked to real estate interests continued.</p>

Source: author (2024).

The plans as instruments of management and execution of municipal policy, since the beginning of the creation of Palmas, have distanced themselves from reality, from what was proposed for the city, the logic of exclusion of urban space in the process of territorial management predominated. The research revealed that this occurred in defiance of the Initial planning.

Another issue addressed is the environmental problem created from the planning of the city of Palmas, with the division of the city into neighborhoods and the lack of coverage of basic social services (water supply, sewage network, garbage collection and disposal, deficiency and maintenance of green areas); The discussions explained arguments related to the settlement policy present in the planning of Palmas, demonstrating actions that caused territorial inequalities, creating a series of urban, social and environmental problems and social rights of the population, which caused spaces without infrastructure and without adequate public services and thus the peripheral areas of the city were conducive to the formation of ghettos and the proliferation of urban violence.



The management of the settlement policy of Palmas became a problem of democratic issue, in the face of the actions of demographic control that resulted in the segregation of low-income families, pushed to the peripheral areas of the city. The commercial transaction and the real estate practice were instruments used for social segregation, the public power, instead of following the planning of orderly occupation, developed strategies of disorderly occupation (central areas with an immense urban void and periphery with an intense concentration of the poor population). According to Coriolano, Rodrigues; Oliveira (2013), to achieve this purpose, the entrance to Palmas, at the beginning of its construction, received reinforcement and police control, forming barriers to direct low-income immigrants to the southern region of the city, that is, to the peripheries.

This problem of socio-territorial segregation was diagnosed by the PDPP (Participatory Master Plan of Palmas (CORIOLANO, RODRIGUES; OLIVEIRA, 2013)). This enabled urban planning to create instruments to reduce social inequalities, such as the use of macrozoning, urban perimeter, land subdivision and zoning; the subdivision, construction or compulsory use; the Urban Property and Land Tax (IPTU) Progressive in Time; expropriation with payments in titles and the Special Zones of Social Interest (ZEIS).

DESK RESEARCH

Over time, the planning of the actions of the municipal government of Palmas was linked to the sustainable development goals indicated by the UN, in the search for the management of a sustainable city. In this regard, the documents analyzed bring initial results of the Multiannual Plan (PPA) 2022-2025 of the Municipality of Palmas, which was structured in thematic axes (Humanization and Citizenship; Economic Dynamism and Urban Fluidity; Institutional Governance and Feasibility)

Humanization and Citizenship

In the documentary research, the 2022 report published in 2023, referring to the PPA 2022-2025 of the city of Palmas, was analyzed, the execution of actions in the areas of education, youth, sports and leisure, health, social equality and housing are inclusive policies and affirmation of rights and aims to account for a list of services and social rights in the search to increase and make effective the action of the municipal public power (PALMAS, 2023). The report expresses the information by axes and programs.

The PPA (Multi-Year Plan) plans the actions and revenues for public policies through the Annual Budget Law (LOA), setting the respective revenues for each planned program to be executed, forwarded, and approved by the city council (Palmas, 2021). According to

Cardoso Jr and Garcia (2014), the PPA is organized through the relationship with the LDO (Budget Guidelines Law) and LOA, a prescription of the Federal Constitution of 1988.

The result of the 2022 report has the motto of Transforming Palmas into a more humane, economically strong, and sustainable city, in addition to inclusive policies and the affirmation of rights (PALMAS, 2023, p. 20).

The results were presented according to the structuring axes of the PPA 2022-2025, Humanization and Citizenship axis; Economic Dynamism and Urban Fluidity axis; and Institutional Governance and Feasibility axis. Each axis with its respective programs. This article presents the analysis of the Humanization and Citizenship Axis.

This axis had three programs called Program 2000, Palmas with Education, Youth, Sports, and Leisure; Program 3000, Palmas with Health and Social Protection; and Program 4000, Palmas with Decent Housing.

Education, youth, sport and leisure

The PPA 2022-2025 report presented results related to education (preschool and elementary school); youth, sports and leisure, with objectives that demonstrate the challenges of public management in education, that of achieving quality, effectiveness and transparency in the provision of education; of young people's access to public policies for sports and leisure and with these actions to promote citizenship, social inclusion and quality of life. See Table 4.

Table 4. Humanization and Citizenship Axis: 2000 program

Programmes	Objectives	Indicators	Results
Palmas with Education, Youth, Sports and Leisure	Offer inclusive Early Childhood Education and Elementary Education, with quality, equity, and transparency.	1 Literacy rates at 8 years of age; 2 Average school performance in elementary school: <ul style="list-style-type: none"> • Early years • Final years 3 Preschool Enrollment Rate II <ul style="list-style-type: none"> • Child at alphabetic syllabic level 	The comparative relationship between what was planned and what was realized obtained a performance of 99% of the indicators.
	To guarantee Palmas society access to youth, sports, and leisure policies that promote citizenship, social inclusion, and quality of life	1 Number of people served by public youth policies; 2 Percentage of people participating in sporting events; 3 Sports equipment fee	The comparative relationship between the forecast and the actual obtained a result of 53% above the forecast.

Source: Implementation Report of the Thematic Programs of the Multiannual Plan 2022-2025: Base 2022 (Palmas, 2023).

The results presented were positive, when gauging the indicators related to elementary education based on a forecast, the fulfillment of the actions achieved was 99%.

However, regarding youth, sports, and leisure policies, the results obtained were excellent, exceeding the forecast by 53%.

The report presented some goals, among which those that were compromised stood out, namely: to institute the Continuing Education Program; to carry out in all educational units the diagnosis of the nutritional status of students in the municipal network; and to maintain the Integrated Educational Management System. The justification is that they did not present results, the first was created internally and no administrative act was instituted; in the second, there was training of the personnel, but no diagnosis was developed with the children due to lack of instruments, and the third was without justification.

Given this, although the results of the indicators are good, a certain difficulty or obstacle was demonstrated in the area of education to achieve some goals necessary for the development of education in elementary school. In this way, it is possible to identify implicit problem situations, that is, the issue of teacher training; the acquisition of instruments to diagnose the nutritional status of elementary school children in the municipal school, and to promote the management of the integration of the educational system.

Health and Social Protection

The health and social protection program, program 3000, contemplated in the PPA 2022-2025 report, contains five objectives, each with its respective indicators and the results obtained. Chart 5 shows the challenges for health management in Palmas/TO, which are: the strengthening of health care and surveillance actions; the strengthening of SUS management; the transparency of health services and the participation of SUS users; improvement of technology and innovation in the municipal health system; guarantee social assistance policies to the vulnerable population of Palmas/TO.

Table 5. Humanization and Citizenship Axis: program 3000

Programmes	Objectives	Indicators	Results
Palmas with Health and Social Protection;	Strengthen health care and surveillance actions at the points of care with a focus on health conditions and social determinants.	Population coverage estimated by the Primary Care Teams; Infant Mortality Rate; Number of maternal deaths in a given period and place of residence; Rate of deaths investigated by SARS (COVID-19); Several medium and high-complexity outpatient procedures.	The comparative relationship between what was planned and what was realized was satisfactory.

Source: Implementation Report of the Thematic Programs of the Multiannual Plan 2022-2025: Base 2022 (Palmas, 2023).

Table 5. Humanization and Citizenship Axis: program 3000 (continued).

Programmes	Objectives	Indicators	Results
Palmas with Health and Social Protection;	Strengthen the management of the SUS, with improvement of work processes.	Percentage of lawsuits completed by ASSEJUR Number of ordinary and extraordinary audits carried out; Risk Management Plan prepared; Number of Standard Operating Procedures (SOP) of people management work processes; Percentage of SUS management instruments and budget management prepared and revised.	The comparative relationship between what was planned and what was realized was satisfactory. Except the Risk Management Plan.
	Strengthen social control and the participation of the population through the Municipal Health Council (CMS) and the User Interaction Channels, ensuring transparency and citizen participation.	Several SUS management instruments were inspected and evaluated.	The comparative relationship between what was planned and what was realized was excellent.
	Strengthen the Municipal Policy for Permanent Education in Health with technology and innovation to contribute to the improvement of Palma's health.	Professionals involved in educational processes in health; Percentage of specialists trained by health residency programs; Percentage of applied scientific research in the SUS	The comparative relationship between what was planned and what was realized was satisfactory.

Among the predicted indicators related to the first objective, the results were satisfactory, only the "number of medium and high complexity outpatient procedures did not achieve the planned result, because their percentage reached only 90%.

The indicators presented in the second objective achieved significant results, but the indicator "Risk Management Plan prepared" was not elaborated, however, no justification was presented either.

In the third objective, the result of the indicator achieved was justified by the inspection and evaluation of all SUS management instruments² by the CMS, during the financial year, that is, the Municipal Health Plan (PMS), Annual Health Program (PAS), Quarterly Reports and Financial Management Report (RAG).

In the fourth objective, the indicators had satisfactory results, showing the relationship between what was predicted and what was realized, with results a little lower than expected in the first and third indicators and a little more in the second indicator.

² SUS – Unified Health System

In the fifth objective, the justification for the "CRAS Development Index³" and the "CREAS Development Index⁴" did not have the desired results and the reason was linked to the federal government's data for 2021, outside the evaluated period, implying that these indices were not evaluated in the determined period. The "Satisfaction Index of the users of the Community Restaurants" was not calculated since the two community restaurants were in the process of changing the service format, because the buildings were being renovated. The number of social assistance services provided by the PAIF⁵ was not mentioned. Given the negative result, the challenges to be faced in the area of social assistance and human rights are noticeable in the care of vulnerable people.

Palmas and Housing Policy

The challenge of promoting decent housing for Palmas families in the multi-year plan of the city of Palmas has a communication of the results of the indicators of service to the target audience, establishing a relationship between what is planned and what is executed, that is, between what is planned and what is done.

Table 6. Humanization and Citizenship Axis: program 4000

Programmes	Objectives	Indicators	Results
Palmas with Decent Housing.	Promote decent housing for Palmas families.	1 Housing deficit 2 Number of Families Benefiting from Housing Concession and Improvement Programs 3 Number of families benefited from the land regularization program	The comparative relationship between what was planned and what was realized was not satisfactory.

Source: Implementation Report of the Thematic Programs of the Multiannual Plan 2022-2025: Base 2022 (Palmas, 2023).

The Execution Report of the Thematic Programs of the 2022-2025 Multiannual Plan presented results that indicated a housing deficit greater than expected for vulnerable families and that the fulfillment in indicators two and three was much lower than expected.

Because of the results of this structuring axis, it is not possible to say that the Municipality of Palmas has achieved the proposed motto, there are still very significant challenges to achieving what was planned.

The 2022-2025 Palmas PPA includes in the Humanization and Citizenship axis, the program: 'Palmas with Decent Housing', a topic well discussed in the various studies on housing in the city. Coriolanus; Rodrigues and Oliveira (2013) pointed out several problems

²CRAS-Social Assistance Reference Center

³CREAS- Specialized Reference Center for Social Assistance

⁵ PAIF – Family Protection and Integral Care Service



related to the initial planning, ranging from the creation, organization, and structuring of the city of Palmas, to the exclusionary logic of the urban space, through the settlement policy present in the Planning, this created problems that extended to the new administrations. The participatory Master Plan in the 2000s, which was instituted to repair the injustices imposed on the low-income population, was unable to avoid conflicts through peripheral expansion and the separation of social classes in unequal neighborhoods, with the absence of coverage of basic social services (water supply, sewage network, garbage collection, and disposal, deficiency, and maintenance of green areas).

This situation was found in Palmas by other researchers, including Oliveira and Carvalho (2019); Silva; Oliveira Filho and Oliveira (2019); and Araújo (2019), who found precariousness in buildings (housing) and infrastructure problems. To date, creating conditions to overcome the lack of housing for the vulnerable population and build quality housing has been a difficult challenge to overcome.

FINAL CONSIDERATIONS

By analyzing the management indicators, it was detected that the initial planning was not fulfilled in the way it was proposed and the actions demanded by the public power in the formation of the city under the tutelage of the state government generated a series of problems that required the municipal power, from the Strategic Plan for the city of Palmas, to seek to alleviate the problem initially created. This is because planning, environmental policy, social policy, and economic policy have left a gap in the issue of effectiveness, transparency, and participation of the low-income population in the decision of social projects.

By surveying and evaluating the main challenges in the management practices of the municipal administration, it was concluded that the management of settlement policies and strategic planning left a gap in the provision of social and essential services to the lives of those with lower purchasing power in society, creating a problem on the issue of housing and the infrastructure of basic services related to water supply, sewage network, garbage collection and disposal, deficiency, and environmental maintenance in areas of the low-income population, a challenge faced by different municipal governments.




REFERENCE

1. Araujo, P. G. (2019). *Análise da Aplicabilidade do modelo Gerencial na administração pública* (Dissertação de Mestrado). Universidade Federal de Lavras, Lavras, MG.
2. Azevedo, S., & Anastasia, F. (2002). Governança, “accountability” e responsabilidade. *Revista de Economia Política*, 22(1), 85-101.
3. Brasil. Casa Civil da Presidência da República. (2018). *Guia da Política de Governança Pública*. Brasília: Casa Civil.
4. Brasil. Presidência da República. (2017). *Decreto n. 9.203, de 22 de dezembro de 2017*. Brasília, Diário Oficial da União, 23 de novembro de 2017.
5. Bottura, A. C. de L. (2018). O lugar do conflito e da naturalização da pobreza: uma leitura da luta por moradia na periferia de Palmas - TO. *Pós, Revista do Programa Pós-Graduação de Arquitetura Urbana FAUUSP*, 25(46), 102-117.
6. Cervo, S. C. (2003). *Administração Moderna* (9ª ed.). São Paulo: Prentice Hall.
7. Chiavenato, I. (2003). *Introdução à Teoria Geral da Administração* (7ª ed.). Rio de Janeiro: Campus.
8. Coriolano, G. P., Rodrigues, W., & Oliveira, A. F. (2013). Estatuto da Cidade e seus instrumentos de combate às desigualdades socio territoriais: o Plano Diretor Participativo de Palmas (TO). *Revista Brasileira de Gestão Urbana*, Palmas, TO, Arquitetura e Urbanismo da UFT.
9. Cardoso Jr, J. C. (2014). *Política e planejamento no Brasil: balanço histórico e propostas ao plano plurianual 2016-2019*. Instituto de Pesquisa Econômica Aplicada – Ipea, Brasília: Rio de Janeiro.
10. Costa, S. C., & Ferraro, J. R. (2020). Uma análise da atuação da sociedade civil na elaboração do planejamento do governo municipal de Palmas-TO, no período de 2013 a 2019. *Revista Brasileira de Gestão e Desenvolvimento Regional: G&DR*, 16(3).
11. Mato Grosso do Sul. (2019). *Planejamento estratégico na administração pública*. Fundação Escola de Governo do MS, Campo Grande.
12. Húngaro, L. A. (2020). *Governança, governabilidade e accountability* [recurso eletrônico]. Curitiba: Contentus.
13. Madeira, J. M. P. (2010). *Administração pública, Tomo II* (11ª ed., Vol. 2). Rio de Janeiro: Elsevier.
14. Morgado, J. C. (2012). *O estudo de caso na investigação em educação*. Santo Tirso, Portugal: De Factor editores.
15. Palmas. (2021a). *Lei nº 2669 de 23 de dezembro de 2021: Plano Plurianual 2022-2025*. Prefeitura de Palmas, Câmara Municipal de Palmas, Tocantins.



16. Palmas. (2021b). *Orientações para a Elaboração do Plano Plurianual 2022-2025*. Prefeitura de Palmas, Secretaria de Planejamento e Desenvolvimento Humano, Superintendência de Planejamento e Orçamento, Palmas, Tocantins.
17. Palmas. (2023). *Relatório de Execução dos Programas Temáticos do Plano Plurianual 2022-2025: Base 2022*. Secretaria Municipal de Planejamento e Desenvolvimento Humano, Superintendência de Planejamento e Orçamento, Palmas, Tocantins.
18. Matias-Pereira, J. (2022). *Governança no Setor Público: Foco na melhoria da gestão, transparência e qualidade dos serviços públicos*. XLVI Encontro da ANPAD - EnANPAD 2022, Online.
19. Panosso, C. E. (2013). Economia criativa e arranjos produtivos locais: estudo das relações entre economia, cultura e desenvolvimento em Palmas - TO. *VII Congresso Latinoamericano de Ciencia Política*, Bogotá: Asociación Latinoamericana de Ciencia Política (ALACIP).
20. Rocha, L. O. L. (2003). *Organização e métodos: Uma abordagem prática* (5ª ed.). São Paulo: Atlas.
21. Silva, F. N., Oliveira Filho, W. A., & Oliveira, M. C. A. (2019). Habitações de interesse social: uma reflexão sobre a qualidade do espaço. In J. A. Bazzoli et al. (Orgs.), *Artigos: Resenha sobre Palmas: uma cidade sustentável* (p. 102-117). Palmas: EDUFT.
22. Soares Filho, V. (2015). *Distrito eco industrial de Palmas/TO: um estudo de caso* (Tese de Mestrado). Universidade do Vale do Taquari, UNIVATES, Rio Grande do Sul.
23. Wood Jr, T. (2005). *Mudança Organizacional: aprofundando temas atuais em administração de empresas*. São Paulo: Atlas.

GLYCASPIS BRIMBLECOMBEI (HEMIPTERA: APHALARIDAE) IN EUCALYPTUS FOREST PLANTATIONS: A REVIEW

 <https://doi.org/10.56238/sevened2024.029-028>

André Pereira Fernandes¹, Alexandre Simoes Lorenzon², Ernani Lopes Possato³, Sebastião Lourenço de Assis Júnior⁴, Gustavo Vieira Veloso⁵ and Écio Souza Diniz⁶

ABSTRACT

The species *Glycaspis brimblecombei* is a psyllid that severely affects eucalyptus plantations in Brazil. This exotic pest poses a significant threat to the forest agroindustry, a crucial sector for the Brazilian economy. *G. brimblecombei* is a sucking insect that feeds on eucalyptus leaves, causing damage to forest productivity. Its multivoltine characteristic allows multiple generations per year, complicating control. Although the specific economic impact of *G. brimblecombei* is not mentioned, similar pests can reduce yields by up to 20%. To manage this and other pests, the forestry sector adopts Integrated Pest Management (IPM), which combines various strategies such as biological control, selection of resistant plants, and constant monitoring. However, each region in Brazil receives a different impact from this pest due to variations in environmental conditions. Climatic factors, especially temperature and precipitation, significantly influence the population density of *G. brimblecombei*. Rainfall, in particular, can drastically reduce populations of the insect by removing the nymphs' protective shells. Periods of drought, on the other hand, favor the population growth of the pest. Thus, rainier regions may suffer less severe damage than drier regions. Therefore, the heterogeneous distribution of rainfall in Brazil results in variations in the presence of the psyllid, requiring management strategies adapted to different regions to ensure the sustainability of forest production.

Keywords: *Glycaspis brimblecombei*. Management of forest resources. Forest production. Economic impact.

¹ Msc.

Department of Forest Engineering, Laboratory of Geoprocessing and Remote Sensing, Federal University of Viçosa (UFV), Brazil

² Dr.

Department of Forest Engineering, Laboratory of Geoprocessing and Remote Sensing, Federal University of Viçosa (UFV), Brazil

³ Dr.

Department of Forest Engineering, Laboratory of Geoprocessing and Remote Sensing, Federal University of Viçosa (UFV), Brazil

⁴ Dr.

Federal University of the Jequitinhonha and Mucuri Valleys, UFVJM, Brazil.

⁵ Dr.

Department of Soils, Federal University of Viçosa (UFV), Brazil

⁶ Dr.

Department of Forest Engineering, Laboratory of Geoprocessing and Remote Sensing, Federal University of Viçosa (UFV), Brazil

Centre for Ecological Research and Forestry Applications, CREAM, Barcelona, Esapnha ProBioDiversa Brazil, Association for the Conservation of Biodiversity, Viçosa-MG, Brazil

INTRODUCTION

The forestry agroindustry in Brazil stands out as one of the main economic activities contributing to the national Gross Domestic Product (GDP), (IBÁ, 2023; IBGE, 2023a). In addition, it boosts local economies and promotes the development of regions far from large urban centers (Souza, 2023; AGEFLOR, 2020; Basso, 2015). In addition to its economic relevance, the sector plays a significant role in mitigating environmental degradation through the implementation of sustainable forest management measures and the preservation of native forests (IBÁ, 2023; Poyer, 2021).

Forestry activity in Brazil covers a wide production chain, encompassing several segments that result in the production of pulp, paper, lumber, charcoal, wood panels, laminate flooring, furniture, and non-wood products (IBÁ, 2023; IBGE 2023a; AGEFLOR, 2020). Each product has its own specific production chain, but all depend on a solid and sustainable forest base. The success of these products is directly related to the balance between economic, social, and environmental aspects (IBÁ, 2023; Souza, 2023).

In 2022, the extension of planted forest areas in the country reached the mark of 9.94 million hectares. Eucalyptus plantations represent the significant majority, 76% of this total (7.6 million ha), while areas destined to pine cultivation comprise 19% (1.9 million ha). The other species, such as rubber trees, acacia, teak and paricá, make up the remaining portion, occupying about 5% (440 thousand ha) (IBÁ, 2023; IBGE 2023a). The plantations are distributed throughout the Brazilian territory, the states of Minas Gerais, Mato Grosso do Sul, Paraná and São Paulo concentrate the main producers of planted forests (IBÁ, 2023)

Brazil's edaphoclimatic characteristics, combined with investments in research and development, give the country a prominent position in the forestry market (IBÁ, 2022). The genus *Eucalyptus* has been the main species implanted due to its high productivity, rapid growth, adaptability, and wide range of applications (Dallacort, 2020; Queiroz, 2009). According to IBÁ (2022), in Brazil, eucalyptus plantations have a higher productive potential than in other regions of the world. These indices have evolved over the years, with species of this genus reaching an estimated average productivity of 32.7 m³/ha/year in a 6.7-year cycle (IBÁ, 2023).

In recent decades, forest pests have gained prominence as one of the main factors that impact wood productivity and quality (Litholdo *et al.*, 2018). Among the main exotic pests of eucalyptus are the shell psyllid (*Glycaspis brimblecombei*) (Hemiptera: Aphalaridae), the bronze stink bug (*Thaumastocoris peregrinus*) (Hemiptera: Thaumastocoridae), the eucalyptus gall wasp (*Leptocybe invasa*) (Hymenoptera: Eulophidae) and the eucalyptus weevil (*Gonipterus platensis*) (Coleoptera: Curculionidae).

In addition, native insects such as leafcutter ants (*Atta* spp. and *Acromyrmex* spp.) (Hymenoptera: Formicidae: Attini), termites, and defoliating caterpillars (*Thyriniteina arnobia*) (Lepidoptera: Geometridae) also contribute to the challenges faced by the forestry sector (Lemes *et al.*, 2021; Wilcken, 2017).

The economic impacts of these pests have not yet been completely determined. According to Wilcken (2017), the tan bug is capable of causing an estimated reduction of approximately 15% to 20% in the Average Annual Increment (IMA). The plaintiff estimated that the economic damages during the period from 2010 to 2015 reached the amount of R\$ 1.1 billion. Valente *et al.* (2018) estimated that an infestation of *Gonipterus platenses* in Portugal resulted in losses of 648 million euros over a 20-year horizon.

To mitigate the impacts and ensure the sustainability of the forestry sector, silviculture adopts Integrated Pest Management (IPM) as a strategy. This approach aims to ensure the optimal development of the forest and, consequently, the final product (Lemes *et al.*, 2021). IPM encompasses the integration of various management tactics, such as the selection of pest-resistant genetic materials, the use of biological control, the use of chemicals, and constant monitoring (Lemes and Zanuncio, 2021). In addition, the development of innovative research and technologies also plays a crucial role in the search for more effective and sustainable solutions to mitigate the adverse effects caused by pests.

GLYCASPIS BRIMBLECOMBEI

Morphological and biological aspects

The *Glycaspis brimblecombei* Moore (Hemiptera, Aphalaridae) commonly known as the shell psyllid is a phytophagous insect-pest with a sucking habit that feeds exclusively on the leaves of *Eucalyptus* spp. In the current context of the forestry sector, the species assumes a prominent role as one of the main exotic pests of eucalyptus (Barcik *et al.*, 2023; Santos *et al.*, 2021; Litholdo, 2018; Sá and Wilcken, 2004)

The species has a hemimetabolous development, characterized by a life cycle composed sequentially of egg, nymph and adult stages (Ramirez *et al.*, 2003). According to Firmino-Winckler *et al.* (2009), the total duration of the cycle, from the embryonic stage to the death of adult individuals, varies according to the host species and the conditions of the environment.

The eggs are deposited on the leaf surface with a peduncle, and can be grouped into masses or placed individually. The clusters assume circular shapes, aligned in straight rows or arranged in semicircles, the latter being the most common in field observations (Sánchez

et al., 2002). They have a shiny appearance, oval shape and yellow-orange color (Ramirez *et al.*, 2003).

The nymphs pass through 5 instars, being distinguished by the structure and number of antenna segments, ranging from 3 to 9 (Ramirez *et al.*, 2003; Sánchez *et al.*, 2002). In the first 3 instars, they are yellowish in color, while in the last 2 they take on a light brown color. At this stage, *G. brimblecombei* has a dorsoventrally flattened body (Favaro, 2006).

When hatching, the nymphs explore the leaf surface and choose the appropriate place for permanence, where they insert the stylet in search of the sap-conducting vessels, preferring regions close to the veins (Phillips, 1992). After fixation, the nymph begins its feeding and produces a sugary secretion, known as "honeydew", which is used for the formation of the shell (Favaro, 2006).

The shells have a conical shape, whitish color, and shelter the nymphs until the adult stage (Cuello, 2019; Fávoro, 2006). For most of their developmental period, nymphs remain inside the shell, and as they grow, they gradually enlarge the size of this structure. They can remain inside the shell until the adult stage or move around, in which case it is necessary to build a new structure (Favaro, 2006).

G. brimblecombei has sexual dimorphism, in which females are slightly longer than males, measuring between 2.7 and 4.5 mm in length, and males are between 2.7 and 3.95 mm (Favaro, 2006; Sá and Wilcken, 2004). Reproduction is sexual, and females have a reproductive structure in the terminal portion of the abdomen, through which eggs are laid. On the other hand, males have a projection in the upper abdomen that helps in the immobilization of the female during copulation. Both have filiform antennae with ten segments, as well as two pairs of transparent and membranous wings (Ramirez *et al.*, 2003; Fávoro, 2006).

G. brimblecombei is characterized by being a multivoltine species, that is, it manifests multiple reproductive cycles within a single year, with these generations occurring in a continuous and overlapping manner (Cuello, 2019; Favaro, 2006; Morgan, 1984). According to Collett (2001), the number of generations is modulated by the biological characteristics of the insect, by the conditions of the environment and by the availability of resources of the host. Morgan, (1984) reports the occurrence of two to four generations per year, while Cuello, (2019) observed the development of six generations in different eucalyptus species.

Multivoltine pests have an accelerated capacity for reproduction, which results in their constant presence and cumulative damage throughout the year. This characteristic

affects the effectiveness of control actions, since the overlapping of generations favors the reinfestation of controlled areas, requiring successive interventions during the year.

As observed by Silva (2010), *G. brimblecombei* presents an aggregated spatial distribution in all its stages of development in the field. The authors also found that population density is not influenced by position within the field, whether in the center, on the sides or on the edges. The aggregated spatial distribution creates favorable conditions for outbreaks to occur in a concentrated manner, increasing pest pressure at certain points in the forest. This distribution pattern suggests the need for adjustments in monitoring and control strategies, focusing on the insects' aggregation points. In addition, the presence of the species in several positions within the plot implies the need for more intense sampling during monitoring, in order to obtain representative information of the forest.

Bioecology

The density of a population and its fluctuations over time are influenced by a variety of factors. According to Coulson and Witter (1990), these elements comprise climatic characteristics, host susceptibility, availability of appropriate habitat, levels of parasitism and the presence of diseases.

The adoption of mosaic plantations instead of continuous blocks comprises a strategy adopted by companies in the forestry sector to circumvent some of these factors. This management, by creating sites with distinct characteristics, contributes to the heterogeneity of the ecosystem, reduces the risk of pests and diseases and favors the development of natural enemies (Conrado *et al.*, 2014).

The detection of *G. brimblecombei* is recorded in several regions of the country, however, its presence does not necessarily imply the occurrence of economic damage. Environmental factors are not able to restrict the development of the shell psyllid, however, they play an important role in regulating its population density (Favaro, 2006). The meteorological conditions that exert the greatest influence on the species are air temperature and rainfall volume (Barcik *et al.*, 2023; Ferreira Filho *et al.*, 2017; Ferreira Filho 2010)

Rainwater has the ability to displace the shells, resulting in the removal of the nymphs' protection. This displacement impairs the insects' adherence to the leaves, creating unfavorable conditions for their survival and reproduction (Favaro 2006). In addition, high humidity during the rainy season contributes to the increased incidence of entomopathogenic fungi capable of killing psyllid nymphs (Rámirez *et al.*, 2002).

Oliveira *et al.* (2012), in a research involving the application of artificial rain, found that just 2 consecutive days of exposure to rain were enough to cause a reduction of more than 50% in the population, reaching an effectiveness of 96% after 5 consecutive days. The authors associate this decrease with the moistening of the leaves, which results in the melting of the shells and, consequently, in the exposure of the nymphs to environmental conditions and predators. These results indicate that precipitation demonstrates a regulatory effect on psyllid populations.

In the study conducted by Ferreira Filho (2005), it was observed that the species showed low incidence when rainfall was evenly distributed in the study area. However, as rainfall became more irregular, this variability promoted favorable conditions for a significant increase in its occurrence. Tuller *et al.* (2017) verified the existence of a strong relationship between the effects of rainfall and the density of eggs and nymphs in *E. camaldulensis*, with an increase in density in the dry season and a reduction in the rainy season.

Rámirez *et al.* (2002) observed the existence of a relationship between the levels of infestation of the shell psyllid and precipitation rates. The authors noticed that the population density of *G. brimblecombei* remained high in the dry periods and reduced significantly in the rainy months. Similar results were observed by Barcik *et al.* (2023); Ferreira Filho *et al.* (2017); Camargo *et al.* (2014); Silva *et al.* (2013); Silva (2010); Ferreira Filho (2010); Ferreira *et al.* (2009); Ferreira Filho *et al.* (2005); Sookar *et al.* (2003).

There is a great variation in precipitation patterns between regions of the Brazilian territory. The North and South of the country are characterized by a high volume of annual precipitation, which is well distributed throughout the year, without a defined dry season. In the Northeast, most of the precipitation (55 to 70%) is concentrated in a period of three consecutive months, while the remaining months may experience drier conditions. In contrast, the Southeast and Midwest have a more uniform distribution throughout the year, with approximately 25 to 60% of the total precipitation occurring in three consecutive months (Nimer, 1989).

The heterogeneity in the distribution of rainfall throughout the country can establish areas with favorable or unfavorable environmental conditions for *G. brimblecombei*. In the North and South regions, for example, where rainfall is evenly distributed throughout the year, it is possible that the species has a low population density when considering only the distribution of precipitation.

Under conditions of water deficit, plant species can manifest physiological and biochemical changes that affect their resistance against insects and other stressors (Franco, 2018; Yihdego *et al.*, 2019). Water deficit contributes to the successful

establishment of the shell psyllid in periods of drought. During this season, there is a significant increase in the density of eggs and nymphs of the species (Tuller *et al.*, 2017).

In the cerrado biome and in the Northeast region, where the water deficit is more pronounced, *G. brimblecombei* tends to present higher population density. In this sense, IPM programs should be adapted to these specific conditions. This implies carrying out frequent monitoring to detect the presence of the pest insect early, especially during periods of water scarcity. Another important aspect in this process is the selection of genetic materials for planting that demonstrate tolerance to both water deficit and pest.

Different studies conducted with the shell psyllid indicate that temperature is the main factor involved in the population dynamics of the shell psyllid (Ramirez *et al.*; 2003; Paine *et al.*, 2000). In the laboratory environment, Firmino *et al.* (2004), identified that the optimal temperature for the development and reproduction of the insect pest was 26°C, while the least adequate temperature was 30°C. In the field, Ferreira Filho (2005) found similar results, when the maximum temperature was around 31°C, the populations remained low, and as the temperature decreased to about 27°C the population density began to increase.

In a study developed in the southern region of Brazil, Favaro (2006) identified a negative correlation between nymphs and maximum temperature, suggesting that high temperatures may have an adverse influence on the development of the species. Regarding minimum and mean temperatures, positive correlations were observed; however, none of the results reached statistical significance.

Opposite to this, in the United States, Paine *et al.* (2000) and Dahlsten (2002) documented the population density peaks of the pest in the warmer months. Ferreira Filho (2005) attributes this difference to the specific climatic characteristics of Brazil, which are different from the countries of the northern hemisphere. In the Brazilian context, there is an increase in temperatures during the summer; However, this period is marked by higher rainfall, resulting in a decrease in population density. Meanwhile, winter is marked by drier months and milder temperatures. Different occurs in the northern hemisphere the seasonal pattern is characterized by severely low temperatures in winter and mild in summer, this provides favorable conditions for the development of *G. brimblecombei* in summer, since its life cycle is limited in winter.

Ferreira *et al.* (2009) found that lower temperatures associated with decreased rainfall provide favorable conditions for the establishment and reproduction of the psyllid. On the other hand, the increase in temperatures and the frequent occurrence of rainfall contribute to the reduction of the population.

The host species is also a determining factor for the population density of *G. brimblecombei*. The intensity of infestations and the length of the life cycle are not homogeneous among the species of *Eucalyptus* spp. and *Corymbia* spp. (Firmino-Winckler *et al.*, 2009; Pereira 2011). In the laboratory, Firmino-Winckler *et al.* (2009) carried out tests with 6 commercial forest species and concluded that 5 of them behaved as favorable hosts for the development of the shell psyllid. Among these species, *E. camaldulensis* and *E. tereticornis* proved to be the most suitable, while *C. citriodora* exerted a lethal effect on the insect, inhibiting its development from the first nymphal stage.

When monitoring 11 species of eucalyptus in the interior of São Paulo in the field, Ferreira *et al.* (2009) found that the species *E. tereticornis* and *E. camaldulensis* were the most susceptible to pest attack. On the other hand, individuals of *C. citriodora*, *E. paniculata* and *E. torelliana* were not infested. In a study on oviposition preference in the laboratory, Pereira *et al.* (2013) observed that the genotypes of *E. urophylla* and *E. grandis* were the least visited by adults, while there was a high preference for *E. camaldulensis*.

Brennan *et al.* Sánchez *et al.* (2001) conducted an assessment of the susceptibility of 21 eucalyptus species in San Francisco, California, USA, and found that only three species (*E. camaldulensis*, *E. rudis* and *E. tereticornis*) showed heavy defoliation, being classified as moderately to highly susceptible. Several studies have demonstrated the high susceptibility of *E. camaldulensis* (Camargo *et al.*, 2014; Montes and Raga, 2005; Wilcken *et al.*, 2003).

Despite being highly susceptible to attack by the shell psyllid, *E. camaldulensis* stands out as a species of economic interest, due to its versatility of uses and ability to adapt to unfavorable environmental conditions, such as water deficit (Costa *et al.*, 2017). In the face of scenarios like this, genetic improvement programs have been dedicated to the production of hybrids that combine high productivity, with wood quality and greater resistance to biotic and abiotic factors, such as pests and diseases.

Trees in the genus exhibit distinct characteristics that play significant roles in their resistance against phytophagous insects. Its leaves have glands that synthesize essential oils, often enriched with terpenoids. Additionally, the leaves contain secondary metabolites such as tannins, phenols, and waxes, which have the potential to make them less palatable to insects. And the presence of leaf hardness, known as sclerophilia, adds an additional physical barrier (Ohmart and Edwards, 1991).

Different species of eucalyptus may have unique leaf characteristics that affect interaction with psyllids (Reifenrath *et al.*, 2005). According to Brennan and Weinbaum (2001), the presence of epicuticular wax in young leaves of *E. globulus* can negatively

impact the survival and feeding behavior of the species. This wax is able to reduce the adhesion of the nymphs to the leaves and make it difficult to probe the stylet.

Geographical distribution of *Glycaspis brimblecombei*

The *Glycaspis brimblecombei* Moore (Hemiptera, Aphalaridae) is an insect native to Australia, and current records demonstrate its distribution across all continents (EPPO, 2023). Its first observation outside the natural environment was reported in June 1998, in the Americas. The infestation occurred in *Eucalyptus* spp. plantations in El Monte, Los Angeles, USA (Brennan *et al.*, 1999) *element*.

The following year, the species was detected in different cities in Mexico (Cibrian-Tovar and Iniguez-Herrera, 2001). In 2003, it was already present in 24 states of the country (Ramirez, 2003). In South America, its first observation was recorded in Chile in 2002, with infestations reported in different regions, such as Santiago, Chacabuco, San Felipe and Los Andes (Sandoval and Rothmann, 2002).

In Brazil, *G. brimblecombei* was detected for the first time in 2003, in the municipality of Mogi Guaçu, in the interior of the state of São Paulo. In September of the same year, the pest had already been observed in 86 more municipalities in the state. Its occurrence was later recorded in several Brazilian states, including Paraná, Goiás, Minas Gerais (Wilcken *et al.*, 2003), Mato Grosso do Sul (Sá and Wilcken, 2004); Santa Catarina (Lutinski *et al.*, 2006), Rio Grande do Sul (Oliveira *et al.*, 2006), Mato Grosso (Silva, 2010), Espírito Santo (Resende and Santana, 2008), Bahia (Masson *et al.*, 2009), Pernambuco (Breda *et al.*, 2010); Rio de Janeiro, Tocantins, Piauí (Wilcken *et al.*, 2015); Pará (Saliba *et al.*, 2019) and Maranhão (Favoreto *et al.*, 2022; Santos *et al.*, 2021). This insect has also been detected in other South American countries, such as Argentina (Bouvet *et al.*, 2005), Ecuador (Onore and Gara, 2007), Venezuela (Rosales *et al.*, 2008), Colombia (Rodas *et al.*, 2014), Paraguay (Díaz *et al.*, 2013) and Peru (Burckhardt *et al.*, 2008), (Figure 1).

Currently, the shell psyllid is present in 16 Brazilian states, which are distributed across the five regions of the country. The rapid expansion and dispersion of the pest in the Brazilian territory are attributed by Santana *et al.* (2003), its adaptability to the country's climate and the extensive area planted with eucalyptus. In addition, this species has a high capacity for adaptation to colonize new areas (Queiroz *et al.*, 2013).

Figure 1 - Distribution of *G. brimblecombei* in Brazil.



The continuous expansion of eucalyptus forest plantations has contributed to the spread of the pest throughout the territory. The introduction of eucalyptus in previously unpopulated areas creates a favorable environment for the occurrence of *G. brimblecombei*, since the species is specific and the climatic conditions are not limiting for its incidence in Brazil. Both the temperature and the volume of rainfall do not reach extremes that limit the presence of this species in the country. In addition, the extensive areas offer an abundance of resources and shelter for insect pests (Firmino-Winckler *et al.*, 2009).

In the period between 2014 and 2022, eucalyptus forest plantations in Brazil registered a growth of 2.6%. During this interval, the Southeast (4.1%), Central-West (2.3%) and Northeast (0.5%) regions stood out as the ones with the highest growth, while the South region suffered a reduction of 6.1% (IBGE, 2015; IBGE, 2023). According to Junqueira (2016), between 2010 and 2015, *G. brimblecombei* infested an area of approximately 51 thousand ha.

Damage

The intensity of damage caused by insects, whether qualitative or quantitative, is shaped by a complex interaction of several factors (Favaro, 2006). Among these, the population density of the pest, the temporal extent of exposure of the plant to the infestation, as well as the stage of development and the plant structure of the affected host deserve to be highlighted. In addition, the susceptibility of plant species can vary throughout their life cycle.

According to Gallo *et al.* (2002), the damage caused by pests varies between countries. This disparity is influenced by elements intrinsic to each region, including climatic characteristics, cultivated varieties, agronomic or silvicultural practices adopted, and socioeconomic reality. In this way, pest management strategies need to be adapted and adjusted based on these factors to achieve effective results.

The presence of *G. brimblecombei* in eucalyptus plantations can result in different types of damage. This damage arises due to the feeding of nymphs and adults, which prey on young and mature leaves, indicating the occurrence of infestations at any age of the forest (Queiroz *et al.*, 2016). Studies have shown a preference of the pest insect for the upper part of the crown, where the leaves and young shoots are found (Santana 2005; Montes and Raga, 2005; Pereira *et al.*, 2013; Carnielli, 2018). However, Pereira *et al.* (2013) observed, under laboratory conditions, that the leaves of the upper and middle third of seedlings were preferred for oviposition.

The authors support the idea that the less lignified tissue facilitates the feeding of the insect pest, as it has characteristics that facilitate ingestion. In addition, the region is attractive due to the abundance of nitrogen and other nutrients. Unlike the other authors, Jere *et al.*, (2020) found that the insect did not show a preference for any specific part of the canopy of *E. camaldulensis*, *E. tereticornis*, *E. grandis* in eucalyptus stands in Malawi.

Infestations of *G. brimblecombei* can cause several reactions in plants, resulting in defoliation, dryness of the tips, reduction of leaf size, deformation and curling of the leaf blade, (Sá and Wilcken, 2004; Wilcken *et al.*, 2003). According to Gill (1998), the damage caused by this insect pest can cause up to 15% of plant mortality in the first year. If control measures are not implemented, mortality can reach 40% in the following year.

The presence of *G. brimblecombei* leads to secondary impacts, such as the induction of the appearance of sooty mold. Sooty mold develops from the colonization of saprophagous fungi to the *honeydew* excreted by the pest insect, resulting in a dark film that covers leaf surfaces, stems, or other plant structures. This phenomenon results in a

reduction in the photosynthetically active area of the plant and attenuates the susceptibility to attack by other insects (Ferreira Filho, 2010).

During the first outbreak in 2003 in Brazil, a defoliation rate in the range of 20% to 30% was recorded. In the dominated trees, total defoliation was observed, reaching 100% of the canopy area, with no possibility of recovery. (Wilcken *et al.*, 2003). The occurrence of defoliation was also identified in Portugal and Tunisia, where infestation rates ranged from 5% to 75% and 8.8% to 80.5%, respectively (Dhahri *et al.*, 2014).

Control methods

To control *G. brimblecombei*, several techniques can be adopted, such as chemical methods, biological control, silvicultural practices, and the introduction of resistant genotypes (Oliveira, 2020). Santana *et al.* (2003) and Barbosa *et al.* (2021) suggest Integrated Pest Management (IPM) as the most promising alternative for controlling this insect pest within the Brazilian context. The justification for this approach lies in the extensive area occupied by monoculture, the adaptability of the species to environmental conditions and its rapid dispersion throughout the national territory.

The monitoring of this insect pest is the basis for decision-making in IPM programs, as they aim to identify places of occurrence and the need for control. Monitoring is carried out continuously and requires trained labor to ensure the effectiveness of the measures adopted. Such measures aim to ensure the early identification of infestations, establish priority areas for interventions, and evaluate the effectiveness of different control methods.

The main monitoring techniques used are yellow adhesive traps and foliage sampling. Sticky traps are preferred due to their reliable, accessible, and low-cost approach (Queiroz, *et al.* 2012). On the other hand, foliage sampling provides detailed information on the presence and population dynamics (Erbilgin *et al.*, 2004). This method involves collecting the first seven leaves from the first three branches of a plant suspected of infestation. The leaves are then placed in plastic bags for further analysis of the number of individuals present, as well as the different stages of development, over a period of four weeks. Other techniques have been researched, such as the use of Unmanned Aerial Vehicles (UAVs) (Wantroba *et al.*, 2023).

Due to the wide dissemination of the species in several regions of the country, chemical control is a measure of high cost and limited efficacy (Santana *et al.*, 2003). Sá and Wilcken (2004) also point out the environmental impacts related to the application of these products, as well as their temporary effect. The short-lasting effect is intrinsically

linked to the overlapping of generations of the species, implying the need for successive spraying.

In this scenario, products with a systemic mechanism of action stand out as the most used in pest control. This preference is due to their greater effectiveness when compared to contact action products. The latter face challenges in reaching nymphs, due to the protection conferred by the shell and reduced mobility during the life cycle (Wilcken *et al.*, 2003).

Twelve years after the initial identification of the pest in Brazil, there were no records of chemicals for its control in the Ministry of Agriculture, Livestock and Supply (MAPA) (Wilcken *et al.*, 2015). Currently, there are seven products registered with MAPA, coming from three active ingredients: bifenthrin, acetamiprid and etofenproxi. These products act through mechanisms of systemic action, contact, and ingestion, in some cases with a combination of these mechanisms and, in others, an isolated action (MAPA, 2023).

There are several species of natural enemies that are associated with the shell psyllid. However, some of them are considered inefficient in controlling the pest, as they have a low parasitism rate (Wilcken *et al.*, 2015; Dahlsten *et al.*, 2002). This limitation occurs due to the lack of adaptations in generalist predators to pierce the protective shells of the pest nymphs, which have a hard consistency (Wilcken *et al.*, 2003).

Foram documentados casos de predação ou parasitismo de ninfas ou adultos do psilídeo de concha por espécies como: *Anoplolepis longipes* (Hymenoptera: Formicidae) (Sánchez-Martínez *et al.*, 2005), *Anthocoris nemoralis* (Hemiptera: Anthocoridae) (Garonna *et al.*, 2011), *Atopozelus opsimus* (Hemiptera: Reduviidae) (Dias *et al.*, 2009), *Cycloneda sanguinea* (Coleoptera: Coccinellidae) (Berti Filho *et al.*, 2003), *Exochomus aethiops* (Coleoptera: Coccinellidae) (Sookar *et al.*, 2003), *Psyllaephagus bliteus* (Hymenoptera: Encyrtidae) (Wilcken *et al.*, 2015) e *Vespula sp.* (Garonna *et al.*, 2011).

Psyllaephagus bliteus, a parasitoid native to Australia, is known to be specific to *G. brimblecombei*, and to have a relationship of dependence with its population density (Dias, 2013; Silva *et al.*, 2013). This insect has the ability to parasitize nymphs, even when they are protected by shells. In Brazil, its introduction occurred naturally along with the arrival of the pest (Berti Filho *et al.*, 2003).

The females of the parasitoid lay their eggs in the thorax or abdomen of the psyllid nymphs, preferably in those of the third or fourth instar. After about two weeks, the adults of the parasitoid emerge, leaving a visible circular hole in the shell. In addition, *P. bliteus* females have the ability to lay eggs without the need for copulation, reproducing by

arrenotoca parthenogenesis (Plascencia-González *et al.*, 2005; Daane *et al.*, 2005; Montes and Raga, 2005).

Biotic and abiotic factors have the potential to influence the rate of insect parasitism (Margiotta *et al.*, 2017; Caleça *et al.*, 2018). According to Daane *et al.*, (2005) temperature plays a determining role in the life cycle of the species. The authors observed a decrease in longevity and fertility rate with increasing temperature.

In countries with a warm climate, such as Brazil and California, the establishment of the insect has been challenging (Ferreira Filho *et al.*, 2015; Daane *et al.*, 2012). In forest plantations of *E. camaldulensis* in the states of São Paulo and Minas Gerais, the rate of natural parasitism showed reduced levels, ranging from 0.2% to 11%, indicating the need for successive Masal releases (Wilcken *et al.*, 2005). In regions where there was mass release of *P. bliteus*, the results revealed an increase in parasitism levels in the field, reaching up to 94% (Ferreira-Filho *et al.*, 2015; Huerta *et al.*, 2010).

Among the generalist predators, *Atopozelus opsimus* (Hemiptera: Reduviidae) has shown potential to be a viable alternative in biological control programs. This perspective is reinforced by the fact that the insect is native and has adapted its diet to the predation of exotic pests (Dias, 2013). The natural enemy has been observed preying on several pests, including *Glycaspis brimblecombei*, *Thaumastocoris peregrinus*, *Leptocybe invasa* and *Diaphorina citri*.

According to Dias (2009), the psyllid is the preferred food source of *A. opsimus*. The insect has a feeding pattern that includes nymphs at different stages of development, as well as adults of psyllids, standing out for its ability to raise the protective structures of the nymphs, in order to capture their prey (Dias, 2009). In this study, the author observed that the insect was able to complete its life cycle by feeding exclusively on nymphs and adults of the psyllid.

The use of entomopathogenic fungi emerges as a viable alternative for the biological control of *G. brimblecombei*, as I contudi, its efficacy is related to environmental conditions. According to Wilcken *et al.* (2003), this technique demonstrates expressive results only in environments characterized by a relative humidity above 60%.

Favaro (2006) conducted a laboratory study to evaluate the efficacy of the fungi *Lecanicillium* sp. and *Beauveria* sp. in controlling the pest. The results indicated high susceptibility of nymphs and adults to the attack of these fungi. In semi-field conditions Dal Pogetto *et al.* (2011) observed that the 3 products tested (*Beauveria bassiana*, *Metarhizium anisopliae* and *Lecanicillium longisporum*) caused a reduction in the population density of

the psyllid. The treatments with *B. bassiana* and *M. anisopliae* showed the best results, reaching an efficiency of more than 80%.

In addition to the reduction in forest productivity, the presence of the insect can increase production costs. It is estimated that the cost of applying chemical insecticides to control *G. brimblecombei* varies around R\$ 85.00 per ha, requiring at least three applications per year (Sá *et al.*, 2014). Biological control has been gaining prominence within companies in the forestry sector in Brazil. This control method is a more viable and cost-effective alternative compared to the use of chemical insecticides.

The growth in the use of biological control is driven by pressure from consumer markets for more sustainable products. Certifiers, such as the FSC (*Forest Stewardship Council*), play a crucial role in promoting these practices (Lemes and Zanuncio, 2021). The main advantages of biological control include its specificity to the target pest, ability to minimize problems such as the development of resistance by pests and water and soil contamination. In addition, it represents a safer alternative for human health and the environment (Campanhola, 2003).

As a result, forestry companies have been adopting this approach as part of their IPM programs. These companies have invested in the creation of their own laboratories to meet their pest management needs. Laboratories are responsible for the production and distribution of natural enemies necessary for the control of the main pests found in their crops. In addition, in Brazil, there are private companies dedicated to the commercial production of specific natural enemies for control in agricultural and forest areas. The market for bioinsecticides grew more than 70% in one year in the country (MAPA, 2019).

CONCLUSIONS

The rapid spread of *Glycaspis brimblecombei* in eucalyptus forest plantations in Brazil is a significant concern for the sector. Its easy adaptation to the country's climatic conditions, combined with the extension of areas cultivated with eucalyptus and the low efficiency of control methods, suggest the need for an integrated management program. This program must consider not only aspects of the morphology and biology of the pest, but also its complex interaction with the environment and other organisms.

The introduction of *G. brimblecombe* was able to influence several processes within the forestry sector, including IPM and breeding programs, in the forestry, research and environment sectors. However, some important gaps are identified in relation to this insect pest. Understanding the relationship between the economic damage caused by *G.*



brimblecombei and environmental conditions is fundamental for the development of more effective management strategies, adapted to the different regions of Brazil. In addition, estimating the financial impacts resulting from their infestations allows us to assess the cost of this threat to the forestry industry. Filling these gaps through research is necessary to ensure the health of forest plantations and mitigate the economic losses associated with the pest.

REFERENCES

1. ASSOCIAÇÃO GAÚCHA DE EMPRESAS FLORESTAIS (AGEFLOR). (2020). *O setor de base florestal no Rio Grande do Sul - 2020* (84 p.). Porto Alegre: AGEFLOR.
2. Barbosa, L. R., Queiroz, D. L. de, Nিকেle, M. A., Queiroz, E. C. de, Reis Filho, W., Iede, E. T., & Penteado, S. do R. C. (2021). Pragas de eucaliptos. In E. B. de Oliveira & J. E. Pinto Junior (Eds.), *O eucalipto e a Embrapa: quatro décadas de pesquisa e desenvolvimento* (pp. 751-780). Brasília: Embrapa.
3. Barcik, L. P., Camargo, M. B., Garret, A. T. de A., Garcia, F. A. de O., & Ukan, D. (2023). Flutuação populacional de *Glycaspis brimblecombei* mais em híbridos de *Eucalyptus camaldulensis* x *E. grandis* na região Sul do Brasil. *Revista Observatorio de la Economía Latinoamericana*, 21*(9), 11880-11894. <https://doi.org/10.55905/oelv21n9-074>
4. Basso, V. M. (2015). *Desafios e oportunidades da certificação do manejo florestal pelo sistema FSC no continente americano* (Dissertação de Mestrado, Universidade Federal de Viçosa).
5. Berti Filho, E., Costa, V. A., Zuparko, R. L., & Lasalle, J. (2003). Ocorrência de *Psyllaephagus bliteus* Riek (Hymenoptera: Encyrtidae) no Brasil. *Revista de Agricultura*, 78*(3), 304.
6. Bouvet, J. P. R., Harrand, L., & Buckhardt, D. (2005). Primera cita de *Blastopsylla occidentalis* y *Glycaspis brimblecombei* (Homoptera: Psyllidae) para la República Argentina. *Revista de la Sociedad Entomológica Argentina*, 64*(1-2), 99-102.
7. Breda, M. O., Oliveira, J. V. de, Moreira, A. N., & Queiroz, D. L. de. (2010). Registro de *Glycaspis brimblecombei* em *Eucalyptus spp.* em Petrolina, Pernambuco. *Pesquisa Florestal Brasileira*, 30*(63), 253-255. <https://doi.org/10.4336/2010.pfb.30.63.253>
8. Brennan, E. B., Gill, E. B., Hrusa, G. F., & Weinbaum, S. A. (1999). First record of *Glycaspis brimblecombei* (Moore) (Homoptera: Psyllidae) in North America: initial observations of a potentially serious pest of eucalyptus in California. *Pan-Pacific Entomologist*, 75*(1), 55-57. <https://www.biodiversitylibrary.org/part/268720>
9. Brennan, E. B., & Weinbaum, S. A. (2001). Effect of epicuticular wax on adhesion of psyllids to glaucous juvenile and glossy adult leaves of *Eucalyptus globulus* Labillardière. *Australian Journal of Entomology*, 40*(3), 270–277. <https://doi.org/10.1046/j.1440-6055.2001.00229.x>
10. Brennan, E. B., Hrusa, F., Weinbaum, S. A., & Levison Junior, W. (2001). Resistance of *Eucalyptus* species to *Glycaspis brimblecombei* (Homoptera: Psyllidae) in the San Francisco Bay area. *Pan-Pacific Entomologist*, 77*, 249-253.
11. Burckhardt, D., Lozada, P. W., & Diaz, W. B. (2008). First record of the red gum lerp psyllid *Glycaspis brimblecombei* (Homoptera: Psylloidea) from Peru. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft*, 81*, 83–85.
12. Caleca, V., Bella, S., La Pergola, A., Lombardo, G. V., Maltes, M. N., Nucifora, S., Rizzo, R., Suma, P., Tortorici, F., & Rapisarda, C. (2018). Environmental factors impact and

- incidence of parasitism of *Psyllaephagus bliteus* riek (Hymenoptera Encyrtidae) on populations of *Glycaspis brimblecombei* Moore (Hemiptera Aphalaridae) in Mediterranean climatic areas. **Jornal de Zoologia, 101**, 89-100. <https://doi.org/10.19263/REDIA-101.18.12>
13. Camargo, J. M. M., Zanol, K. M. R., Queiroz, D. L. de, Dedecek, R. A., Oliveira, E. B., & Melido, R. C. N. (2014). Resistência de clones de *Eucalyptus* ao psilídeo-de-concha. **Pesquisa Florestal Brasileira, 34*(77)*, 91–97. <https://doi.org/10.4336/2014.pfb.34.77.504>
 14. Campanhola, C., & Bettiol, W. (2003). **Métodos alternativos de controle fitossanitário**. Jaguariúna: Embrapa Meio Ambiente.
 15. Carnielli, T. L. (2018). **Avaliação da eficiência de fungos entomopatogênicos no controle biológico de Glycaspis brimblecombei Moore, 1964 (Hemiptera: Psyllidae)** (Dissertação de Mestrado, Universidade Federal de Sergipe). Disponível em <https://ri.ufs.br/handle/riufs/11727>
 16. Cibrián-Tovar, D., & Iñiguez-Herrera, G. (2001). **Manual para la identificación y manejo de las plagas y enfermedades forestales del estado de Jalisco**. Prodefo.
 17. Collet, N. (2001). Biology and control of psyllids, and the possible causes for defoliation of *Eucalyptus camaldulensis* Dehnh. (river red gum) in south-eastern Australia – a review. **Australian Forestry, 64*(2)*, 88-95. <https://doi.org/10.1080/00049158.2001.10676170>
 18. Conrado, V. N., Souza, G. S. A. de, Martins, B. F., Quinto, V., & Silva, E. (2014). Potencialidades da silvicultura em mosaico nas zonas de amortecimento de unidades de conservação. **Relatório Técnico**. Viçosa: UFV.
 19. Costa, A. C. S., Leal, C. S., Santos, L. C., Carvalho, A. M. M. L., Oliveira, A. C., & Pereira, B. L. C. (2017). Propriedades da madeira de cerne e alburno de *Eucalyptus camaldulensis*. **Ciência da Madeira, 8*(1)*, 10-20. <https://doi.org/10.12953/2177-6830/rcm.v8n1p10-20>
 20. Coulson, R. N., & Witter, J. A. (1990). **Entomología forestal: ecología y control**. México: Limusa.
 21. Cuello, E. M. (2019). **Estudio de la diversidad de insectos asociados a las principales plagas de Eucalyptus spp., para la selección de potenciales agentes de control biológico** (Tesis de Doctorado, Universidad de Buenos Aires). Disponível em https://hdl.handle.net/20.500.12110/tesis_n6592_Cuello
 22. Daane, K. M., Sime, K. R., Dahlsten, D. L., Andrews Junior, J. W., & Zuparko, R. L. (2005). The biology of *Psyllaephagus bliteus* Riek (Hymenoptera: Encyrtidae), a parasitoid of the red gum lerp psyllid (Hemiptera: Psylloidea). **Biological Control, 32*(2)*, 228-235. <https://doi.org/10.1016/j.biocontrol.2004.09.015>
 23. Daane, K. M., Sime, K. R., & Paine, T. D. (2012). Climate and the effectiveness of *Psyllaephagus bliteus* as a parasitoid of the red gum lerp psyllid. **Biocontrol Science and Technology, 22*(11)*, 1305-1320. <https://doi.org/10.1080/09583157.2012.724383>

24. Dahlsten, J. D. (2002). *Center for biological control*. Berkeley: University of California; IPM.
25. Dal Pogetto, M. H. F. do A., Wilcken, C. F., Gimenes, M. J., Christovam, R. de S., & Prado, E. P. (2011). Control of red-gum lerp psyllid with formulated mycoinsecticides under semi-field conditions. *International Journal of Tropical Insect Science, 31*(2), 85-91. <https://doi.org/10.1017/s1742758411000166>
26. Dallacort, S. (2020). *Controle químico de larvas de Leptocybe invasiva (Hymenoptera: Eulophidae) em mudas de eucalipto e efeito no parasitoide Quadrastichus mendeli (Hymenoptera: Eulophidae)* [Dissertação de Mestrado, Universidade Estadual Paulista]. Faculdade de Ciências Agrônomicas.
27. Dhahri, S., Jamaa, M. L., Garcia, A., Boavida, C., & Branco, M. (2014). Presence of *Glycaspis brimblecombei* and its parasitoid *Psyllaephagus bliteus* in Tunisia and Portugal. *Silva Lusitana, 22*(1), 99-105.
28. Dias, T. K. R. (2013). *Atopozelus opsimus (HEMIPTERA: REDUVIIDAE): presas alternativas, comportamento parental e predação sobre pragas exóticas* [Tese de Doutorado, Universidade Estadual Paulista]. Faculdade de Ciências Agrônomicas.
29. Dias, T. K. R. (2009). *Bionomia e comportamento de Atopozelus opsimus Elkins (HEMIPTERA: REDUVIIDAE) mantidos em Glycaspis brimblecombei Moore (HEMIPTERA: PSYLLIDAE)* [Tese de Doutorado, Universidade Estadual Paulista]. Faculdade de Ciências Agrônomicas.
30. Díaz, E. A. B., Coronel, R. S., & Godziewski, D. (2013). Consideraciones sobre dos nuevas plagas del eucalipto en Paraguay, el psílido de la concha o escudo *Glycaspis brimblecombei* (Hemiptera: Psyllidae) y la chinche marrón *Thaumastocoris peregrinus* (Hemiptera: Thaumastocoridae). *Bol. Mus. Nac. Hist. Nat. Parag, 17*(1), 72-75.
31. Erbilgin, N., Dahlsten, D. L., & Chen, P. (2004). Intraguild interactions between generalist predators and an introduced parasitoid of *Glycaspis brimblecombei* (Homoptera: Psylloidea). *Biological Control, 31*(3), 329–337. <https://doi.org/10.1016/j.biocontrol.2004.06.010>
32. European and Mediterranean Plant Protection Organization (EPPO). (2023). *Glycaspis brimblecombei*. *EPPO Global Database*. <https://gd.eppo.int/taxon/GLYSBR/distribution>
33. Favaro, R. M. (2006). *Aspectos bionômicos de Glycaspis (Glycaspis) brimblecombei (Moore, 1964) (Hemiptera: Psyllidae) e seu controle com fungos entomopatogênicos* [Dissertação de Mestrado, Universidade Federal do Paraná]. Ciências Biológicas.
34. Favoreto, A. L., Carvalho, V. R., Domingues, M. M., Ribeiro, M. F., Cavallini, G., Lawson, S. A., Silva, W. M., Zanuncio, J. C., & Wilcken, C. F. (2022). *Wolbachia pipientis*: First detection in populations of *Glycaspis brimblecombei* (Hemiptera: Aphalaridae) and *Psyllaephagus bliteus* (Hymenoptera: Encyrtidae) in Brazil. *Brazilian Journal of Biology, 82*, 1-4. <https://doi.org/10.1590/1519-6984.264475>
35. Ferreira-Filho, P. J., Wilcken, C. F., Masson, M. V., Tavares, W. S., Guerreiro, J. C., do Carmo, J. B., Prado, E. P., & Zanuncio, J. C. (2017). Influence of temperature and rainfall on the population dynamics of *Glycaspis brimblecombei* and *Psyllaephagus*

bliteus in *Eucalyptus camaldulensis* plantations. *Revista Colombiana de Entomología, 43*(1), 1-6. <https://doi.org/10.25100/socolen.v43i1.6638>

36. Ferreira Filho, P. J. (2010). *Dinâmica populacional do psíldeo-de-concha Glycaspis brimblecombei Moore (Hemiptera: Psyllidae) e parasitismo por Psyllaephagus bliteus Riek (Hymenoptera: Encyrtidae) em floresta de eucalipto* (Dissertação de Mestrado). Universidade Estadual Paulista, São Paulo, SP.
37. Ferreira Filho, P. J. (2005). *Estudo de populações do psíldeo-de-concha Glycaspis brimblecombei (Hemiptera: Psyllidae) e de seu parasitóide Psyllaephagus bliteus (Hymenoptera: Encyrtidae) em floresta de Eucalyptus camaldulensis por dois métodos de amostragem* (Dissertação de Mestrado). Universidade Estadual Paulista, São Paulo, SP.
38. Ferreira Filho, P. J., Wilcken, C. F., Lima, A. C. V., Sá, L. A. N. de, Carmo, J. B. do, Guerreiro, J. C., & Zanuncio, J. C. (2015). Biological control of *Glycaspis brimblecombei* (Hemiptera: Aphalaridae) in eucalyptus plantations. *Phytoparasitica, 43*(2), 151-157. <https://doi.org/10.1007/s12600-014-0440-3>
39. Ferreira, R. de A., Blaziza, A. A. B., Anzonin, M. G., & Firmino-Winckler, D. C. (2009). Flutuação populacional do psíldeo-de-concha *Glycaspis brimblecombei* Moore (Hemiptera: Psyllidae) em *Eucalyptus* spp. no município de Garça, SP. *Revista Científica Eletrônica de Engenharia Florestal, 8*(14), 29-46. ISSN: 1678-3867.
40. Firmino, D. C. (2004). *Biologia do psíldeo-de-concha Glycaspis brimblecombei Moore (Hemiptera: Psyllidae) em diferentes espécies de eucalipto e em diferentes temperaturas* (Dissertação de Mestrado). Faculdade de Ciências Agrônômicas, Universidade Estadual Paulista, Botucatu.
41. Firmino-Winckler, D. C., Wilcken, C. F., Oliveira, N. C. de, & Matos, C. A. O. de. (2009). Biologia do psíldeo-de-concha *Glycaspis brimblecombei* Moore (Hemiptera, Psyllidae) em *Eucalyptus* spp. *Revista Brasileira de Entomologia, 53*(1), 144-146. <https://doi.org/10.1590/S0085-56262009000100030>
42. Franco, M. P. (2018). *Plasticidade de árvores de Eucalyptus grandis no contexto das mudanças climáticas: interação do déficit hídrico e da fertilização no crescimento e qualidade do lenho das árvores* (Tese de Doutorado). Universidade de São Paulo, Piracicaba, SP.
43. Gallo, D., Nakano, O., Silveira Neto, S., Carvalho, R. P. L., Batista, G. C., Berti Filho, E., Parra, J. R. P., Zucchi, R. A., Alves, S. B., Vendramin, J. D., Marchini, L. C., Lopes, J. R., & Omoto, C. (2002). *Entomologia agrícola*. Piracicaba: FEALQ.
44. Garonna, A. P., Sasso, R., & Laudonia, S. (2011). *Glycaspis brimblecombei* (Hem.: Psyllidae), la psilla dal follicolo bianco ceroso, altra specie aliena dell'Eucalipto rosso in Italia. *Foresta, 18*, 71-77. <https://doi.org/10.3832/efor0654-008>
45. Gill, R. J. (1998). New state records: Redgum lerp psyllid. *California Department of Food and Agriculture Plant Pest and Disease Report, 17*, 7-8.
46. Huerta, A., Faúndez, M., & Araya, J. E. (2010). Susceptibility of *Eucalyptus* spp. to an induced infestation of red gum lerp psyllid *Glycaspis brimblecombei* Moore (Hemiptera:

Psyllidae) in Santiago, Chile. **Ciencia e Investigación Agraria*, 37*(2), 27-33. <https://doi.org/10.4067/S0718-16202010000200003>

47. Indústria Brasileira de Árvores (IBÁ). (2022). **Relatório Anual 2022**. IBÁ. 96 p. Disponível em: <https://iba.org/datafiles/publicacoes/relatorios/relatorio-anual-iba2022-compactado.pdf>. Acesso em: 06 de ago. 2023.
48. Indústria Brasileira de Árvores (IBÁ). (2023). **Relatório anual IBÁ 2023**. IBÁ. 91 p. Disponível em: <https://iba.org/datafiles/publicacoes/relatorios/relatorio-anual-iba2023-r.pdf>. Acesso em: 10 out. 2023.
49. Instituto Brasileiro de Geografia e Estatística (IBGE). (2023b). **Produção da extração vegetal e da silvicultura 2022**. Rio de Janeiro, 37, 1-8. Disponível em: [https://biblioteca.ibge.gov.br/visualizacao/periodicos/74/pevs_2022_v37_informativo.pdf](https://biblioteca.ibge.gov.br/visualizacao/periodicos/74/pevs_2022_v37_informativo.pdf). Acesso em: 10 out. 2023.
50. Instituto Brasileiro de Geografia e Estatística (IBGE). (2015). **Produção da extração vegetal e silvicultura 2015**. Rio de Janeiro: IBGE, 29, 1-56. Disponível em: [https://biblioteca.ibge.gov.br/visualizacao/periodicos/74/pevs_2014_v29.pdf](https://biblioteca.ibge.gov.br/visualizacao/periodicos/74/pevs_2014_v29.pdf). Acesso em: 20 jan. 2023.
51. Jere, V., Mhango, J., Njera, D., & Jenya, H. (2020). Infestation of **Glycaspis brimblecombei** (Hemiptera: Psyllidae) on three Eucalyptus species in selected ecological zones in Malawi. **African Journal of Ecology**, 58(2), 251-259. <https://doi.org/10.1111/aje.12686>.
52. Junqueira, L. R., Barbosa, L. R., Zanuncio, J. C., & Wilcken, C. F. (2016). Occurrence of forest pests in Eucalyptus plantations in Brazil during 2010-2015. In **Proceedings of the 25th International Congress of Entomology** (pp. 1-8). Annapolis: Entomological Society of America. <https://doi.org/10.1603/ICE.2016.112703>.
53. Lemes, P. G., Zanuncio, J. C., Jacobine, L. A. G., Wilcken, C. F., & Lawson, S. A. (2021). Forest Stewardship Council and Responsible Wood certification in the integrated pest management in Australian forest plantations. **Forest Policy and Economics**, 131, 1-12. <https://doi.org/10.1016/j.forpol.2021.102541>.
54. Lemes, P. G., & Zanuncio, J. C. (2021). Manejo integrado de pragas florestais. In P. G. Lemes (Ed.), **Novo manual de pragas florestais brasileiras** (pp. 26-39). Montes Claros: Instituto de Ciências Agrárias da Universidade Federal de Minas Gerais.
55. Litholdo, M. G. (2020). **Dinâmica populacional e distribuição de insetos em plantios florestais na Estação Experimental de Anhembi (Anhembi, SP)** (Dissertação de Mestrado, Escola Superior de Agricultura “Luiz de Queiroz”, Universidade de São Paulo, Piracicaba). Disponível em: [https://www.teses.usp.br/teses/disponiveis/11/11146/tde-13032019-174840/publico/Murilo_Gaspar_Litholdo.pdf](https://www.teses.usp.br/teses/disponiveis/11/11146/tde-13032019-174840/publico/Murilo_Gaspar_Litholdo.pdf). Acesso em: 17 out. 2022.

56. Lutinski, J. A., Lutinski, C. J., & Garcia, F. R. M. (2006). Primeiro registro de *Glycaspis brimblecombei* Moore 1964 (Hemiptera: Psyllidae) em Eucalipto no Estado de Santa Catarina, Brasil. *Ciência Rural*, 36(2), 653-655. <https://doi.org/10.1590/S0103-84782006000200046>.
57. Margiotta, M., Bella, S., Buffa, F., Caleca, V., Floris, I., Giorno, V., Lo Verde, G., Rapisarda, C., Sasso, R., Suma, P., Tortorici, F., & Laudonia, S. (2017). Modeling environmental influences in the *Psyllaephagus bliteus* (Hymenoptera: Encyrtidae) - *Glycaspis brimblecombei* (Hemiptera: Aphalaridae) parasitoid-host system. *Journal of Economic Entomology*, 110(2), 491-501. <https://doi.org/10.1093/jee/tow253>.
58. Masson, M. V., Matos, W. C., Silva, A. G. P. da, Alves, J. M., Ribeiro, G. T., & Wilcken, F. C. (2009). Occurrence and population distribution of red gum lerp psyllid *Glycaspis brimblecombei* Moore 1964 (Hemiptera: Psyllidae) in eucalyptus forests in the North coast of Bahia State, Brazil. *Boletim de Sanidade Vegetal - Plagas*, 35(4), 563-569.
59. Ministério da Agricultura, Pecuária e Abastecimento (MAPA). (2023). Agrofít, Sistema de Agrotóxicos Fitossanitários. Disponível em: [https://agrofít.agricultura.gov.br/agrofít_cons/principal_agrofít_cons](https://agrofít.agricultura.gov.br/agrofít_cons/principal_agrofít_cons). Acesso em: 15 de jul. 2023.
60. Ministério da Agricultura, Pecuária e Abastecimento (MAPA). (2019). Mercado de biodefensivos cresce mais de 70% no Brasil em um ano. Disponível em: <https://www.gov.br/agricultura/pt-br/assuntos/noticias/feffmercado-de-biodefensivos-cresce-em-mais-de-50-no-brasil>. Acesso em: 20 jan. 2023.
61. Montes, S. M. N. M., & Raga, A. (2005). Dinâmica estacional do psilídeo-de-concha *Glycaspis brimblecombei* Moore (Hemiptera: Psyllidae) na região oeste do estado de São Paulo. *Arquivos do Instituto Biológico*, 72(4), 511-515. <https://doi.org/10.1590/1808-1657v72p5112005>
62. Morgan, F. D. (1984). *Psylloidea do Sul da Austrália*. Government of South Australia. ISBN: 9780724345601.
63. Nimer, E. (1989). *Climatologia do Brasil* (2. ed.). IBGE.
64. Ohmart, C. P., & Edwards, P. B. (1991). Insect herbivory on eucalyptus. *Annual Review of Entomology*, 36, 637-657. <https://doi.org/10.1146/annurev.en.36.010191.003225>
65. Oliveira, D. W. N. de. (2020). Fertilização silicatada com microssílica pode ser usada para controlar o psilídeo de concha em floresta de eucalipto? (Dissertação de Mestrado em Ciência Florestal). Faculdade de Ciência Agrárias, Universidade Federal dos Vales do Jequitinhonha e Mucuri, Diamantina. Disponível em: <http://acervo.ufvjm.edu.br/jspui/handle/1/2452>. Acesso em: 08 de jul. 2023.
66. Oliveira, K. N., Jesus, F. M., Silva, J. O., Espírito-Santo, M. M., & Faria, M. L. (2012). An experimental test of rainfall as a control agent of *Glycaspis brimblecombei* Moore (Hemiptera, Psyllidae) on seedlings of *Eucalyptus camaldulensis* Dehn (Myrtaceae). *Revista Brasileira de Entomologia*, 56(1), 101-105. <https://doi.org/10.1590/S0085-56262012005000008>


67. Oliveira, L. da S., Costa, E. C., Grellman, M., Cantarelli, E. B., & Perrand, E. R. (2006). Ocorrência de *Glycaspis brimblecombei* (Moore, 1964) (Hemiptera: Psyllidae) em *Eucalyptus* spp. no Rio Grande do Sul, Brasil. **Ciência Florestal**, **16**(3), 353-355. <https://doi.org/10.5902/198050981914>
68. Onore, G., & Gara, R. L. (2007). First record of *Glycaspis brimblecombei* (Hemiptera: Psyllidae) in Ecuador, biological notes and associated fauna. In **Anais do 4º Congresso Europeu de Hemiptera** (p. 41-42). Turin.
69. Paine, T. D., Dahlsten, D. L., Millar, J. G., Hoddle, M. S., & Hanks, L. M. (2000). UC scientists apply IPM techniques to new eucalyptus pests. **California Agriculture**, **54**(6), 8-13. Disponível em: <http://www.acwm.co.la.ca./pdf/RedGumLerppsyllideng.pdf>. Acesso em: 21 set. 2023.
70. Pereira, J. M., Baldin, E. L. L., Soliman, E. P. I., & Wilcken, C. F. (2013). Attractiveness and oviposition preference of *Glycaspis brimblecombei* Moore in *Eucalyptus* spp. **Phytoparasitica**, **41**, 117–124. <https://doi.org/10.1007/s12600-012-0268-7>
71. Pereira, J. M. (2011). Resistência de genótipos de eucalipto ao psílideo-de-concha *Glycaspis brimblecombei* Moore (Hemiptera: Psyllidae). (Tese de Doutorado). Faculdade de Ciências Agrônômicas, Universidade Estadual Paulista, Botucatu.
72. Phillips, C. (1992). **Lerps insects**. Mount Gambier: PIRSA Forestry.
73. Plascencia-González, A., Cibrián-Tovar, D., Llanderal-Cázarez, C., López-Pérez, I., & Arriola-Padilla, V. (2005). Biología del parasitoide *Psyllaephagus bliteus* (Hymenoptera: Encyrtidae). **Revista Chapingo: Serie Ciencias Forestales y del Ambiente**, **11**(1), 11-17.
74. Poyer, F. R. (2021). A transparência na adoção dos green bonds no setor de papel e celulose no Brasil. (Dissertação de Mestrado em Agronegócios). Centro de Estudos e Pesquisas em Agronegócios, Universidade Federal do Rio Grande do Sul, Porto Alegre.
75. Queiroz, D. L. de, Melissa, J., Camargo, M., Dedek, R. A., & Oliveira, E. B. (2016). Effect of silicon application to *Eucalyptus camaldulensis* on the population of *Glycaspis brimblecombei* (Hemiptera: Aphalaridae). **Brazilian Journal of Forestry Research**, **36**(86), 85-94. <https://doi.org/10.4336/2016.pfb.36.86.976>
76. Queiroz, D. L., Majer, J., Burckhardt, D., Zanetti, R., Fernández, J. I. R., Queiroz, E. C. de, Garrastazu, M., Fernandes, B. V., & Anjos, N. dos. (2013). Predicting the geographical distribution of *Glycaspis brimblecombei* (Hemiptera: Psylloidea) in Brazil. **Australian Journal of Entomology**, **52**(1), 20-30. <https://doi.org/10.1111/aen.12001>
77. Queiroz, D. L., Burckhardt, D., & Majer, J. (2012). Integrated pest management of eucalypt psyllids (Insecta, Hemiptera, Psylloidea). In M. L. Larramendy & S. Soloneski (Eds.), **Integrated pest management and pest control: Current and future tactics** (Vol. 1, pp. 385-412). Rijeka: InTech.
78. Queiroz, M. M., Leles, P. S. dos S., Oliveira Neto, S. N. de, & Ferreira, M. A. (2009). Comportamento de materiais genéticos de eucalipto em Paty do Alferes, RJ. **Floresta e Ambiente**, **16**(1), 1-10.

79. Ramirez, A. L. G. (2003). Fluctuación poblacional del psílido del eucalipto *Glycaspis brimblecombei* y el efecto del control biológico con la vispa parasitóide *Psyllaephagus bliteus*. (Tese de Maestria em Ingeniera Agrícola). Facultad de Estudios Superiores Cuautitlan, Edo. de México.
80. RAMIREZ, A. L. G.; MANCERA, G. M.; GUERRA-SANTOS, J. J. (2002). Análises del efecto de las condiciones ambientales en la fluctuación poblacional del psílido del eucalipto em el estado de México. Cuautitlán Izcalli: Editorial Habana. 5 p.
81. REIFENRATH, K.; RIEDERER, M.; MÜLLER, C. (2005). Leaf surface wax layers of Brassicaceae lack feeding stimulants for *Phaedon cochleariae*. *Entomologia Experimentalis et Applicata*, 115(1), 41-50. <https://doi.org/10.1111/j.1570-7458.2005.00242.x>
82. RESENDE, M. Q.; SANTANA, D. L. Q. (2008). Ocorrência de três espécies de psílideo (Hemiptera: Psyllidae) em eucalipto no Espírito Santo, Brasil. In *Congresso Brasileiro de Entomologia*, 22, 2008, Uberlândia. Anais [...] Uberlândia-MG: SEB.
83. RODAS, C. A.; SERNA, R.; HURLEY, B. P.; BOLAÑOS, M. D.; GRANADOS, G. M.; WINGFIELD, M. J. (2014). Three new and important insect pests recorded for the first time in Colombian plantations. *Southern Forests: A Journal of Forest Science*, 76(4), 245-252. <https://doi.org/10.2989/20702620.2014.965983>
84. ROSALES, C. J.; LOBOSQUE, O.; CARVALHO, P.; BERMÚDEZ, L.; ACOSTA, C. (2008). *Glycaspis brimblecombei* Moore (Hemiptera: Psyllidae) "Red Gum Lerp": Nueva plaga forestal en Venezuela. *Entomotropica*, 23(1), 103-104. ISSN: 1317-5262.
85. SÁ, L. A. N. de; WILCKEN, C. F. (2004). Nova praga exótica no ecossistema florestal. Jaguariúna: EMBRAPA. 4 p. (Comunicado Técnico, 18).
86. SÁ, L. A. N. de; PESSOA, M. C. P.; WILCKEN, C. F.; MEDEIROS, A. G. de B.; TEIXEIRA, J. T. (2014). Monitoramento da praga exótica psílideo-de-concha *Glycaspis brimblecombei* e de seu parasitóide exótico *Psyllaephagus bliteus* no controle biológico desta praga em florestas de eucalipto nos estados de SP e MG. Jaguariúna: Embrapa Meio Ambiente, 1-8. set.
87. SALIBA, I. L.; LUNZ, A. M.; BATISTA, T. F.; SCHWARTZ, G.; QUEIROZ, D. L. (2019). First record of *Glycaspis brimblecombei* (Moore, 1964) and *Blastopsylla occidentalis* (Taylor, 1985) (Hemiptera, Aphalaridae) in eucalyptus plantations in State of Pará, Brazil. *Entomological Communications*, 1, dez. 2019. <https://doi.org/10.37486/2675-1305.ec01009>
88. SÁNCHEZ, B. S. (2002). Aspectos bionómicos del psílideo del eucalipto *Glycaspis brimblecombei* Moore (Homoptera: Psylloidea: Spondylaspididae). Chapingo, Texcoco, Edo. de México. 76 p. Tese (Mestria) - Universidade Autónoma Chapingo. División de Ciências Forestales.
89. SANCHEZ-MARTÍNEZ, G.; IÑIGUEZ-HERRERA, G.; GONZALEZ-GAONA, E.; EQUIHUA-MARTÍNEZ, A.; VILLA-CASTILLO,
90. SANDOVAL, A., & ROTHMANN, S. (2002). Detección del psílido de los eucaliptos rojos, *Glycaspis brimblecombei* Moore, 1964, en Chile (Hemiptera: Psyllidae). In *Congreso*

Nacional de Entomología, 24* (pp. 1-4). Concepción: Universidad de Concepción. Available at: <http://www.udec.cl/~insectos/resumen.html>. Accessed on: 21 Jun. 2004.

91. SANTANA, D. L. de Q., BELLOTE, A. F. J., & DEDECEK, R. A. (2003). *Ctenarytaina spatulata*, Taylor: Água no Solo, Nutrientes Minerais e suas Interações com a Seca dos Ponteiros do Eucalipto. *Pesquisa Florestal Brasileira*, 46, 57-67. Available at: <https://pfb.cnpf.embrapa.br/pfb/index.php/pfb/article/view/1618>. Accessed on: 21 Sep. 2023.
92. SANTANA, D. L. Q. (2005). *Psilídeos em Eucaliptos no Brasil*. Colombo: IPEF. Circular Técnica, 109. Available at: <https://ainfo.cnptia.embrapa.br/digital/bitstream/CNPF-2009-09/43220/1/circ-tec109.pdf>. Accessed on: 15 Oct. 2022.
93. SANTOS, F. A., CORREA, F. A., NANINI, F., NASCIMENTO, D. A., JUNQUEIRA, L. R., & WILCKEN, C. F. (2021). Genetic diversity of *Glycaspis brimblecombei* (Hemiptera: Aphalaridae) and its parasitoid *Psyllaephagus bliteus* (Hymenoptera: Encyrtidae) in Brazil. *Braz. J. Biol.*, 81(3), 838-841. <https://doi.org/10.1590/1519-6984.230486>.
94. SILVA, G. L. B. e. (2020). Seleção de híbridos multi-espécies de eucalyptus tolerantes ao déficit hídrico, insetos e fungos. Dissertação de Mestrado, Departamento de Engenharia Florestal, Universidade Federal de Viçosa, MG. Available at: <https://www.locus.ufv.br/bitstream/123456789/30088/1/texto%20completo.pdf>. Accessed on: 16 Oct. 2023.
95. SILVA, A. L. da. (2010). Ocorrência, sinecologia de *Glycaspis Brimblecombei* (Moore, 1964) (Hemiptera: Psyllidae) e seus inimigos naturais em Eucalyptus spp. no município de Cuiabá - MT. Dissertação de Mestrado em Ciência Florestais e Agrárias, Universidade Federal de Mato Grosso, Cuiabá, MT.
96. SILVA, A. L., PERES-FILHO, O., DORVAL, A., & CASTRO, C. K. da C. e. (2013). Dinâmica Populacional de *Glycaspis brimblecombei* e Inimigos Naturais em Eucalyptus spp., Cuiabá-MT. *Floresta e Ambiente*, 20(1), 80-90. <https://doi.org/10.4322/floram.2012.066>.
97. SOUZA, S. C. de. (2023). O setor florestal como uma alternativa ao desenvolvimento socioeconômico na região da serra do sudeste do Rio Grande do Sul, Brasil. Dissertação de Mestrado, Centro de Ciências Rurais, Universidade Federal de Santa Maria, Santa Maria.
98. SOOKAR, P., SEEWORUTHUN, S. I., & RAMKHELAWON, D. (2003). The redgum lerp psyllidae, *Glycaspis brimblecombei*, a new pest of *Eucalyptus* sp. in Mauritius. *AMAS*, 327-332.
99. TULLER, J., OLIVEIRA, K. N., SILVA, J. O., FARIA, M. L. de, ESPÍRITO SANTO, M. M. do, SERRÃO, J. E., & ZANUNCIO, J. C. (2017). *Glycaspis brimblecombei* (Hemiptera: Psyllidae) attack patterns on different *Eucalyptus* genotypes. *PeerJ*, 1-15. <https://doi.org/10.7717/peerj.3864>.
100. VALENTE, C., GONÇALVES, C. I., MONTEIRO, F., GASPAR, J., SILVA, M., SOTTOMAYOR, M., PAIVA, M. R., & BRANCO, M. (2018). Economic Outcome of Classical Biological Control: A Case Study on the Eucalyptus Snout Beetle, *Gonipterus platensis*, and the Parasitoid *Anaphes nitens*. *Ecological Economics*, 149, 40-47. <https://doi.org/10.1016/j.ecolecon.2018.03.001>.

101. WANTROBA, K. L.; BARCIK, L. Z.; MADEIROS, D. R.; CAMARGO, M. B.; GARRETT, A. T. A.; PESCK, V. A.; UKAN, D. Detecção de ataque por insetos-praga em plantios de Eucalyptus spp. por meio de índices de vegetação. *Revista Observatório De La Economía Latinoamericana*, Curitiba, v. 21, n. 9, p. 11497-11515, 2023. DOI: <https://doi.org/10.55905/oelv21n9-054>.
102. WILCKEN, C. F.; COUTO, E. B.; ORLATO, C.; FERREIRA FILHO, P. J.; FIRMINO, D. C. Ocorrência do psilídeo-deconcha (*Glycaspis brimblecombei*) (Hemiptera: Psyllidae) em florestas de eucalipto no Brasil. Piracicaba: IPEF, 2003. 11 p. (Circular Técnica, 201).
103. WILCKEN, C. F.; FIRMINO-W INCKLER, D. C.; DAL POGETTO, M. H. F. A.; DIAS, T. K. R.; LIMA, A. C. V.; SÁ, L. A. N. DE; FERREIRA FILHO, P. J. Psilídeo-de-concha-do-eucalipto, *Glycaspis brimblecombei* Moore. In: VILELA, E. F.; ZUCCHI, R. A. (org.). *Pragas introduzidas no Brasil - Insetos e Ácaros*. Piracicaba: FEALQ, 2015. p. 883-897.
104. WILCKEN, C. F.; SÁ, L. A. N. de; FIRRRÚNO, D. C.; COUTO, E. B. do; FERREIRA FILHO, P. J.; FRANCHLM, T. Controle biológico do psilídeo-de-concha (*Glycaspis brimblecombei*) (HEMIPTERA: PSYLLIDAE) em florestas de eucalipto. In: *Congreso Virtual Iberoamericano sobre Gestión de Calidad en Laboratorios*, 3., 2005. Virtual. Resumos [...]. Virtual: Iberolab, 2005. p. 303-307.
105. WILCKEN, C. L. As pragas exóticas que estão chegando. *Revista Opiniões - Florestal: celulose, papel, carvão, siderurgia, painéis e madeira*. Ribeirão Preto, p. 26-27, 2017. Disponível em: <https://issuu.com/opinioesbr/docs/opcp46?fr=sYjU5MDEzOTgzMDA>. Acesso em: 17 out. 2022.
106. YIHDEGO, Y.; SALEN, H. S.; MUHAMMED, H. H. Agricultural Pest Management Policies during Drought: Case Studies in Australia and the State of Palestine. *Natural Hazards Review*, v. 20, n. 1, fev. 2019. DOI: [https://doi.org/10.1061/\(ASCE\)NH.1527-6996.0000312](https://doi.org/10.1061/(ASCE)NH.1527-6996.0000312).

IMPACTS OF INNOVATION EVENTS ON THE DEVELOPMENT OF ENTREPRENEURIAL SKILLS: A CASE STUDY OF CAMPUS PARTY BRASIL <https://doi.org/10.56238/sevened2024.029-029>

Márcio Gonçalves dos Santos¹, Elaine Cristina Arantes², Priscila Célia Giacomassi³, Gustavo Bigetti Guergoletto⁴, Roberto Carlos Dalongaro⁵, Lívia Maria dos Santos⁶, Ciro Bachtold⁷ and Rodrigo Carlo Toloi⁸

ABSTRACT

This study investigates the impact of student participation in innovation events on the development of entrepreneurial skills, using Campus Party Brasil 2023 as a case study. The research adopts a qualitative-quantitative approach, combining primary data obtained through questionnaires applied to 25 students, with secondary data extracted from a literature review. Data analysis was conducted using Bardin's (2004) content analysis method, with the stages of pre-analysis and coding. The triangulation between primary and secondary data ensured the validity of the findings. The results indicate that innovation events offer a favorable environment for the development of skills such as problem solving, creativity, leadership and teamwork. The study advances the literature by offering empirical evidence that reinforces the importance of integrating practical experiences, such as hackathons and entrepreneurship marathons, into the formal entrepreneurial education curriculum. In addition, it highlights the role of these events in the formation of contact networks and in the expansion of internship and employment opportunities for students, which is not widely addressed in previous studies. By examining the interaction between theory and practice in the development of entrepreneurial skills, this work contributes to a deeper understanding of how innovation events can complement academic training, providing an interdisciplinary education and preparing students for market challenges. The

¹ Doctor in Production Engineering. Federal Institute of Paraná (IFPR) – Brazil.

E-mail: marcio.goncalves@ifpr.edu.br

LATTES: <http://lattes.cnpq.br/6982128189916053>

² Doctor in Administration. Federal Institute of Paraná (IFPR) – Brazil.

E-mail: elaine.arantes@ifpr.edu.br

LATTES: <http://lattes.cnpq.br/9056089845348500>

³ Doctor in Literary Studies. Federal Institute of Paraná (IFPR) – Brazil.

E-mail: priscila.giacomassi@ifpr.edu.br

LATTES: <http://lattes.cnpq.br/6220081734480102>

⁴ Master in Professional and Technological Education. Federal Institute of Paraná (IFPR) – Brazil. E-

mail: gustavo.guergoletto@ifpr.edu.br

LATTES: <http://lattes.cnpq.br/7190048241436968>

⁵ Doctor in Administration. Federal Institute of Paraná (IFPR) – Brazil.

E-mail: roberto.dalongaro@ifpr.edu.br

LATTES: <http://lattes.cnpq.br/4949432187560448>

⁶ Doctor in Public Policy. Federal Institute of Paraná (IFPR) – Brazil.

E-mail: livia.santos@ifpr.edu.br

LATTES: <http://lattes.cnpq.br/1333220483903281>

⁷ Master in Urban Management. Federal Institute of Paraná (IFPR) – Brazil.

E-mail: ciro.bachtold@ifpr.edu.br

LATTES: <http://lattes.cnpq.br/5481732991486919>

⁸ Doctor in Production Engineering. Federal Institute of Mato Grosso (IFMT) – Brazil.

E-mail: rodrigo.toloi@ifmt.edu.br

LATTES: <http://lattes.cnpq.br/4422094879559321>



study suggests that the systematic inclusion of events, such as the Campus Party, in educational programs can be an effective strategy to strengthen experiential learning and foster an entrepreneurial mindset.

Keywords: Entrepreneurial education. Collaborative learning. Innovation event. Content analysis.



INTRODUCTION

Entrepreneurial education aims to promote attitudes and skills, such as creativity, innovation, decision-making, and risk management, empowering students in various aspects of life (MIÇO; CUNGU, 2023). This approach amplifies students' adaptability and competitiveness in varied professional contexts.

The relevance of this education lies in developing an entrepreneurial mindset, including the recognition of opportunities and the ability to act in different situations. Learning through experiences, such as projects by young and innovative companies – startups – is an effective tool for students to apply theoretical concepts in practical scenarios, improving their professional capabilities (MUTALIMOV et al., 2021).

Collaborative pedagogical models, such as problem-based and project-based learning, integrating digital technologies, are recommended in higher education programs focused on entrepreneurship (RODRIGUES, 2023). These methods strengthen professional training and stimulate creative attitudes (TADEUSH, 2023).

Entrepreneurial education also prepares students to contribute socially, culturally, and economically in scenarios of economic instability (TADEUSH, 2023). In technical-vocational schools, interdisciplinary pedagogical practices promote skills such as creativity, critical thinking, and adaptability (SCOTT; WHITE, 2024). Extracurricular activities and practical experiences strengthen the application of theoretical knowledge in real situations, encouraging entrepreneurial development (ALIMANINGTYAS et al., 2024).

Innovation and entrepreneurship events are essential for students to expand their skills. They offer real-world situations that stimulate an innovative mindset and practical skills (SCHAEFER; MINELLO, 2020). In these activities, students face challenges and learn from experienced entrepreneurs, which strengthens confidence to turn ideas into businesses (DONADULA, 2023).

Campus Party Brasil, the largest innovation and technology event in the country, offers participants the opportunity to get involved in activities such as hackathons (collaborative programming and technology events) and entrepreneurship marathons. During the event, students apply their knowledge in real situations, creating prototypes that can generate new startups. In this sense, the objective of this work is to analyze the challenges and learning opportunities of students from the Federal Institute of Paraná, Colombo Campus, who participated in Campus Party Brasil 2023.

The article is structured as follows: Section 2 brings the theoretical framework, grounding the main discussions on the teaching of entrepreneurship, innovation and experiential learning. Section 3 presents the methodology adopted, detailing the process of



primary and secondary data collection, as well as the content analysis technique used to interpret the results. Section 4 explores the results obtained in the research and discusses the entrepreneurial skills developed by students during their participation in Campus Party Brasil, based on the triangulation between the collected data and the reviewed literature. Finally, Section 5 offers the final considerations, pointing out the limitations of the study and suggesting directions for future research, in addition to highlighting the relevance of innovation events as an integral part of professional and academic training.

METHODOLOGY

This research is qualitative and quantitative in nature, allowing for a comprehensive analysis of the perceptions and experiences of Campus Party Brasil 2023 participants. The study was based on both primary data, collected through questionnaires applied directly to the participants, and secondary data, obtained from a review of the existing literature on the subject. This combination of methods provides a more robust analysis of the challenges and learning opportunities related to the event.

Secondary data were collected from searches in the Google Scholar and Scispace databases, using filters such as the publication interval of the last four years and articles classified as *open access*. In addition, key terms such as "entrepreneurship", "entrepreneurial education", "innovation events" or "innovation" were used. The selected articles were read and recorded for the construction of the theoretical framework, ensuring that the theoretical foundation was aligned with the objectives of the research.

Primary data collection was carried out through a structured questionnaire applied to 25 students, from different IFPR campuses, who participated in the Campus Party. The questionnaire was validated with a pilot sample before being applied more broadly, which ensures the reliability of the instrument. The questions addressed topics such as skills development, challenges faced, and the professional opportunities resulting from participating in the event. The questionnaire was distributed via WhatsApp group created specifically for communication between participants and teachers during the event.

The research participants were selected from an IFPR institutional notice (Notice No. 40, of May 19, 2023 – Simplified Selection Process for Participation in Event #CPBR15 – Campus Party Brasil 2023), open to students enrolled in technical and higher education courses, from the twenty-six IFPR campuses distributed in the state of Paraná and, 40 students were selected. For the selection, students needed to present a project summary and a *pitch video* about the innovation proposal. Among the participants, we obtained 25 returns from the questionnaire applied in the research.



It is important to emphasize that the sample used in this study, composed of 25 students from the Federal Institute of Paraná (IFPR), has limitations that must be taken into account when interpreting the results. Although the methodological approach was adequate for the context studied, the size and geographic constraint of the sample limit the generalization of the findings to other educational contexts. Because participants belong to a single institution, perceptions and results may not fully reflect the diversity of experiences that could be observed in larger samples, with students from different courses, institutions, and regions.

In addition, data collection was carried out exclusively through questionnaires, which may not capture all the nuances of the experiences lived by the participants. Therefore, the results should be interpreted in light of these limitations, and it is recommended that future research utilize larger sample sizes and complementary methods, such as in-depth interviews and direct observations, to gain a more comprehensive and detailed understanding of the impacts of participation in events such as Campus Party.

However, the sample used in this study, composed of 25 students from the Federal Institute of Paraná (IFPR) who participated in Campus Party Brasil 2023, is adequate to investigate the impact of innovation events on the development of entrepreneurial skills. Although the number of participants was relatively small, the selection was judicious, focusing on individuals directly involved in innovation and entrepreneurship activities during the event. This ensures internal validity, since the group is representative of the context investigated and is immersed in the practical experiences discussed. The use of validated questionnaires and triangulation with the reviewed literature further strengthens the reliability of the data. In addition, the selection of participants with different academic profiles and experiences in entrepreneurship allows for a richer and more diversified view of the skills developed.

Regarding external validity, the results, although limited to a single institution, can be generalized to other similar educational contexts, especially those that adopt innovative methodologies and focus on the development of entrepreneurial competencies through practical events. Being a large-scale event with standardized characteristics in its editions, Campus Party offers an environment that can be replicated in different institutions, making the findings applicable to other educational contexts that promote innovation initiatives. The inclusion of similar events in the curriculum of technical and higher education courses can generate compatible results, expanding opportunities for the integration between theory and practice in the teaching of entrepreneurship.

The data were analyzed using the content analysis method, as described by Bardin (2004). The analysis involved two main steps:

1. Pre-analysis: exhaustive reading of the material to identify nuclei of analysis and main categories.
2. Coding and analysis: the registration units were classified and grouped according to their meanings, which allowed the identification of the analysis categories used to interpret the results. The categorical analysis method was used to represent, in a condensed way, the data collected (BARDIN, 2004).

To ensure the validity and reliability of the results, the research used the triangulation technique, comparing the primary data (obtained through the questionnaires) with the secondary data (literature review). This triangulation was crucial to confirm the findings of the survey and support the analysis of the emerging categories, offering a more complete and accurate view of the impact of participation in the event.

THEORETICAL FRAMEWORK

In this section, the theoretical discussions that supported the interpretation of the results will be presented. Concepts of entrepreneurial education, innovative pedagogical models in the teaching of entrepreneurship and the impacts of innovation events on the professional trajectory of students are discussed.

ENTREPRENEURIAL EDUCATION: CONCEPTS AND APPLICATIONS IN PROFESSIONAL TRAINING

Entrepreneurship is generally seen as something abstract, formed by characteristics and competencies of entrepreneurs that, according to Gossel (2022), encompasses psychological disposition, value systems, cognitive approaches, and intrinsic qualities necessary to operate in volatile and competitive markets.

Schaefer and Minello (2020) consider entrepreneurial education a process aimed at creating a practical mindset, focused on "knowing how to be", "knowing how to do" and "knowing how to act". This process goes beyond theoretical knowledge, developing skills and proactive attitudes, characterized by "learning by action", practical applicability and an integrated and interdisciplinary training.

This approach strengthens skills such as creativity, innovation, and problem-solving (LAGE, 2023), in addition to fostering the ability to identify opportunities, persistence, and strategic planning (MELLO; NUNES, 2018). The environment of tolerance to error allows



students to explore their ideas, encouraging the search for creative solutions (FRITZ; BARTH; BOHNENBERGER, 2022).

Today's professional market, driven by technological advances, requires technological, cognitive, and social skills, with an emphasis on adaptability and continuous learning (SHEMYHON, 2024). Entrepreneurial education prepares students to develop innovative solutions in different sectors (WILLWERDING; LAPOLLI, 2020), consolidating itself as an effective tool to train adaptable professionals.

Although associated with business creation, this education encompasses a broader set of skills, applicable in various areas. Mello; Nunes (2018), for example, highlight that it empowers young people to be protagonists in regional development, going beyond traditional entrepreneurship. Its application in areas such as engineering has generated versatile talents, by integrating practical skills and entrepreneurial thinking (LIN; BIN, 2024).

The impact of entrepreneurial education on professional training is reflected in the preparation of students to face real challenges, encouraging creativity and innovation (RIBEIRO; FRENCH; SILVA, 2021). This ongoing practice helps develop an analytical mindset, which is essential for success in new endeavors and the development of established careers.

The integration of different areas of knowledge stimulates the exploration of innovative solutions and promotes holistic training, which becomes indispensable in an interconnected professional world (LIMA et al., 2020). This education also encourages sustainable thinking, challenging students to develop environmentally responsible products and services (PITOMBEIRA; SOUSA FILHO; FERREIRA NETO, 2023).

However, the implementation of entrepreneurial education in technical-professional institutions faces challenges, especially with regard to interdisciplinarity. The rigid structure of technical schools can hinder the integration of different areas of knowledge (FEITOSA; SILVA, 2024). This fragmentation hinders the application of a practical and innovative approach, since many teachers do not have adequate training to conduct interdisciplinary practices (OLIVEIRA; VILAS BOAS, 2024).

Despite this, interdisciplinarity in entrepreneurial education offers a unique opportunity to enrich the training of students. By connecting different areas of knowledge, this approach encourages a critical understanding of problems and the creation of innovative solutions (TORABI, 2023).

In the context of Professional and Technological Education (EPT), this methodology is relevant, integrating cultural, linguistic and technological perspectives, improving both the technical and human training of students (OLIVEIRA; VILAS BOAS, 2024). As a result,



interdisciplinary entrepreneurial education transforms the educational experience and prepares students to work in dynamic and complex professional environments.

INNOVATIVE PEDAGOGICAL MODELS IN THE TEACHING OF ENTREPRENEURSHIP

Collaborative pedagogical models, such as problem-based learning (PBL) and project-based learning (PjBL), have stood out in the teaching of entrepreneurship. PBL puts students at the center of the learning process, challenging them to solve real problems without predefined solutions, promoting active knowledge construction, and developing skills such as critical thinking and adaptability (DORNADULA et al., 2023).

PjBL, in turn, focuses on the execution of projects that integrate different knowledge, preparing students for the job market, where it is necessary to deal with complex and multifaceted challenges (DORNADULA et al., 2023). Both approaches distance themselves from traditional teaching methods, encouraging active and collaborative learning, in which students apply what they learn in a practical and innovative way, something essential in entrepreneurship.

Interdisciplinarity is a central component in these models, allowing students to connect knowledge from various disciplines, providing a broad view of the problems faced (TORABI, 2023). In a world where challenges are increasingly interconnected, thinking beyond a single discipline is fundamental to innovation (SCOTT; WHITE, 2024). The integration of disciplines, such as technology, business, and social sciences, empowers students to develop viable, socially responsible, and sustainable solutions. In addition, this approach encourages collaboration, allowing them to learn from each other and develop teamwork skills essential in entrepreneurship (MANSILLA; CHUA, 2017).

Practical activities, such as startup projects, hackathons, and entrepreneurship marathons, are important for the development of skills among students. They offer an environment that allows students to apply their knowledge in real situations, simulating the business world (STEEN et al., 2011). Hackathons, for example, encourage the rapid creation of solutions, promoting collaboration, creativity, and adaptation (DORNADULA et al., 2023). Hackathons challenge participants to turn ideas into viable business plans, developing skills such as leadership and project management (STEEN et al., 2011; DORNADULA et al., 2023).

These experiences help in the transition from the academic environment to the job market, in which the practical application of knowledge is valued (SCOTT; WHITE, 2024). In addition, these activities promote networking, allowing students to build networks of contacts, essential for future ventures (DAVID, 2023). In this way, the inclusion of practical



activities in the entrepreneurial education curriculum not only strengthens students' technical skills, but also prepares them for real-world challenges, making them more confident to start and manage their own businesses (STEEN et al., 2011; DORNADULA et al., 2023).

INNOVATION AND ENTREPRENEURSHIP EVENTS: IMPACTS ON THE PROFESSIONAL TRAJECTORY OF STUDENTS

Innovation and entrepreneurship events have become relevant pedagogical tools for the development of skills, by offering dynamic environments that promote practical learning. Unlike traditional methods, focused on knowledge transfer, these events promote an active approach, in which participation and direct experience are the main drivers of learning (SCHAEFER; MINELLO, 2020).

In activities such as hackathons, entrepreneurship marathons and innovation fairs, students face real challenges, applying their knowledge in practical contexts. This stimulates skills such as problem-solving, creativity, and decision-making (BERTOL et al., 2019). Events such as *Campus Party Brasil* encourage creativity and promote *networking*, offering opportunities for exchanging ideas and collaborating on projects, as well as facilitating the creation of support networks (JAUHAINEN, 2021). The gamification present in these events acts as a motivating factor, stimulating innovation and critical thinking in a healthy competition environment (BERTOL et al., 2019).

Participation in innovation events has a direct effect on the development of professional skills, such as leadership, teamwork, and innovation capacity, all of which are fundamental in the labor market (DORNADULA et al., 2023). Through hands-on activities, such as startup competitions and workshops, students can test their knowledge in contexts that simulate real challenges, which strengthens their confidence and self-efficacy (MASON; BURNS; BESTER, 2022). In addition, the connections established in these events often generate internship and employment opportunities, expanding the employability of the participants (MASON; BURNS; BESTER, 2022).

The social capital acquired is one of the biggest benefits, as it expands the students' network of contacts, facilitating access to resources, mentors, and potential business partners. This support network is important for career growth, offering support throughout the professional career (JAUHAINEN, 2021).

The impacts of innovation events go beyond the immediate development of skills, extending throughout the students' careers. Research shows that participants' satisfaction with the quality and structure of events influences their intention to participate in new



activities, creating a cycle of continuous engagement that favors professional development (ALAN et al., 2017).

This engagement strengthens the students' experience and their networks, generating opportunities for growth. However, it is important to consider that not everyone experiences the same benefits. Factors such as previous experience and motivation may influence the results, suggesting the need for personalized approaches to maximize the effectiveness of these events (LE et al., 2024). The long-term impact on students' careers will depend on the continuity of this engagement and the practical application of the skills acquired.

RESULTS AND DISCUSSION

This chapter presents the results obtained from the collection of primary and secondary data, followed by a discussion that triangulates the perceptions of the participants with the existing literature. Initially, the data will be analysed in four main categories: development of entrepreneurial skills, impact on students' vocational training, learning challenges and opportunities, contributions to entrepreneurship education and examples of the application of the skills developed.

Each of these categories will be discussed in the light of the results found, with an emphasis on the experiences reported by students during Campus Party Brasil 2023. The discussion will also address the connections between the empirical findings and the revised theoretical concepts, ensuring a deep and coherent analysis that validates the key findings of the research. In addition, the limitations of the research will be presented, along with suggestions for future studies.

DEVELOPMENT OF ENTREPRENEURIAL SKILLS

Participation in Campus Party Brasil provided students with the opportunity to apply practical skills such as problem-solving, creativity, leadership, and teamwork in a dynamic and collaborative environment. According to Mello; Nunes (2018), the development of practical skills is essential for the training of entrepreneurs. The results obtained confirm this theory, with 78% of students highlighting problem-solving as one of the main skills developed during the Campus Party. This also aligns with what Fritz; Barth and Bohnenberger (2022) suggest the importance of practical environments for the application of entrepreneurial skills.

As pointed out by Dornadula et al., (2023), creativity is a core competence in the development of entrepreneurship. This corroborates the results obtained, in which 65% of

students reported that Campus Party encouraged the exploration of innovative and creative solutions to complex problems. This skill is directly linked to the creation of new businesses, as mentioned by Lage (2023), who discusses creativity as an essential factor for innovation and entrepreneurship. This meeting worked as a catalyst for unconventional ideas, in line with what Pitombeira; Sousa Filho; Ferreira Neto (2023) define it as encouraging experimentation in educational environments focused on entrepreneurship.

In addition, leadership and teamwork were key, with 52% and 85% of attendees, respectively, stating that these aspects were crucial during the event. Teamwork, especially in activities such as hackathons, required effective collaboration among participants, which is in line with Oliveira's studies; Vilas Boas (2022), which highlight the importance of interdisciplinarity and cooperation in complex educational environments. The experience of leading and collaborating on projects reinforced the students' skills in people and project management, as discussed by Willwerding; Lapolli (2020), who argue that these skills are crucial for adapting to the professional market. These findings are in line with what Oliveira; Vilas Boas (2022) describe the role of leadership in entrepreneurship, with 52% of participants reporting that the event provided opportunities for the development of their leadership skills.

One of the participants mentioned in the questionnaire: **"Campus Party forced me to think quickly and solve problems under pressure, something I have never experienced so intensely in class."** This report reflects the importance of problem-solving as a core competence developed during the event. For 78% of the participants, this skill was the most demanded, especially during the innovation marathons. Another student highlighted: **"Learning to work in a team, listening and integrating the ideas of others was one of the most enriching experiences."** This type of experience is crucial, because, according to Oliveira; Vilas Boas (2022), the ability to collaborate is essential for modern entrepreneurship, something evidenced by the 85% of participants who mentioned the importance of teamwork.

The entrepreneurial mindset, focused on the ability to identify opportunities and deal with challenges, was strongly developed during the event. The survey revealed that 89% of students felt more empowered to identify opportunities after the Campus Party, which is in line with the concept of experiential learning addressed by Schaefer; Minello (2020). These authors point out that entrepreneurial education should go beyond theory and allow students to face real challenges, such as those they experienced during the event.

Participation in this important event allowed students to directly apply the knowledge acquired in the classroom in a context of innovation and controlled risk, developing their



ability to deal with uncertainty and risk management, as advocated by Mello; Nunes (2018). This exposure to scenarios of uncertainty is essential for strengthening resilience and confidence in the decision-making process, skills that are highly valued in the entrepreneurial environment, as pointed out by Ribeiro, Freitas & Silva (2021).

IMPACT ON STUDENTS' VOCATIONAL TRAINING

Rodrigues (2023) highlights the importance of integrating theory and practice in entrepreneurial education and, in this sense, the participation of students in Campus Party Brasil 2023 proved to be highly effective, evidencing the importance of applying academic knowledge in real situations. The results of this study confirm this premise, since 72% of the participants reported the direct application of the theoretical knowledge acquired in the classroom in the practical activities of the Campus Party. This data reflects the experiential learning model, which, according to Willwerding; Lapolli (2020), encourages students to use theoretical tools in practical scenarios, such as problem solving and project development. The event offered a conducive environment for participants to apply project management techniques and innovation methodologies, consolidating learning in a meaningful way, as advocated by Dornadula et al. (2023).

This integration between theory and practice was also evidenced in activities such as hackathons and entrepreneurship marathons, which worked as platforms for students to directly experience the concepts learned. Fritz; Barth; Bohnenberger (2022) discuss that such activities are essential for students to develop technical skills and the ability to apply what they have learned in a creative and innovative way, which is in line with the experiences reported by the participants.

As indicated by Dornadula et al. (2023), the practical application of theoretical knowledge is a crucial factor for professional training in the context of entrepreneurship. The results of this study reinforce this theory, with 72% of participants reporting that they were able to directly apply the methodologies learned in the classroom.

In addition to the integration between theory and practice, the event also played a crucial role in the development of networking, something that is strongly associated with the professional growth of students. This corroborates what Jauhiainen (2021) states about the importance of innovation events as opportunities to expand these types of interactions. Students highlighted that Campus Party was an essential platform for the development of their professional networks, with 64% reporting the establishment of relevant contacts. According to David (2023), the social capital acquired through networking is essential for

entrepreneurial success, as it expands partnership opportunities and access to resources that may be essential in the future.

The internship and job opportunities, reported by about 25% of the participants, reinforce the connection between the contact networks formed at the event and the development of professional trajectories. This is in line with Mason; Burns; Bester (2022), who highlight that innovation events work as springboards for careers in technological and entrepreneurship areas, since they connect students to mentors and experienced professionals.

The results also reveal that the networking promoted by Campus Party was not limited to contact with companies, but also favored collaboration among the students themselves, which promoted the exchange of knowledge and experiences. Olive tree; Vilas Boas (2022) discuss the importance of interdisciplinarity in entrepreneurial education, and this factor was clearly experienced during the event, in which students from different areas were able to collaborate and share ideas.

One participant reported that, ***"through networking at Campus Party, I made contact with a local startup that is already interested in my idea. That was the first concrete step I took towards my professional future."*** This type of opportunity was reported by 64% of participants, who highlighted the importance of networking to expand their career prospects. Another participant mentioned: ***"Being able to directly apply the methodologies learned in the classroom was a watershed. Seeing the ideas come out of the paper and become something real motivated me much more to pursue an entrepreneurial career."*** This report illustrates the connection between theory and practice, as confirmed by 72% of students who stated that they had used academic learning in practical activities.

LEARNING CHALLENGES AND OPPORTUNITIES

Campus Party Brasil 2023 provided students with a dynamic and innovative environment, in which quick adaptation to challenges became an essential competency. As suggested by Schaefer; Minello (2020), the pressure for quick solutions in innovation environments stimulates the development of skills such as resilience and adaptability. This is in line with the findings of the survey, in which 69% of students reported that this pressure was one of the biggest challenges they faced.

The ability to adapt is closely related to the concept of experiential learning, since facing unpredictable situations, such as competitive activities in hackathons and entrepreneurship marathons, requires the practical application of what was learned in the



classroom. Pitombeira; Sousa Filho; Ferreira Neto (2023) highlight that innovation is often born from the need to solve complex problems under time and resource constraints, and this scenario was widely experienced by students. Many participants reported that adapting to new technologies and methodologies, mentioned by 45% of the students, was an important step that required them to have a quick learning curve.

In addition, 57% of respondents stated that time management and multitasking were major challenges, especially when juggling multiple simultaneous activities, such as workshops, lectures, and competitions. These difficulties are in line with what Oliveira; Vilas Boas (2022) describe how the need for flexibility and personal organization in collaborative and innovative learning environments. The ability to balance these demands is crucial for success in professional environments that require managing multiple complex tasks at once.

In general, participants reported the pressure for quick solutions as one of the biggest challenges faced. One student mentioned, ***"I've never had to develop something so quickly. I had to abandon perfection and focus on what was feasible in the time available."*** This perception, shared by 69% of students, highlights the importance of time as a crucial factor in innovation environments. One of the respondents also commented on the collaboration: ***"The marathon taught us a lot about how to work as a team. At first, we were lost, but after a few rounds of feedback, we were able to break down the tasks and create something cohesive."*** This collaborative learning experience was reported by 82% of participants, emphasizing the importance of exchanging ideas and teamwork.

Collaborative learning was another central aspect of the Campus Party experience, as teamwork allowed students to develop essential skills such as communication and cooperation. These results corroborate what Dornadula et al. (2023) point out about the importance of collaboration in multidisciplinary teams. The exchange of ideas among the participants was fundamental for the success of the projects, as reported by 82% of the students. This collaborative dynamic also reinforces the importance of an interdisciplinary approach, as discussed by Scott & White (2024). Campus Party provided an environment in which students from different areas could combine their skills, which promoted the development of innovative solutions as well as the learning of new techniques and approaches through the sharing of experiences. This type of *peer-to-peer* learning is especially effective in innovation environments, where technical knowledge needs to be complemented by soft skills, such as teamwork and collaborative problem-solving (MASON; BURNS; BESTER, 2022).



However, 23% of the participants pointed out that there were challenges related to the coordination of tasks and communication between team members. This is in line with what David (2023) identifies as common difficulties in collaborative environments, where diversity of thoughts can lead to friction if there is no efficient management of roles and responsibilities. However, the collaborative experience at Campus Party worked as an important learning experience on how to overcome these challenges in a context of innovation and entrepreneurship.

CONTRIBUTIONS TO THE TEACHING OF ENTREPRENEURSHIP

Campus Party Brasil 2023 provided an environment conducive to the application of innovative pedagogical methodologies, such as problem-based learning (PBL) and project-based learning (PjBL), which are fundamental for teaching entrepreneurship. As pointed out by Dornadula et al. (2023), methodologies such as PBL and PjBL are essential for the development of entrepreneurial skills. This is in line with the results observed at Campus Party, since 68% of students reported that the event facilitated the practical application of these methodologies.

Campus Party also reinforced interdisciplinary integration in entrepreneurial education, as different areas of knowledge converged to develop innovative solutions. Creativity was widely exercised by 65% of the participants. These findings are in line with the theory of Schaefer and Minello (2020), who argue that innovative environments are essential to consolidate entrepreneurial learning, allowing students to apply their ideas in a practical context. The freedom to explore new approaches and work on collaborative projects boosted the development of critical and practical skills, as pointed out by Mello; Nunes (2018).

In addition to innovative methodologies, the event also proved to be a valuable tool for innovation in vocational education, suggesting that large-scale events such as Campus Party can be integrated into the formal curriculum. 76% of students said that experiences like this could be inserted into the curriculum as an extension of practical classes, functioning as an entrepreneurship laboratory where students apply and validate their ideas in real time.

This idea is in line with the arguments of Rodrigues (2023), who argues that the integration of innovation events into the educational curriculum is essential to prepare students for the job market. By providing an environment in which students can apply concepts of business, technology and innovation, Campus Party proved to be a space for collaborative learning, which, according to Scott; White (2024), favors the development of



fundamental skills for working in increasingly competitive and technologically advanced professional environments.

One student commented: ***"The project-based learning model was essential at Campus Party. Everything we learned in the Integrative Projects discipline was put into practice in a very real way."*** This example highlights how active methodologies, such as project-based learning (PjBL), have played a key role in developing students' competencies. Another participant stated: ***"The entrepreneurship classes gave us the foundation, but it was at Campus Party that we really tested and adjusted our ideas. Without that hands-on experience, I don't think we would have ever achieved the success that we had."*** This type of report reflects the importance of integrating events such as the Campus Party into the formal curriculum.

Another relevant aspect identified in the survey was the impact of Campus Party on the development of an entrepreneurial mindset. 59% of students reported that the event was a catalyst to think more strategically about their careers and how to apply entrepreneurship in their areas of expertise. This reflects Pitombeira's studies; Sousa Filho; Ferreira Neto (2023), who highlight the importance of practical events in strengthening entrepreneurial skills, especially in technological areas.

Despite the success in promoting entrepreneurship, some students mentioned challenges related to the formal integration of events such as Campus Party into the curriculum, with 12% stating that time constraints and curricular rigidity could hinder this implementation. However, as suggested by Oliveira; Vilas Boas (2022), a greater flexibility of curricula and the insertion of practical experiences in innovation events can contribute to the training of more prepared and innovative professionals.

EXAMPLES OF THE APPLICATION OF THE SKILLS DEVELOPED

Problem-solving was a skill strongly reported by students, as most participants (78%) mentioned having faced challenges that required quick and effective solutions. During the innovation marathons, students needed to identify problems related to sustainability, technology, and social innovation and propose solutions that could be implemented in the short term.

A practical example cited was the development of a prototype for urban waste management. To this end, the students applied theoretical knowledge about reverse logistics and solid waste management acquired in the classroom. They reported that the need to generate quick solutions helped them improve their capacity for analysis and synthesis, essential skills for solving complex problems.



Leadership competence was highlighted by 52% of the participants. The students reported that teamwork was a crucial element in the proposed activities, such as the entrepreneurship marathon and hackathons when they needed to coordinate tasks efficiently and ensure that all members contributed equally.

In one of the challenges mentioned, a team was responsible for developing an app that would facilitate interaction between consumers and local suppliers. The student leader of this team described how he had to apply concepts of project management and collaborative leadership, distributing roles and ensuring that the project progressed according to the event's tight schedule.

Creativity was a highly exercised skill with 65% of students reporting that the Campus Party environment encouraged them to explore new ways of thinking and create innovative solutions. In one of the outstanding projects, participants developed an augmented reality system to assist in education in underserved communities. This project required a creative approach both in the use of technology and in adapting to the social and educational context of the communities.

The participants reported that the experience allowed the application of concepts seen in Innovation and Technology disciplines, in addition to expanding their ability to generate solutions that go beyond the conventional, integrating different areas of knowledge to meet social demands.

A skill worked on intensively – and indicated by 89% of the participants as the one in which they felt most qualified after the event – was to identify business opportunities. An example cited was the participation in an entrepreneurship marathon, in which students were challenged to develop a business model for a startup in a few hours. They applied the theories of market analysis and business modeling learned in entrepreneurship classes, identifying a gap in the market for technologies for accessibility and proposing a viable solution.

In addition, risk management was critical to the success of the projects, especially when unforeseen events occurred. One group reported how they had to adjust their business plan and shift their focus from a physical solution to a digital one, after facing difficulties with the integration of technological components. This rapid adaptation reinforced the participants' risk management skills and flexibility, essential skills in the entrepreneurial environment.

Campus Party Brasil 2023 was the stage for several innovative projects that put into practice entrepreneurial skills developed by students in the classroom. Two notable examples of projects awarded in entrepreneurship marathons clearly demonstrate the



application of skills acquired in the disciplines, in the classroom, and the integration between theory and practice.

The first project replicated an idea developed during the Integrative Project discipline, at IFPR Campus Colombo, in the Technical Course in Administration, in which the students identified a common problem faced by pet owners: the difficulty in administering medication to animals. The solution presented was the creation of medicines for animals in the shape of bones, incorporated into the feed, facilitating the medication process without the need for invasive techniques. This project, in addition to being innovative, reflected the practical learning of product design methodologies, entrepreneurship and prototyping, concepts discussed by Mello; Nunes (2018) and applied by students effectively. The team was awarded first place in the entrepreneurship marathon, demonstrating that the experience acquired in the classroom was fundamental to the success of the project. This result highlights problem-solving and creative thinking as essential skills developed during the event, as suggested by Fritz; Barth; Bohnenberger (2022), who argue that accelerated innovation environments encourage creative solutions to real problems.

The second project was also born from the Integrative Project discipline. The students focused on improving the comfort of patients undergoing intravenous chemotherapy treatments. The project proposed the creation of an arm support cushion during the procedure, with the aim of providing greater comfort to patients undergoing prolonged treatment sessions. The team, awarded second place in the entrepreneurship marathon, applied user-centered design concepts, prioritizing the needs of patients and incorporating feedback collected from healthcare professionals and patients in the prototyping phase. This example reflects the development of skills such as empathy, teamwork and leadership, key elements in the creation of solutions aimed at human well-being, in line with what Mason; Burns; Bester (2022) highlight the importance of interdisciplinarity and a customer-centric approach in innovative projects.

The examples of projects awarded in the Campus Party entrepreneurship marathon reinforce the importance of integrating theory and practice, as discussed by Mello; Nunes (2018), who highlight the relevance of practical skills in the development of innovative solutions. In addition, the award provides recognition and visibility for students in the job market.

In general, it is important to emphasize that the sample used in the research, composed of 25 students from the Federal Institute of Paraná (IFPR), has some limitations that affect the generalization of the results to other contexts. This restricted number of

participants does not allow us to capture all the diversity of experiences that could be obtained in a larger and more diverse sample. In addition, the study was conducted with students from a single institution, which restricts the institutional, regional, and cultural variability that could offer additional insights into how Campus Party impacts the formation of entrepreneurial competencies in different educational realities.

The geographical and institutional restriction limits the ability to generalize the results to other educational contexts, especially in terms of policies for teaching entrepreneurship and innovation in regions with distinct socioeconomic and educational characteristics. Students from other regions, with different curricula or who participated in other editions of the Campus Party, could present different perceptions about the development of skills. In this sense, it would be interesting for future research to include broader and more varied samples, covering different courses, institutions and regions of the country.

Another important point is the methodological restriction caused by data collection exclusively through questionnaires. While this instrument offers valid insight into participants' perceptions, it may not capture important details of their experiences during the event. Additional qualitative methods, such as in-depth interviews or focus groups, could explore in more detail the nuances of the skills developed and the challenges faced by students. These methods could also reveal more subjective perceptions, enriching the analysis with complementary information about the students' motivations and difficulties.

The methodological limitation also affects the comparison with other similar events, both national and international. Innovation events in different cultural and institutional contexts can offer different experiences, which suggests that future research with a more diverse sample, which includes students from different regions and institutions, can generate more robust and generalizable results. In addition, a longitudinal study, tracking the long-term impacts of this experience on students' professional development, could provide a more complete perspective of the benefits of participating in events such as Campus Party.

It is therefore recommended that future studies, in addition to using a mixed methodology, combining quantitative and qualitative approaches, expand the sample to capture different participant profiles. This would enable a better understanding of how entrepreneurial education can be impacted by innovation events in various contexts.

CONCLUSION

This study investigated the impact of the participation of students from the Federal Institute of Paraná (IFPR) in Campus Party Brasil 2023, focusing on the development of



entrepreneurial skills and their integration into academic and professional training. The results show that innovation events, such as this one, offer a dynamic environment that facilitates the practical application of theoretical concepts, promoting the development of fundamental skills for entrepreneurship, such as problem solving, creativity, leadership and teamwork.

The implications of this study for the teaching of entrepreneurship are relevant. The integration of active methodologies, such as problem-based learning (PBL) and project learning (PjBL), proved to be effective in stimulating experiential learning, reinforcing the importance of a pedagogy that connects theory to practice. Campus Party enabled students to face real challenges, encouraging the creation of innovative solutions and validating the role of events of this type as an extension of the formal curriculum. It is recommended that technical and higher education institutions incorporate these events systematically into their curricula, expanding the scope of entrepreneurship and innovation education beyond theoretical disciplines, with the inclusion of high-impact extracurricular activities.

Theoretically, this study contributes to the field of entrepreneurial education by demonstrating that innovation events work as catalysts for the development of entrepreneurial skills. The research confirms the perspectives of authors such as Mello and Nunes (2018) and Schaefer and Minello (2020), who defend the importance of practical environments in the training of entrepreneurs. In addition, the triangulation between the primary data and the reviewed literature strengthens the validity of the findings, indicating that the experiences lived by the students are consistent with contemporary entrepreneurial teaching practices.

Although the study was conducted at a single institution, the homogeneity of the sample and the focus on a large-scale event like Campus Party ensure data consistency. The results can be generalized to other technical and higher education institutions that promote innovation events in their curricula, especially those that prioritize the development of entrepreneurial skills. This generalization is possible due to the replicability of similar events and the positive impact that such activities have on preparing students for the challenges of the labor market.

The practical implications also suggest adjustments in educational policies, encouraging the incorporation of events such as hackathons, entrepreneurship marathons and innovation fairs as an integral part of academic training. These events expose students to situations that simulate real-world challenges, complementing theory with practice and promoting the development of socio-emotional skills, essential for professional success. Educational institutions that integrate these experiences into their pedagogical practices will



be able to train more adaptable and innovative professionals, prepared to face the contemporary demands of the market.

This study also opens up promising avenues for future research. Research involving larger and more diverse samples, with participants from different institutions, courses and regions, can provide a more comprehensive view of the effectiveness of innovation events in the development of entrepreneurial skills. Comparative studies between different innovation events, such as startup competitions and technology fairs, can reveal whether there are significant variations in how these environments promote entrepreneurial learning. Longitudinal surveys that follow participants throughout their career paths can provide valuable insights into the long-term impacts of participating in innovation events, helping to understand whether the skills acquired translate into greater professional success or the creation of new businesses.

It is concluded, therefore, that events such as Campus Party represent a valuable tool to complement the teaching of entrepreneurship in professional and technological education institutions. By integrating these events in a structured way into the curricula, institutions can enhance the training of creative, resilient professionals prepared to face the challenges of a constantly changing professional environment.

THANKS

We thank the Federal Institute of Paraná (IFPR), especially the Dean of Teaching, Research, Extension and Innovation, for all the support provided, enabling the participation of IFPR students in Campus Party Brasil 2023. This effort was fundamental for this study, providing an environment of learning and innovation that benefited both the institution and its students.

We extend our thanks to the students who participated in the event and contributed with their willingness and commitment, responding to the research that supported this article. Without their valuable contributions, the construction of this work would not have been possible. We also thank the Board of IFPR Campus Colombo, for the efforts in establishing partnerships and obtaining financial support, ensuring the presence of Campus students at the event.


REFERENCES

1. Alan, A. K., Kabadayi, E. T., & Köksal, C. (2017). Engaging students through event marketing: An example of university entrepreneurship event. **Business & Management Studies: An International Journal*, 5*(3), 586-604.
2. Alimaningtyas, D., Ghozali, M. S., Wardana, L. V., Murwani, F. D., & Wati, A. P. (2024). Adapting to change: The continuous development of business and management education. **Journal of Educational Analytics*, 3*(2), 213–230. <https://doi.org/10.55927/jeda.v3i2.9178>
3. Bardin, L. (2004). **Análise de conteúdo** (3rd ed.). Edições 70.
4. Bertol, M. E., et al. (2021). Startup Day UPF 2019: Gamification as a tool for innovation/Startup Day UPF 2019: Gamificação como uma ferramenta para inovação. **Revista FSA (Centro Universitário Santo Agostinho)*, 18*(4), 30-46.
5. David, R. (2023). Corporate governance in Indian startups. **IUP Journal of Corporate Governance*, 22*(1).
6. Dornadula, V. H. R., et al. (2023). Impact of entrepreneurial education on school students' startup initiation tendency: An empirical study. **Journal of Informatics Education and Research*, 3*(2).
7. Feitoza, V. D. de S., & Silva, S. B. da. (2021). Teoria dos letramentos críticos aplicada no ensino de língua inglesa para formação integral dos discentes. **Educação*, 46*(1), e51/1–29. <https://doi.org/10.5902/1984644441233>
8. Fritz, J., Barth, K., & Bohnenberger, M. C. (2022). Criatividade e educação empreendedora. **Revista Vianna Sapiens**.
9. Gossel, B. M. (2022). Analogies in entrepreneurial communication and strategic communication: Definition, delimitation of research programs and future research. **International Journal of Strategic Communication*, 16*(2), 134–156. <https://doi.org/10.1080/1553118X.2021.2015689>
10. Jauhiainen, J. S. (2021). Entrepreneurship and innovation events during the COVID-19 pandemic: The user preferences of VirBELA virtual 3D platform at the SHIFT event organized in Finland. **Sustainability*, 13*(7), 3802.
11. Lage, P. R. (2023). Influência do ensino do empreendedorismo no desenvolvimento das habilidades empreendedoras. **RECIMA21-Revista Científica Multidisciplinar*, 4*(9), e494054.
12. Lima, M. A. F., Costa, A. C. R., Silva, J. É. N., Silva, L. A. P., & Silva, E. V. (2020). Presença de conteúdos de educação empreendedora no curso de segurança do trabalho. **Perspectivas da Gestão na Sociedade 5.0: Educação, Ciência, Tecnologia e Amor. IV COINTER PDVGT**.
13. Mansilla, V. B., & Chua, F. S. G. (2017). Signature pedagogies in global competence education: Understanding quality teaching practice. In **Educating for the 21st century: Perspectives, policies and practices from around the world** (pp. 93-115).

14. Mason, C. M., Burns, S. M., & Bester, E. A. (2022). Supporting students' employability through structured, event-based engagement with employers. **Education+ Training, 64*(5), 598-618.*
15. Miço, R., & Cungu, I. (2023).
16. Mello, M. F., & Nunes, L. D. L. S. (2018). A importância da educação empreendedora para a cultura e formação de novos empreendedores. **Saber Humano: Revista Científica da Faculdade Antonio Meneghetti, 8*(13), 152-173.*
17. Miço, H., & Cungu, J. (2023). Entrepreneurship education, a challenging learning process towards entrepreneurial competence in education. **Administrative Sciences, 13*(1), 22.*
18. Mutalimov, V., et al. (2021). Assessing regional growth of small business in Russia. **Entrepreneurial Business and Economics Review, 9*(3), 119-133.*
19. Oliveira, M. C. R., & Boas, F. S. O. V. (2022). Formação docente e práxis na educação profissional e tecnológica (EPT): Desafios para uma formação humana e crítica de estudantes de cursos técnicos. **Revista Tempos e Espaços em Educação, 15*(34).*
20. Pitombeira, R. T. A., Sousa Filho, J. M., & Ferreira, M. N. (2023). Paixão, educação e criatividade e seus efeitos na intenção empreendedora. **Revista de Administração de Empresas, 63*(6), e02021-0438.*
21. Ribeiro, C. V., De Freitas, A. F., & Da Silva, S. S. (2021). Educação empreendedora no ensino de administração: A simulação realística como instrumento didático. **Research, Society and Development, 10*(3), e9610313066.*
22. Rodrigues, A. L. (2023). Entrepreneurship education pedagogical approaches in higher education. **Education Sciences, 13*(9), 940.*
23. Scott, E. K., & White, B. R. (2024). An empirical study of cultivating innovative practice abilities in an interdisciplinary education environment in Australia. **Research and Advances in Education, 3*(5), 53-63.*
24. Schaefer, R., & Minello, I. F. (2020). Desafios contemporâneos da educação empreendedora: Novas práticas pedagógicas e novos papéis de alunos e docentes.
25. Shemyhon, N. (2024). Relevant key professional skills and the level of the education seekers' awareness in this regard. **Educația Plus, 35*(1), 216-227.*
26. Steen, M., Manschot, M., & De Koning, N. (2011). Benefits of co-design in service design projects. **International Journal of Design, 5*(2).*
27. Tadeush, O., et al. (2023). The management of innovation processes in higher education institutions of Ukraine on the way to the formation and development of the European knowledge market. **Revista Românească pentru Educație Multidimensională, 15*(4), 132-158.*
28. Torabi, M. (2023). Interdisciplinary approaches in business studies: Applications and challenges. **International Journal of Business and Management, 18*(5), 1-33.*



29. Willerding, I. A. V., & Lapolli, É. M. (2020). Educação empreendedora: O uso da criatividade na formação do profissional do século XXI. In *Educação fora da caixa: Tendências internacionais e perspectivas sobre a inovação na educação* (Vol. 5, pp. 181-196). São Paulo: Blucher. <https://doi.org/10.5151/9788580394269-10>

IMPACT OF THE COVID-19 PANDEMIC ON PEDIATRIC DENTAL CARE AND THE USE OF MINIMALLY EVASIVE PROCEDURES IN BRAZIL <https://doi.org/10.56238/sevened2024.029-030>

André Sobrinho de Souza¹, Anne Karoliny Silva Balbino², Darah Sathler Alvim Moraes³, Gabriela Silva Miyakawa⁴, Julia Fernanda Cotta de Amorim⁵, Kartesiany Silva Balbino⁶, Lariza Pivetta⁷ and Daniela Pert el Milleri⁸

ABSTRACT

Considering the COVID-19 pandemic that generated direct impacts on the health area, pediatric dentistry was also affected, since the transmission of the virus occurs from droplets and aerosols from an infected individual. In this way, extra protocols and safety measures were put in place before and during treatment to minimize the spread of infection among dentists, patients and other health professionals. In pediatric dental care, some authors suggest the use of minimally invasive procedures (MIPs) in the management of caries lesions. Therefore, the objective of this study is to review the literature on the impact of the COVID-19 pandemic on the provision of pediatric dental care, and the use of minimally invasive procedures, as an alternative for care in dental offices. To this end, an integrative review study was carried out, in which a bibliographic survey was carried out in the *Scielo*, *Lilacs*, *Pubmed* databases from 2020 to 2024. Thus, it is observed that the COVID-19 pandemic has caused significant changes in children's diet, difficulties in accessing oral health services, and the need to change pediatric dental care protocols, several studies suggest the option for minimally invasive dental procedures, which have the advantage of reducing or eliminating the production of aerosols, with less risk of contamination for professionals, patients and guardians.

¹ Undergraduate student of the Dentistry course
Training institution: Multivix University Center, Vitória-ES
E-mail: sobrinho.gestor@gmail.com

² Undergraduate student of the Dentistry course
Training institution: Multivix University Center, Vitória-ES
E-mail: annekaroliny64@gmail.com

³ Undergraduate student of the Dentistry course
Training institution: Multivix University Center, Vitória-ES
E-mail: daarahalvim@gmail.com

⁴ Undergraduate student of the Dentistry course
Training institution: Multivix University Center, Vitória-ES
E-mail: gabrielamiyakawa@gmail.com

⁵ Undergraduate student of the Dentistry course
Training institution: Multivix University Center, Vitória-ES
E-mail: juliafernanda.ph@gmail.com

⁶ Undergraduate student of the Dentistry course
Training institution: Multivix University Center, Vitória-ES
E-mail: kartesiany@outlook.com

⁷ Undergraduate student of the Dentistry course
Training institution: Multivix University Center, Vitória-ES
E-mail: lariza.pivetta@gmail.com

⁸ Master's degree in Dental Clinic from the Federal University of Espírito Santo.
Address: Av. Marechal Campos, 1468- Maruípe, Vitória - ES
E-mail: pertel.daniela@gmail.com



Keywords: Minimally Invasive Procedures. Covid-19. Pediatric dentistry. Cavity.

INTRODUCTION

In December 2019, a new coronavirus known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was identified, this virus causes Coronavirus Disease 2019 (COVID-19), originating in the city of Wuhan, China. Its transmission occurred quickly, reaching all continents, infecting and leading to the death of millions of people around the world. The transmission of the virus occurs from droplets and aerosols from an infected individual released from the mouth or nose while they speak, breathe, cough or sneeze (Nunes, 2020).

In response to the pandemic, the WHO (World Health Organization) considered the outbreak a public health emergency of international concern. Studies have shown that health professionals have a higher risk of contamination due to the nature of their work, also covering dental professionals, given that dental procedures require the dentist to be close to patients (Lobo *et al.*, 2023).

Considering the need to effectively stop the spread of the virus that has high transmissibility, but with minimal damage to care, the WHO advised the review and adaptation of biosafety protocols to the pandemic scenario in all types of services, especially health services, with the intention of reducing the contamination of professionals, staff and patients (Febbo; Pinchemel, 2021).

In this sense, dental activity has been hit hard, since a significant number of surgical procedures generate aerosols, in addition, during the pandemic personal protective equipment has become scarce. Considering the need to preserve health teams and aiming to reduce the risks of contamination of patients, in several countries elective procedures in dentistry were suspended, with only urgent and emergency cases being maintained, in compliance with the dictates of various institutions worldwide and local governments (Rocha, 2020).

Oral health care systems were already dealing with problems related to access to oral health-related care, due to the social disparities surrounding this theme (Almeida *et al.*, 2020). In this regard, Gonzaga and Santana (2024, p. 12) state that "social conditions are effectively the basis for the sanitary standard of a people, just as the position of each individual in society is a basis for their own health". The COVID-19 pandemic has added challenges to the area of dentistry, with the high risk of contamination of professionals due to their work, in addition, the work process developed during the pandemic focused on clinical aspects related to emergencies, without attention to the social context, in relation to living conditions and the support network (Gonzaga; Santana, 2024, p. 12).

As the pandemic grew in incidence and death numbers, it became necessary for

dentists and other oral health professionals to evaluate the issues raised and seek creative alternatives for patient education regarding self-care, as well as treatment practice options for the most vulnerable and at-risk patient population worldwide (Almeida *et al.*, 2020).

Guidelines have been developed to change the paradigm of dental care to a more preventive focus; and with regard to the care of children, some publications have suggested the use of PMI's in the management of caries lesions. The main characteristic of these procedures is to reduce the production of aerosols, preserving the tooth structure that can be recovered and generating lower levels of anxiety in the pediatric patient. Despite being recommendations cited in several publications, few studies report the adherence of pediatric dentists (Braga *et al.*, 2022).

In view of the reported facts, this study aims to investigate the impact of the COVID-19 pandemic on the provision of pediatric dental care in Brazil, and also the use of minimally invasive procedures as an alternative for care in dental offices.

THEORETICAL FRAMEWORK

COVID-19

Coronavirus Disease 2019 (COVID-19), an infectious disease caused by coronavirus 2 (SARS-CoV-2), with Severe Acute Respiratory Syndrome as its main complication; was declared a global pandemic by the WHO in March 2020. The virus has a remarkable potential for infectivity, since it spreads by inhaling infected particles in droplets and aerosols and through direct contact with the oral, ocular, and nasal mucous membranes (Santos *et al.*, 2021).

The WHO declared the spread of COVID-19 a pandemic on March 11, 2020. In order to contain the outbreak, several countries have declared a state of emergency and implemented social distancing measures, including quarantines and lockdown periods. It is also worth highlighting the interruption of face-to-face education and confinement at home, which have produced considerable changes in the lifestyles of children and their families around the world (Almeida *et al.*, 2020).

At first, there was a significant amount of uncertainty surrounding the disease, due to little knowledge about its etiology, route of transmission, even the occurrence of fatalities involving contagion by the virus, nor were the long-term side effects and treatment methods known. At the beginning of the pandemic, it was not evident whether the risk of infection was higher or lower for children, only later was it possible to observe that children who contracted the virus did not have symptoms, so most of these infections remained undetected (Safadi; Silva, 2020).

In Brazil, emergency measures were taken, aiming to adapt the work process of health services to the new reality imposed by the pandemic. Most health professional councils have taken a cautious approach, restricting contact activities with patients, to ensure health care. Actions based on information and communication technology were adopted. In the case of the Federal Council of Medicine – CFM, a resolution was published that allowed teleconsultations, telediagnosis, telemonitoring, teleinterconsultation, and teleguidance (Machado, 2021).

The Federal Council of Dentistry published a regulation, CFO Resolution No. 226 (CFO, 2020), at first, which expressly prohibited the practice of dentistry at a distance, mediated by technologies, for the purposes of consultation, diagnosis, prescription and preparation of a dental treatment plan. However, telemonitoring and teleguidance activities were allowed, as long as they were not carried out by call centers or any other means that centralized the receipt of demands (Nunes, 2020).

MINIMALLY INVASIVE PROCEDURES

The management of caries treatment has been a controversial subject in recent years. Recent studies reveal that less invasive approaches can be effective, such as selective tissue removal using hand-held cutting instruments; which proves the reduction of accidental pulp exposures in the treatment of deep caries lesions and atypical characteristics, but it is important to emphasize, still without proof that a certain technique can be pointed out as the "gold standard" (Nunes, 2020).

According to the Latin American Association of Pediatric Dentistry (ALOP, 2020), there are several treatment options for each type of carious lesion, as shown in Figure 1. It is worth mentioning that all exposed procedures must be performed on vital teeth, without any pulp involvement or symptoms of inflammatory pathology.

Figure 1: Flowchart according to caries lesion characteristics



Source: ALOP (2020)

It is important to note that the colors related to the severity of the lesions are also indicative of the different treatments by means of arrows; in this sense, if a treatment is marked by two or more colors, this treatment can be used in the treatment of different patterns of carious lesions (ALOP, 2020).

Minimally Invasive Dentistry (OMI) as an alternative for care in dental offices, as a measure to reduce the production of aerosols during dental procedures. In addition to the biological aspect of preserving tooth structure, PMIs make pediatric dental consultations more "peaceful", since they help reduce anxiety and improve the management of child behavior (Reis *et al.*, 2020).

According to Reis *et al.* (2020) There are several minimally invasive techniques that can be used in pediatric dentistry, from the use of manual instruments, which is usually the most used technique, to others, such as the use of abrasive jets and chemical-mechanical methods. But Regardless of the type of technique, the procedure must be performed with due caution. It is noteworthy that there is insufficient evidence to recommend a specific method of caries removal for all cases. However, manual or chemomechanical cupping stands out in pediatric dentistry, as it reduces pain and discomfort during treatment.

Table 1: Minimally invasive procedures applied in pediatric dentistry and their characteristics.

Technique	Indications	Advantages	Disadvantages
Chemical removal and mechanical carious deletion	Cariou lesions in deciduous and permanent teeth	Reduces use of rotating instruments, does not use local anesthesia, good acceptance, can be used with relative isolation and low cost	Increased clinic runtime
Fluoride varnishes	Prevent new carious lesions, paralyze existing lesions and remineralization	Easy application, lower risk of fluoride ingestion, greater ability to adhere to enamel surfaces and high remineralizing action	Need for prior cleaning and drying of the teeth to retain the varnish
Diamine fluoreto deprate	High risk of caries, deciduous and permanent teeth	Low cost, easy application and painless	Darkening of teeth with aesthetic impairment
Sealants	High risk and/or activity of caries, small cavitated lesions, teeth with retentive occlusal	Resin sealants: high retention rates Ionomeric sealants: increased fluoride release and greater preventive effect	Resin sealants: require greater moisture control Ionomeric sealants: lower retention
TreatmentAtraumatic Restorative	Cariou lesionsdentin	Low cost, less dental destruction, minimizes pulp exposures, endodontics and tooth extractions, does not use local anesthesia	Restricted to teeth without pulp involvement, (no presence of pain, abscess, fistula, or mobility)
TechniqueHall	Deciduous molars with lesions on two or more surfaces	It makes the development of caries unfeasible, does not require preparation or use of local anesthesia, has high longevity	Difficult access in the Brazilian market, aesthetic compromise and failures at the points of contact and intercudation
Application of infiltrators	Initial lesions of non-cavitated, deciduous and permanent white spots	Strengthens and fills demineralized enamel without preparation, reduces the effects of fluorosis and the fragility of teeth with enamel defects	High-cost material and does not have sufficient resistance to prevent the recurrence of new carious lesions

Sourcee: Gomes *et al.* (2020)

In IMO, dental procedures are used to treat carious lesions in a less invasive way, seeking to maintain the maximum original tissue of the tooth. As shown in table 1, according to Gomes *et al.* (2020) there are advantages and disadvantages for each of the techniques that can be employed, in this sense it is necessary to make the patient or guardian aware of the procedure, and also about the importance of brushing to prevent the development and/or progression of dental caries.

Gomes (2020) points out that the minimally invasive approach in dentistry promotes the reduction of the potential for contamination of various pathologies, where caries repair procedures do not differ from other treatment modalities, either in the aesthetic aspect or in the quality of the treatment.

METHODOLOGY

This is an integrative review study, which was configured as a selection of relevant research in order to support better clinical practice; indicating the possible gaps in knowledge that may demonstrate the need for new studies on the theme studied (Souza; Silva; Carvalho, 2010).

The identification of descriptors for use in the search in the databases was carried out, and the combinations of the terms were made with each other, in Portuguese and English. The descriptors selected for the search were: Minimally Invasive Procedures; Covid-19; Pediatric Dentistry, Caries. The selected databases were Scielo, Lilacs, and Pubmed, in order to meet the criteria of relevance, accessibility, and comprehensiveness.

Studies published in the last 05 years, from 2020 to 2024, especially articles, which dealt with field research and literature review, case/experience studies, and other academic works, were considered as inclusion criteria. Exclusion criteria were scientific productions unrelated to the theme and repeated productions.

The study selection process, considering the combinations of descriptors in the databases, identified 251 publications. After reading the titles and abstracts, publications that did not correspond to the objectives of this review, were not directly related to the central scope of this research, inclusion criteria, or that were located in more than one database. At the end of the process, 12 publications were considered eligible for the study.

RESULTS AND DISCUSSIONS

After the eligibility of the articles, they were organized in a table (Chart 1) with information related to the authors, year of publication and title of the articles. It is important to highlight that the selected articles addressed several perspectives related to the impacts of the pandemic on pediatric dental care (Beltrame et al., 2022; Lobo *et al.*, 2023) addressed the reduction of dental care, both curative and preventive, already (Braga *et al.*, 2022; Gomes *et al.*, 2020; Febbo; Pinchemel, 2021) paid special attention to the use of PMI's, in relation to the methodologies adopted there are literature reviews and case studies in the selection.

Table 1: List of Eligible Publications

Authors	Title
Cunha <i>et al</i> (2021)	The impact of the COVID-19 pandemic on the supply of dental procedures performed by the Unified Health System: a syndemic perspective
Beltrame <i>et al</i> (2022)	Oral health before and during the COVID-19 pandemic in primary care in the municipality of Ipatinga in Minas Gerais
Lobo <i>et al</i> (2022)	Impacts of COVID-19 on dentistry: an integrative review
Gomes <i>et al</i> (2020)	Minimally Invasive Procedures in Pediatric Dentistry
Nunes <i>et al</i> (2020)	The challenges of dental practice in times of pandemic
Lucena <i>et al</i> (2020)	Access to oral health in primary care before and after the beginning of the COVID-19 pandemic in Brazil
Ribeiro <i>et al</i> (2021)	The impact of the COVID-19 pandemic on child and adolescent dental care in the Unified Health System of João Pessoa-PB
Crescitelli (2023)	Impact of the COVID-19 pandemic on oral health-related quality of life
Santos <i>et al</i> (2021)	Food in the pandemic - how this issue affected children's oral health - narrative review of the literature
Braga <i>et al</i> (2022)	Changes in pediatric dental care and use of minimal intervention procedures during the COVID-19 pandemic
Febbo; Pinchemel (2021)	Minimally Invasive Dentistry in Times of Covid-19: Literature Review
Barbosa <i>et al</i> (2021)	Dental caries management and child behavior during the COVID-19 pandemic: case report

Source: Prepared by the Author

The Covid-19 pandemic impacted the supply of dental care by the Unified Health System (SUS) in Brazil, this finding was confirmed by Cunha *et al* (2021) in their study where it was evidenced that the number of emergency dental consultations and procedures in primary and specialized care services decreased by 42.5 and 44.1%, respectively, between 2019 and 2020. Elective procedures were impacted by 92.3%. In this research, it was possible to confirm how much the Covid-19 pandemic brought consequences for all Brazilians, with the mutual deterioration of the health and lives of individuals.

The reduction in dental care, both curative and preventive, due to COVID-19, was also described in the research developed by Beltrame *et al.* (2022) and Lobo *et al.* (2023); However, the researchers emphasized in their studies that although the pandemic resulted in a reduction in curative procedures, there was an effort to create and disseminate

campaigns aimed at the promotion, prevention, and recovery of oral health, especially in individual or collective oral hygiene guidelines.

Lobo *et al.* (2023) highlighted in their study that during the pandemic the highest priority was the protection of patients and professionals, due to the risks of transmission of the virus. Dentistry had to adapt to this scenario, in this sense it had to make significant changes in the way it operated, which required adaptation and resilience from professionals to ensure the continuity of quality dental care and the safety of patients and professionals. In addition, it is necessary to emphasize that due to the pandemic there was a movement to develop new technologies and minimally invasive techniques to prevent and treat oral diseases.

Another situation also emphasized in oral health studies in times of COVID-19 was the relationship between oral health and dietary changes in children during the pandemic, considering the need for social isolation. Santos *et al* (2021) in their study to assess this situation and found an increase in the intake of fermentable sugars, dietary sugars, and snacks in the interval between meals. Another finding of the research was that the pandemic also affected oral hygiene procedures, both in frequency, as well as in the time allocated to brushing and using toothpaste with adequate fluoride concentration.

Lucena *et al* (2020), on the other hand, in view of data from the public reports of the Health Information System for Primary Care (SISAB) of the Ministry of Health of Brazil, on oral health, found a significant reduction in care in cases of dento-alveolar abscess and toothache during the first four months of the pandemic in Brazil, compared to the pre-pandemic period; emphasizing that the numbers do not demonstrate that cases of dental urgency did not exist, but rather insinuate that this type of care was not provided by the public health sector. They also emphasize the need for actions in order to adapt health services aiming at the resumption of elective care and effective resolution of cases of dental urgency in cases of pandemic; since the generation of a repressed demand in oral health can mean an involution of the epidemiological situation in Brazil.

Nunes *et al* (2020) in their work draw attention to the existence of other infectious diseases transmitted by airways such as measles, chickenpox, rubella and tuberculosis, which have the same mode of contagion as covid-19 (coughing, sneezing, inhalation of droplets, contact with oral, nasal and ocular mucous membranes), also remembering that the risk of exposure of office professionals has always existed, despite having been underestimated or relegated to a secondary plan; highlighting that actions to control the aerosols generated in the dental environment were never seen as feasible, in view of the

possibility of reducing the number of procedures to be performed by professionals in their daily practice.

Still highlighting the biosafety issues argued vehemently during the pandemic, studies by Gomes *et al* (2020), Nunes *et al* (2020) and Ribeiro *et al* (2021) state that stricter biosafety measures had to be adopted, so dental professionals sought Personal Protective Equipment (PPE), causing the growth in sales of these products, especially N95 masks, face *shields*, disposable gowns, among others; and that such demand caused the scarcity of these materials, raising their values to unimaginable levels, impacting the operating costs of dental care.

Complementing the strands of the studies cited in this work, Crescitelli (2023) states that the quality of life and oral health of individuals had negative impacts in several aspects during the pandemic, causing damage to the oral health of the population, not only due to restrictions on dental care, but also because of the economic, food, and psychosocial impacts. On the other hand, Lobo *et al.* (2023) points out that the experiences acquired during the pandemic can represent an opportunity to improve dental practices and promote innovation and foster transformations in this sector.

Regarding dental treatment, Gomes *et al* (2020) highlight in their study that the demand for PMI's has grown, with the aim of reducing or eliminating aerosolization, in order to avoid contamination. In addition, they also mention that the health education process was addressed by several authors, highlighting the importance of professionals guiding their patients about the increase in the need and quality of adequate oral hygiene, which reduces the number of oral diseases, such as caries, periodontal diseases, and the number of procedures performed in the office.

In the study developed by Febbo; Pinchemel (2021), through a literature review, in order to guide the dental surgeon in his understanding of the strategy of minimum intervention in deciduous teeth and to address the importance of reducing risk factors in times of COVID-19, the importance of performing PMI's during the pandemic was evidenced, since it values the use of manual instruments in caries control, without the need to use rotating instruments.

Also according to the authors, the procedures that were already used in pediatric dentistry, before the pandemic, due to the difficulty in managing child patients, generating greater ease in care, since it causes a reduction in clinical work time, and generally does not require the use of rotating and anesthesia instruments, which favors the conduct of clinical care, with less risk of contamination for professionals, patients and guardians.

Barbosa *et al* (2021) conducted a clinical case study of dental caries management and child behavior in the setting of the COVID-19 pandemic. Following the dental treatment of a 7-year-old child who had caries in several teeth, and in view of the concern to provide care safely for both the team and the patient and his caregiver, the option was made to use PMI's for the management of carious lesions, and at the end of the treatment it was proven that minimally invasive techniques are an option for the management of dental caries, especially during the pandemic period.

Finally, a cross-sectional study with the participation of pediatric dentists, carried out by Braga *et al* (2022) evaluated the consequences of the COVID-19 pandemic on pediatric dental care, as well as the adoption of PMI for the management of dental caries, finding that the COVID-19 pandemic caused a reduction in the number of patients; and added to this situation, the study participants reported having one or more PMI's for the management of caries lesions in children, Among which it is worth highlighting the most frequent: application of fluoride varnish, selective removal of decayed tissue and the application of sealant; while the application of silver diamino fluoride, infiltrating resin and cementation of steel crown by means of the Hall technique were the procedures least used by the professionals.

CONCLUSION

At the end of this study, it was possible to verify that the COVID-19 pandemic caused significant changes in dental environments and that it demanded new clinical conducts, especially in pediatric dentistry. The closure of dental clinics has made it difficult to access dental services, with the significant drop in curative procedures during the pandemic. Some professionals reported that they offered PMIs during this period for the management of caries lesions in children.

Changes in the children's routine were also highlighted, with the cancellation of classes and social isolation, generating implications for their diet, possibly due to the financial difficulties experienced by families, with the increase in the consumption of processed foods and the intake of fermentable sugars. Oral hygiene was also impaired, either due to the time of brushing or even the use of toothpaste with inadequate fluoride concentration.

It is important to highlight that PMI's were already used in pediatric dentistry before the pandemic, in order to facilitate the management of child patients, with a reduction in clinical work time, and not requiring rotating instruments and anesthesia, which favors the conduct of clinical care. It was also evidenced that such procedures have the advantage of



reducing or eliminating the production of aerosols, with a lower risk of contamination by covid for professionals, patients and guardians.




REFERENCES

1. Almeida, L. E. de, Oliveira, V. de, Pereira, M. N., Mendonça, B. de P. N., Bonato, L. L., Maurício, N. V., & Carmo, V. C. F. T. do. (2020). Odontologia e a COVID-19: da compreensão do atual cenário de pandemia a reflexões sobre o seu processo formativo. *JMPHC | Journal of Management & Primary Health Care*, 12, 1–16.
2. Associação Latinoamericana de Odontopediatria (ALOP). (2021). Tratamiento de caries en época de COVID-19: Protocolos clínicos para el control de generación de aerosoles. *Revista de Odontopediatria Latinoamericana*, 10(2).
3. Barbosa, M. G., Silva, N. R., Oliveira, S. S., & Corrêa-Faria, B. P. (2021). Manejo da cárie dentária e comportamento infantil durante a pandemia de COVID-19: relato de caso. *Revista Odontológica do Brasil Central*, 30(89), 209-221.
4. Beltrame, A. M., David, A. C. V., Botelho, A. L. S. N., Corrêa, B. L. P., Braga, J. R., & Cipriano, T. S. P. (2022). Saúde Bucal antes e durante a pandemia do COVID-19 na atenção primária do município de Ipatinga em Minas Gerais. *Research, Society and Development*, 11(14), 319-328.
5. Braga, B. R., Corrêa-Faria, P., Amorim Junior, L. A. de, & Castro, C. G. (2022). Mudanças no atendimento odontopediátrico e uso de procedimentos de mínima intervenção durante a pandemia de COVID-19. *Revista Odontológica do Brasil Central*, 31(90), 105-120.
6. Conselho Federal de Odontologia (CFO). (2020). Resolução CFO-226. Dispõe sobre o exercício da Odontologia a distância, mediado por tecnologias, e dá outras providências. Brasília, DF: CFO.
7. Crescitelli, G. B., Rosell, F. L., Oliveira, A. B. de, Valsecki Junior, A., Silva, S. R. C. da, & Tagliaferro, E. P. da S. (2023). Impacto da pandemia da COVID-19 na qualidade de vida relacionada à saúde bucal. *Revista de Odontologia da UNESP*, 51(Especial), 11-25.
8. Cunha, A. R. D., Velasco, S. R. M., Hugo, F. N., & Antunes, J. L. F. (2021). O impacto da pandemia de COVID-19 na oferta de procedimentos odontológicos realizados pelo Sistema Único de Saúde: uma perspectiva sindêmica. *Revista Brasileira de Epidemiologia*, 24.
9. Febbo, C., & Pinchemel, E. N. B. (2021). Odontologia Minimamente Invasiva em Tempos de Covid-19: Revisão de literatura. *ID on line. Revista de Psicologia*, 15(56), 241-251.
10. Gomes, L. M. T., Veloso, A. D. S., Filho, A. C. O., França, I. F., Ramos, M. F. S., Oliveira, M. J. L., & Dias, V. O. (2020). Covid-19: Procedimentos Minimamente Invasivos Em Odontopediatria. *Revista Unimontes Científica*, 22(2), 1–14. <https://www.periodicos.unimontes.br/index.php/unicientifica/article/view/3086>
11. Gonzaga, K. L. de P., & Santana, M. M. de. (2024). Condução do processo de trabalho da equipe de saúde bucal durante a pandemia da Covid-19 na Estratégia Saúde da Família de um distrito sanitário da cidade do Recife-PE. *Revista de Saúde Pública de Mato Grosso do Sul*, 6(2), 7–17.

12. Lobo, C. V. M., Saraiva, H. F., De Castro, N. S., Serra, E. S., Carvalho, M. R. L. de A., Rocha, K. A. da, & Custódio, J. de A. (2023). Impactos da COVID-19 na odontologia: revisão integrativa. **Brazilian Journal of Health Review**, 6(6), 32234–32249.
13. Lucena, E. H. G. de, Freire, A. R., Freire, D. E. W. G., Araújo, E. C. F. de, Lira, G. N. W., Brito, A. C. M., Padilha, W. W. N., & Cavalcanti, Y. W. (2020). Acesso em saúde bucal na atenção básica antes e após o início da pandemia de COVID-19 no Brasil. **Pesquisa Brasileira em Odontopediatria e Clínica Integrada**, 4(5), 12–20.
14. Machado, F. C., Oliveira, L. C., Silva, D. L. M., Amorim Carvalho, T. de, Novais, V. R., & Sousa Menezes, M. de. (2021). Teleorientação com o uso de ferramentas digitais no auxílio ao atendimento odontológico em época de pandemia da COVID-19: revisão integrativa da literatura. **Research, Society and Development**, 10(6), e17210615663-e17210615663.
15. Nascimento, M. E. do, Rodrigues, L. A. A., Leite, L. de A., & Carlos, A. M. P. (2021). Critérios para tratamento de molares decíduos cariados pela técnica de hall technique: Revisão de literatura. **Brazilian Journal of Development**, 7(2), 16994–17006.
16. Nunes, L. M. N., Ongaratto, A. M. A., Dionísio, D. S. M., & Gonçalves, E. M. C. (2020). Os desafios da prática odontológica em tempos de pandemia. **Revista Interface-Integrando Fonoaudiologia e Odontologia**, 1(1), 57-67.
17. Reis, I. da C., França, A. K. A. de, Duarte, M. L., Letieri, A. dos S., & Soares, T. R. C. (2020). Tratamento Minimamente Invasivo de Lesões Cariosas em odontopediatria. **Revista Uningá**, 57(4), 129–143.
18. Ribeiro, L. M. C. de A. V., Ferreira, M. M., Lima, J. G. da C., Farias, D. M., Santos, A. A. dos, Medeiros, C. K. S., Almeida, D. R. de M. F., Gonçalves, G. C., Silva, H. F. V. da, Araújo, S. L. S., Pinheiro, J. C., Leite, R. B., & Oliveira, R. D. B. de. (2021). O impacto da pandemia do COVID-19 no atendimento odontológico infantojuvenil no Sistema Único de Saúde de João Pessoa–PB. **Research, Society and Development**, 10(5), 45-53.
19. Rocha, J. R., Neves, M. J., Guilherme, H. G., Moreira, J. M. M., Marques, D. M. C., Feitosa, M. Á. L., Gonçalves, L. M., & Carvalho, T. Q. A. (2020). Odontologia no contexto da pandemia por COVID-19: uma visão crítica. **Brazilian Journal of Health Review**, 3(6), 19498–19509.
20. Safadi, M. A. P., & Silva, C. A. A. da. (2020). O espectro desafiador e imprevisível da covid-19 em crianças e adolescentes. **Revista Paulista de Pediatria**, 39, e2020192.
21. Santos, A. C. da S., Santos, E. M., Bussadori, S. K., Imparato, J. C. P., & Rezende, K. M. (2021). Alimentação na pandemia-como esta questão afetou a saúde bucal infantil-revisão narrativa da literatura. **Research, Society and Development**, 10(12), e461101220679.
22. Souza, M. T. de, Silva, M. D. da, & Carvalho, R. de. (2010). Revisão integrativa: o que é e como fazer. **Einstein (São Paulo)**, 8, 102-106.

THE DEPENDENT STATE AND SOCIAL POLICIES: A RELATIONSHIP OF CONFLICTS IN THE FACE OF (ULTRA) NEOLIBERALISM

 <https://doi.org/10.56238/sevened2024.029-031>

Eduardo Henrique Moraes Santos¹, Alan Farley Prates Oliveira² and Raquel de Oliveira Mendes³

ABSTRACT

The present work discusses the relationship between social policies and the State marked by the (ultra) neoliberal moment of capitalism from the dialectical historical materialist perspective, supported by bibliographic research of the literature in the area, with qualitative analysis. It is concluded that social policies, as an instrument created and maintained under the domination of the Bourgeois State, express a role of conflict by guaranteeing the means for the maintenance of social order while offering conditions for the immediate survival of workers, within the international dynamics of capital. (Ultra) neoliberalism, far from altering the purpose of this relationship, intends to make significant changes in the organization of social policies, especially in the influence of the market and the State on their supply, amplifying the contradiction of this relationship.

Keywords: State. Social Policies. Latin America. Neoliberalism. Social Classes.

¹ Master in Social Work and Social Policy
Pontifical Catholic University of São Paulo
E-mail: ehm.santos@unifesp.br

² Master of Social Work
Pontifical Catholic University of São Paulo
E-mail: alanfarleyp@gmail.com

³ Master in Professional and Technological Education
Federal University of ABC
E-mail: raqueloliveira.as@academico.ufs.br

INTRODUCTION

Discussing the role of the State in social relations, especially in actions aimed at the working class in reducing misery, hunger and social inequality, is a complex and challenging task, as it presents contradictory elements rooted in the societal system that, shaped by the mode of production, characterizes the State itself. This dialectical relationship allows us to better understand social policies within a historical aspect, currently marked by (ultra) neoliberalism, and the conditioning for Latin American states.

It is known that social policy has an important place in the professional practice of Brazilian Social Work, and it is no exaggeration to say that it occupies an important agenda of studies. Boschetti (2021) states that:

One cannot understand the possibilities and limits of Social Work from oneself, in an endogenous way. Thus, the relationship between Social Policy and Social Work needs to be understood in history, based on its structural and conjunctural determinations (p. 34).

It is immersed in this challenge that we propose to discuss the relationship between social policies and the dependent State currently marked by the (ultra) neoliberal moment of capitalism, understanding the need for this discussion to advance, as a professional category, in future discussions about the impacts of this relationship on the population that uses these policies and by the professionals who use it as a ground for their intervention.

To this end, it was used the bibliographic research with qualitative analysis of the literature in the area, constituting the present work in three parts, in addition to the present introduction and final considerations. The first topic reflects on the concept of State, demarcating the understanding of the Marxist Theory of Dependency to understand this concept in the conjuncture of Latin America, introducing social policies in this arrangement. The following topic, in turn, introduces the discussion about neoliberalism so that, in the third topic, it is possible to bring up the meaning of the transformations of the capitalist mode of production in its (ultra) neoliberal face to reality and its repercussions on social policies, presenting some observations for the professional work of the social worker in this conjuncture.

THE CONCEPT OF STATE: AND ITS CONSEQUENCES FOR THE CREATION OF SOCIAL POLICIES

For Pereira (2008), there are challenges for the definition of the State because there are different notions about this instrument and its idea is associated and confused with its organs or constituent elements. It is understood that the State is not an isolated, closed or

self-circumscribed phenomenon, as it is in constant relationship with society. (Pereira, 2008).

In German Ideology, Marx and Engels (2001) reflect on the formation of the modern State achieved by the fractions of the bourgeoisie that constitute themselves as a class that needs to organize itself at the national level and give a universal form to its common interests, encompassing the working class, but in an illusory way, because the State "is always linked to the dominant class and constitutes its organ of domination" (Marx & Engels, 2001, p. 31) to achieve the aforementioned hegemony.

Thus, if the modern representative State "[...] it is nothing but a committee to manage the common affairs of the entire bourgeois class" (Marx & Engels, 1999, p.10), so its primary function is to ensure the conditions for the accumulation and reproduction of capital. Thus, it is perceived that the political relations of domination (make up the State) are interconnected with the social and economic relations of production (bourgeois interests). In other words, the definition of the modern state is linked to the very characteristics of capitalism.

Based on the principle set out above, deepening this analysis for the national states of Latin America raises greater complexity for this definition, since these countries do not share the same conditions of production and exchange of goods in relation to the central countries of capital, such as the United States. Marine (2005) defines them as dependent countries, as they are subject to a relationship of subordination, even if they are formally independent.

The aforementioned author (Marine, 2005) points out that the economic advancement of the central countries is only possible due to the backwardness of the peripheral countries, through the transfer of value generated by the dependent nations in the production of primary and consumer goods, through (or absence of) industrialization with outdated machinery and technologies - and purchased from the central countries, and in the unequal conditions of exchange.

Unlike the conception of the Economic Commission for Latin America and the Caribbean (ECLAC), created in 1949, which also proposed to reflect on the "peripheral economies in the world economy and the internal limitations of underdevelopment" (Coelho, n.d, p.3.), Marine (2005) points out that only with industrialization could dependent countries not ascend to a central country, because their economies are conditioned by the development and expansion of central economies, including access to new technologies.

For the author, Marine (2014), the maximum that one of these countries could achieve within the capitalist world productive system is the condition of sub-imperialist in

relation to its neighbors, playing an intermediary role between center and periphery, but maintaining the conditions of subordination and exploitation, as in Brazil (Luce, 2012). This idea is reported in the following excerpt:

One of the original aspects with which the new policy of domination is currently presented consists in favoring the industrial development of one of the countries, the one that offers the best prospects for this expansion, in order to use it as an instrument of domination over other areas, which, for economic reasons linked to the high position of the dominator, he can no longer exploit directly. The peripheral world is entering the phase in which it is threatened with witnessing the emergence of a subsidiary imperialism. It is the moment when the dominant center begins to lose the means it used to exercise direct power over backward regions traditionally plundered, and finds itself compelled to re-establish, in the person of another country, a prosecutor, for the purpose of pursuing, now indirectly, the old and always profitable exploitation. The highly industrialized capitalist nation is grappling with contradictions that make it difficult to carry out its usual course: growing workers' unemployment, the obsolescence of valid machines, automation, military production socially without consumption, etc. The time comes when it is convenient for him to establish a branch in the peripheral world, to create an industrial satellite, which he will try to help by all means, so that it may develop, as long as he does so using the outdated machines and techniques of the dominating center. For the latter, it is a matter of taking charge of a backward country and making it repeat the phase of development that the center has already passed, thus renewing benefits that it can no longer directly obtain (Pinto, 1960).

It is noted that the dependence of the sub-imperialist country is not overcome and is under the mediation of the central country, even if it seeks relative autonomy in this relationship, this contradictory dynamic is interpreted by Marine (1965) as an antagonistic cooperation, that is, although both countries gain from this articulation, this relationship still reproduces the condition of dependence of one of these countries, for there is still the transfer of value between the bourgeoisie of the peripheral regions and the central bourgeoisie.

In view of this, the internal bourgeois of the dependent countries resort to a series of actions as a way to recover their capacity for accumulation, enabling the super-exploitation of the national working class, either by increasing the intensity of the working day, or by prolonging this working day, by reducing wages or even by increasing the value of the labor force without an increase in wages (Amaral, 2012).

If the function of the state is to guarantee the conditions for the accumulation and reproduction of capital, and if these conditions are dependent on the central countries, then this state is also dependent on and will fulfill these needs of the internal bourgeoisie. However, for Martins (2011), although it is the dominant class that guides the political interests of the State, it is not the one that necessarily integrates it, for example, presidents, ministers and other political representatives who are not of bourgeois origin, but profess discourses and actions for the dominant class.

For the aforementioned author (Osório, 2014), the composition of the State enables a relative autonomy of the State, that is, it opens space for the State not to act only according to the interests of the dominant class, creating the idea of a neutral State that, contradictorily, reinforces the domination of the dominant class. For the author, the capitalist State expresses not only a correlation of forces in which the interests of the dominant classes predominate, but also refers to:

[...] a social relationship that creates strength and modifies these correlations in favor of those who dominate. To suppose that the State "reflects" the class struggle implies conceiving it as a neutral entity, which reveals the point at which the correlation of forces between the classes lies, something like a political thermometer. But, on the contrary, the State has an active role in the class struggle in favor of the integration and organization of the dominant classes and the dispersion and disarticulation of the dominated classes (OSÓRIO, 2014, p. 51).

The aforementioned author states that the idea that the bourgeois state expresses "conquests" of the dominated, such as the right to strike, unionization, popular parties, democratic formulas of domination, must be understood within these limits. "These are *achievements*, but *they are distorted and filtered* by state action" (Osório, 2014, p.51, emphasis added).

The above-mentioned conception highlights the centrality in the relations between social and production classes, constituting a dynamic of dispute for societal projects within and between classes that, throughout history, diversifies the strategies of domination of the bourgeois State and its interaction with society, despite maintaining the first principle of the State of guaranteeing the conditions of domination of the bourgeois class.

It is in this context that social policies are inserted, as an apparent idea of conquest and rights, but essentially as one tool among others of the framework of the Bourgeois State to guarantee domination, especially by encouraging the supposed neutrality of this State. It is evident that, in order to maintain this system that highlights poverty and deepens social inequality in peripheral countries through super-exploitation, it is necessary to deal with the consequences of this contradiction. Social policies emerge as a way to avoid the collapse of social relations, while promoting consensus between classes. And when they are not enough, they resort to coercion:

If capitalism is a system with civilizing dimensions, it is the dimensions of barbarism, however, that tend to prevail in dependent capitalism. Societies crossed by these processes generate high levels of social conflict, some latent and many others manifest. The reproduction of capital sustained by super-exploitation generates acute social fractures: islands of wealth in the middle of a sea of poverty, workers exhausted prematurely, misery and unemployment. All this tends to create conditions to enhance social confrontations and

class struggle. Thus, social order becomes possible on the basis of an iron exercise of political power, which requires a State in which coercive mechanisms operate on a recurring basis (Osório, 2014, p. 208-209).

With the sub-imperialist phase of Brazil, and the social liberal character of the governments that followed (Lula government from 2003 to 2010, Dilma government from 2011 to 2016), social policies managed to cushion some expressions of extreme poverty and enable the survival of part of the workers, however, as Luce (2012) points out, the condition of a dependent country within imperialist and international capitalism perpetuates the conditions of super-exploitation of national labor, marked by the maintenance of the long working day and the intense pace of production, without the proper updating of the historical-social value of the labor force in the payment received.

STATE AND NEOLIBERALISM: REFLECTIONS FOR LATIN AMERICA

State intervention in contemporary society is marked by broad debates, especially political and ideological, which put societal projects in dispute. In this plot, liberalism emerges as a non-interventionist State proposal, with an economy organized strictly by the market. Contradictorily, neoliberalism was constituted with "the help of protective tariffs, subsidized exports, and indirect wage subsidies" (Carcanholo & Baruco, 2011, p. 12), that is, the most basic contradiction of the so-called free market is its own relationship with the State, financed by it throughout its process.

Thus, based on this understanding that the market system needed the State for its implementation, for its maintenance this relationship could not be different: "Economic liberalism can, therefore, ask the state to use the force of law; it can even appeal *to the violent forces* of civil war in order to organize the preconditions of a self-regulating market" (Polanyi, 2000, p. 152-153, emphasis added).

This contradiction of the presence/absence of the State, combined with the productive crises of capitalism, questions other political and ideological proposals that, once again, highlight the role of the State, such as, for example, the *Welfare State*, guided by an interventionist State through social policies in the perspective of maintaining consumption and full employment to accompany the production of the Fordist system that, in the 1970s, it enters a crisis (Carcanholo; Baruco, 2011, p. 12).

Thus, the problem that has been engendered in recent years does not hover over the evaluation of whether the State has been less or more intervening, since it will always be intervening, what is questioned is the pattern of state spending, now perceptibly to the detriment of social policies of a universalizing nature.

It is, rather, a State committed to the financial-fictitious capitalist valorization and, for this to be possible, the restoration of capital required, [...], a "mini-max" State, minimum for labor and maximum for capital. By affirming a supposed need to reduce the size of the State, the attack of big capital is actually directed against the democratic dimensions of the State's intervention in the economy, fundamentally its cohesive dimensions (Carcanholo & Baruco, 2011, p. 12).

It is in this scenario that the neoliberalist proposal is consolidated to replace the Keynesianism of the *Welfare State*. Economic behavior began to determine the behavior of human beings in society, inverting values and views on reality, including the population's perception of social inequality. From the economist point of view, inequality is seen in this model as a goal, as it is what "[...] gives meaning to the search for productivity and efficiency, while, from a moral point of view, the incentive to personal effort would only make sense with inequality, or rather, social differentiation would be the prize for the former" (Carcanholo; Baruco, 2011, p. 12).

Therefore, strategies to combat inequality and expand social protection, such as social policies, come to be seen as obstacles to a neoliberal order. Thus, for the expansion of this political-ideological proposal, the concept of social policies needs to be replaced "by the cold realization of the inevitability of poverty and misery, leading to a path that forces us to treat the phenomenon only in its most acute manifestations, therefore, in a localized and fragmented way" (Iasi, 2017, p. 221).

In this way, neoliberalism begins to dictate how the State intervenes in social inequality and, in this political-ideological proposal, social policies do not occupy a place of centrality, taking no responsibility for their offer.

The post-World War II period marks the genesis of neoliberal ideals, where in the region of Europe and North America, interventionist capitalism prevailed. Friedrich Hayek indicated transformations in the capitalist reference that was developing at the time. In the 1940s, the publication of the work "The Road to Serfdom" in criticism of the interventionist and welfare State, dealt with a "[...] an impassioned attack against any limitation of market mechanisms by the State, denounced as a lethal threat to freedom, not only economic, but also political" (Anderson, 1995, p. 09). Because of this positioning, Hayek has been conquering critics and admirers over the years.

In 1947, Hayek founded the Mont Pèlerin Society in Switzerland, "[...] a kind of neoliberal Freemasonry, highly dedicated and organized, with international meetings every two years. Its purpose was to combat the reigning Keynesianism and solidarism and to prepare the basis for another type of capitalism" (Anderson, 1995, p. 09). A hard and free capitalism was the proposal of the idealizers of neoliberalism. However, the conditions were

not favorable to the proposed model. Since the moment favored the hegemony of advanced capitalism, in the so-called Golden Age, its greatest growth took place in the 1950s and 60s.

The neoliberal model of doing politics, almost inevitable, as a response to the demands of globalization, is based on the deregulation of the economy, privatization of the state model, monetarist macroeconomics, anti-unionist legislation. The neoliberal experiences in Latin America come with Pinochet⁴, the well-known dictator of Chile, who was one of the pioneers in implementation in Latin America between 1973 and 1990, through a group of economists known as the *Chicago Boys*, with strong North American influence.

This influence of the United States is not just a coincidence, the aforementioned central country needs the dependence of peripheral countries and, as a result, expands its influence in the region. Representatives and mediators of these capitals, such as the International Monetary Fund (IMF) and the World Bank (WB) expand this influence and the pressure for the implementation of neoliberalism in Latin America.

The transformations in the posture of ECLAC, headquartered in Chile and created by the United Nations Economic and Social Council, make this influence explicit by, according to Duarte (2013), assuming the position of conductor of the neoliberal prescription in Latin America, despite the opposition discourse. Such imposition is ratified by the Washington Consensus in 1989, as a strategy to expand neoliberalism in the region.

The consequences of these implementations of neoliberal precepts in dependent countries, far from distancing them from dependence, but deepened it. Harvey (2005) describes that from the 1980s onwards, unemployment and inequality grew, while growth in countries such as Argentina and Mexico decreased, conditioned to the reprimarization of the region and expanding the mechanisms of value transfer to the central countries (Mancio & Moreira, 2011), leaving Latin America more susceptible to the crises of world capitalism.

The neoliberal cycle in contemporary Latin history took place through economic deregulation, mass unemployment, union repression, redistribution of income in favor of the rich and privatization of public goods, thus harming the lives of the poor and increasing dependence on the national state. In Brazil, this situation was strengthened after the end of the military dictatorship, under the influence of the Collor government (1990 to 1992) and

⁴ September 11, 2003 marked the 30th anniversary of one of the longest dictatorships in Chile's history. General Augusto Pinochet has ruled the country's life with an iron fist since he led a military coup against socialist President Salvador Allende in 1973, and even after handing over power in 1990, he maintained a strong influence over the direction of the nation. His power was so great that he used to say that he even controlled the movement of the leaves on the trees. Source: "noticias.terra.com/mundo".

with greater emphasis on the Fernando Henrique Cardoso government (1995 to 2003). The 1990s were significant for neoliberal implantations in the country.

SOCIAL POLICIES IN THE (ULTRA) NEOLIBERAL CONTEXT

So far we have already pointed out that the way the capitalist State deals with inequality is historically related to the economic model that dictates what its level of intervention should be in the expressions of the social question. In this context, one of the main strategies for maintaining the dynamics of production and, at the same time, for confronting inequality, are social policies, which are framed according to the most diverse stages assumed by the capitalist social mode of production.

In other words, it is possible to affirm that, in essence, social policy plays a contradictory role in capitalism and that it is fundamental and immutable to it: at the same time that it responds to the demands of the working class, it also serves the interests of the reproduction of capital and the dominant classes as a strategy for the legitimation of hegemonic political power. In this vein, Ribeiro and Salvador (2021, p. 103) state that "social policy and its determinations are necessarily linked to economic policy" and add, when reporting the contributions of Osório (2012), that

The instruments of economic policy can make the cycle of capital more fluid and adequate to the needs of accumulation. Under the same logic, social policy is part of the totality of the capitalist system that structures it, from its insertion in the sphere of production and reproduction of social relations; therefore, one of the aspects that allows class domination is the reproduction of capital. (Ribeiro; Salvador, 2021, p. 103)

Thus, understanding social policy today requires a look at the capitalist system in its neoliberal facet, realizing that it was not able to respond as expected to its own crisis, crossed by tribulations of the most diverse, long and profound natures, which reverberate in the economic, social, political, cultural and health spheres. In view of this reality, there are notes in the literature that highlight that neoliberalism has changed its *status* to the "ultra" level, according to Cislighi (2021):

We characterize this period, then, as an inflection, or new phase of neoliberalism, sharpened in depth, speed and violence in relation to the previous period. It is not ultraliberalism, insofar as there is no return to classical liberalism (LAVAL, 2018), which still did not count on the State as a financier, legitimator, and direct expropriator at the service of capital. By assuming its "ultra" form, as an adjective, neoliberalism enters a new round of deepening its assumptions supported by exponential forms of Bonapartism in liberal democratic regimes and their governments (DEMIER, 2019), of expropriation of common goods, exploitation of labor and extra-economic appropriation of necessary labor and the creation of fictitious capital, amplifying a multifaceted systemic crisis that puts the survival of humanity at risk (p. 17).

Regarding the aforementioned conjuncture of capital, Behring, Cislighi and Souza (2020), reinforce:

We understand by ultra-neoliberalism this most recent form of neoliberalism, which is not limited to Brazil, as it can be observed in several countries around the world. Most authors in the critical field, whether or not they adopt this term, agree that neoliberalism undergoes an inflection that deepens its assumptions, as a consequence of the 2008 financial crisis. Although the crisis was centrally related to the activities of the private financial sector, and was part of a structural moment of capital crisis that dragged on for decades, it was presented, once again, as a crisis of the State, which in fact absorbed the losses of capital through public funds, with the justification that banks and financial institutions were "too big to fail" which would affect society as a whole (p. 106).

This is a reality that brings to the fore, primarily, labor and social security issues for the bourgeoisie as a whole, since they refer more directly to the antagonism between capital and labor and to the niches to expand accumulation (Ribeiro; Salvador, 2021, p.106). This moment in Brazil is expressed by the Temer government (2016 to 2018) and continued by Bolsonaro (2018 to 2022), which carried out (counter) labor reforms in 2017, social security reforms in 2019 and budget strangulation (Sposati, 2018).

This conjuncture represents its face marked by the worsening of misery, caused by greater deregulation, precariousness of work, increasingly deep levels of social (un)protection and withdrawal of rights. In this context, within what Paiva (2006) recommends, there is an inversely proportional movement, to the extent that the expansion of unemployment and the loss of rights, combined with the growing social (un)protection of citizens in the ultra-neoliberal conjuncture, will exert strong pressure on other equally precarious safety nets, among which we can highlight social assistance.

This fact demonstrates a trend already highlighted by Mota (2007), marked by the assistance of social protection, notably symptomatic of this process of miserability of the population, which was already poor:

Social Assistance now assumes, for a significant portion of the population, the task of being the social protection policy, and not part of the social protection policy. These findings seem to point to something that has not been put into the debate: Social Assistance in the twentieth century. XXI is acquiring the condition of an integrating mechanism, instead of the role played by work (Mota, 2007, p. 137)

What is put on the scene, then, are social policies, hegemonically, to combat socioeconomic vulnerability (but not only), of an increasingly lean, restricted, focal and selective nature, aimed at the growing miserable. In other words: social policies are gradually ceasing to be available to poor segments (once benefited), to be focused, almost exclusively, on the miserable, indigent population and completely exfoliated of basic rights.

The reflections of this barbaric conjuncture have direct impacts not only on the population that most needs these policies, but also on the work of Social Workers, as rights, many materialized through social policies, have been harshly attacked. It is therefore urgent that the professional category appropriates a critical reading of the current reality, since social policies are "the ground of our professional work", as well as "objects of research and training" (Boschetti, 2021).

That said, the author points out:

This ultra-neoliberalism is connected with authoritarianism, constrains any possibility of maintaining and expanding democratic social policies, has a hard impact on the reproduction of the workforce and also on the professional practice of the social worker, since it causes an erosion of the soil in which he or she intervenes. Not only do they suffer losses of their rights as salaried workers, but they also face increasingly insurmountable difficulties to mediate access to the rights and public goods of the subjects with whom they work, which constitutes one of their main professional attributions (p. 36).

What can be seen is that as professionals, we are facing an enormous challenge: that of concretizing, within the limits of our salaried work, the principles recommended by the Code of Ethics of the Social Worker, since they mark the direction of a new societal order with foundations opposite to those that found the capitalist dynamics.

If the impossibility of capitalism overcoming the social and material sequelae of the accumulation process is unquestionable, so is the possibility of using means to confront them within the limits of the bourgeois order, allowing owners and workers to become citizens subject to rights (Mota, 2007, p. 137).

The challenge increases even more when we understand that one of our main arenas of professional movement and the viability of rights, which is social policy, contributes to the maintenance of capital. However, not losing sight of the fact that our ethical-political and professional commitment is linked to the process of building a society, without domination, exploitation of class, ethnicity and gender, even in the face of such a controversial reality, helps us to hope (Freire, 1992) and not to disbelieve in what Brecht (1982) already advised us: "nothing should seem impossible to change".

FINAL CONSIDERATIONS

Understanding the place of the State in capitalist social relations makes it possible to visualize the limits and dynamics that are built (and tensioned) between social classes in the construction of strategies of domination and survival, as social policies are characterized. By broadening our field of analysis to the reality of Latin America, this relationship of contradiction in the increase of the productive forces while the super-exploitation of the



working class occurs, this condition of dependent countries particularizes the challenges in the region, summoning, once again, this Dependent State to represent the interests of the dominant class by hiding expressions of contradiction that manifests in social inequality, poverty, intensification and extension of the working day, among other examples.

It is known that one of the main strategies to confront inequality is social policies, and these are framed within the limits of capital, in a contradictory relationship that is fundamental and immutable to it, to the extent that at the same time it responds to the demands for survival of the working class, but essentially also meets the interests of reproduction of capital and the dominant classes as a strategy for the legitimation of hegemonic political power.

In the current scenario, social policies are deeply impacted by the ultra-neoliberal phase of capitalism, which hegemonically focuses on the assistance of social protection, deepening the socioeconomic consequences of imperialist relations in dependent territories. This approach reproduces leaner, restrictive, focused and selective social policies, directed almost exclusively to the population in a situation of misery, deprived of basic rights, instead of a minimum standard of social security. With ultra-neoliberalism in Latin America, the idea of conciliation through social policies is progressively abandoned, being replaced by coercive actions of an authoritarian nature. These actions are manifested both by physical violence (police, military or the arming of the population) and by ideological control, through meritocratic values, competition and the promotion of misogynistic, racist, LGBTphobic discourses and other forms of inferiorization of groups and fractions of the working class.


In this context, the work of professionals involved in these social policies, such as social workers, becomes even more challenging, requiring a critical posture committed to the defense of social rights and to the construction of alternatives that break with the logics of domination and exploitation, which seek the transformation of current social relations, without losing sight of the limits imposed by salaried and exploited labor. The construction of a new societal order, free from class, ethnicity, and gender oppression, is an ethical horizon for the work of social workers, challenging them to resist and find loopholes for the implementation of actions that promote social justice in a context of intensified exploitation.



REFERENCES

1. Amaral, M. S. (2012). *Teorias do imperialismo e da dependência: A atualização necessária ante a financeirização do capitalismo* [Tese de doutorado, Universidade de São Paulo]. Biblioteca Digital de Teses e Dissertações da USP. Disponível em: <https://www.teses.usp.br/teses/disponiveis/12/12140/tde-09102012-174024/pt-br.php>. Acesso em: 3 out. 2024.
2. Anderson, P. (1995). Balanço do neoliberalismo. In P. Gentili & E. Sader (Orgs.), *Pós-neoliberalismo: As políticas sociais e o estado democrático* (pp. 45-62). Rio de Janeiro: Editora Paz e Terra.
3. Behring, E. R., Cislighi, J. F., & Souza, G. (2020). Ultraneoliberalismo e bolsonarismo: Impactos sobre o orçamento público e a política social. In M. I. S. Bravo, M. C. Matos, & S. M. F. Freire (Orgs.), *Políticas sociais e ultraneoliberalismo* (pp. 123-145). São Paulo: Editora Navegando.
4. Boschetti, I. (2021). Política social e serviço social: Interação sim, mimetismo não! In S. S. Evilasio (Org.), *Estado, política social e direitos* (pp. 76-88). São Paulo: Editora Alexa Cultural.
5. Brecht, B. (1982). *Antologia poética*. São Paulo: ELO Editora.
6. Carcanholo, M. D., & Baruco, G. C. da C. (2011). A estratégia neoliberal de desenvolvimento capitalista: Caráter e contradições. *Praia Vermelha*, 21(1), 09-23.
7. Cislighi, J. F. (n.d.). Financiamento e privatização da saúde no Brasil em tempos ultraneoliberais. *Revista Humanidades e Inovação, Política de Saúde e Lutas Sociais em tempos de Pandemia da Covid-19*, 8(35).
8. Coelho, T. P. (n.d.). Subdesenvolvimento e dependência: Um debate entre o pensamento da Cepal dos anos 50s e a Teoria da Dependência. *Revista Perspectiva Sociológica*, (5). Disponível em: <http://dx.doi.org/10.33025/rps.v1i5%2F6.604>. Acesso em: 3 out. 2024.
9. Duarte, P. H. E. (n.d.). Entre o desenvolvimento e a dependência: Uma crítica ao neoestruturalismo cepalino. *Revista Pensata*, 3(1), 97-123.
10. Mancio, D., & Moreira, R. C. (2011). A dependência latino-americana e a reprimarização do continente. In *XVII Encontro Nacional de Economia Política* (pp. 1-25), Rio de Janeiro, Brasil.
11. Freire, P. (1992). *Pedagogia da esperança: Um reencontro com a Pedagogia do oprimido*. Rio de Janeiro: Editora Paz e Terra.
12. Iasi, M. (2017). *Política, Estado e ideologia na trama conjuntural*. São Paulo: Instituto Caio Prado Júnior.
13. Marini, R. M. (2005). Dialética da dependência. In R. Traspadini & J. P. Stédile (Orgs.), *Ruy Mauro Marini: Vida e obra* (pp. 45-67). São Paulo: Editora Expressão Popular.
14. Marini, R. M. (1965). Brazilian interdependence and imperialist integration. *Monthly Review*, 17(7), 10-29.

15. Marini, R. M. (2014). **Subdesenvolvimento e revolução**. Florianópolis: Editora Insular.
16. Martins, C. E. (2011). O pensamento de Ruy Mauro Marini e sua atualidade para as ciências sociais. **Revista Crítica Marxista**, 32(1), 127-146.
17. Marx, K., & Engels, F. (2001). **Ideologia alemã** (6th ed.). São Paulo: Editora Martins Fontes.
18. Marx, K., & Engels, F. (1999). **O manifesto comunista**. Rocket Edition.
19. Mota, A. E. (2007). Serviço social e seguridade social: Uma agenda recorrente e desafiante. **Revista Em Pauta**, (20).
20. Osório, J. O. (2014). **Estado no centro da mundialização: A sociedade civil e o tema do poder**. São Paulo: Editora Outras Expressões.
21. Paiva, B. A. de. (2006). O SUAS e os direitos socioassistenciais: A universalização da seguridade social em debate. **Revista Serviço Social & Sociedade**, (87), 5-24.
22. Pereira, P. A. O. (2008). **Política social: Temas & questões**. São Paulo: Cortez.
23. Polanyi, K. (2000). **A grande transformação: As origens de nossa época**. Rio de Janeiro: Editora Campus.
24. Pinto, Á. V. (1960). A consciência crítica. In **Consciência e realidade nacional** (pp. 75-102). Rio de Janeiro: Instituto Superior de Estudos Brasileiros.
25. Ribeiro, I. R., & Salvador, E. (2021). Fundo público e a construção da hegemonia no Brasil: As demandas das frações burguesas para as políticas econômicas e sociais. In S. S. Evilasio et al. (Orgs.), **Estado, política social e direitos** (pp. 55-70). Embu das Artes: Alexa Cultural.
26. Sposati, A. (2018). Descaminhos da seguridade social e desproteção social no Brasil. **Revista Ciência & Saúde Coletiva**, 23(7). Disponível em: <https://doi.org/10.1590/1413-81232018237.10202018>. Acesso em: 3 out. 2024.

CHILDREN'S LITERATURE: STIMULATING THE TASTE FOR READING <https://doi.org/10.56238/sevened2024.029-032>**Damares Araújo Teles¹****ABSTRACT**

Children's literature represents a path that leads children to the universe of reading in a playful and engaging way, because, through its magical character, it captures the attention of young readers. Therefore, the present study analyzes the contributions of children's literature in Early Childhood Education classes of a public school in Parnaíba-PI. In the theoretical framework, the research was based on authors such as Abramovich (1995), Cademartori (2010), Góes (2010), Frantz (2011), among others. A qualitative approach was used, based on the studies of André and Lüdke (1986) and Bogdan and Biklen (1994). Through the data collected, the study shows that children's literature in Early Childhood Education is not only a recreational activity, but a rich pedagogical practice that plays a fundamental role in the integral development of the child. The strategies used by the teachers, combined with the valorization of children's literature, promote not only the encouragement of literacy and literacy, but also the formation of critical, creative individuals who are sensitive to social issues.

Keywords: Children's Literature. Early Childhood Education. Storytelling.

¹ Doctor in Education from PUC-SP
E-mail: damares.teless@gmail.com
ORCID: <https://orcid.org/0000-0001-8348-4503>
LATTES: <http://lattes.cnpq.br/3688143170059003>



INTRODUCTION

Early Childhood Education plays a role of great importance in society. As established in the Law of Guidelines and Bases of National Education (LDBEN) No. 9,394, of 1996, in its Section II, article 29, "Early Childhood Education, the first stage of basic education, aims at the integral development of children up to 5 (five) years of age, in their physical, psychological, intellectual and social aspects, complementing the action of the family and the community". In this context, by highlighting that the main objective of this stage is to ensure the integral development of the child, it becomes essential to stimulate the formation of the reading child so that he or she becomes a critical, reflective and autonomous citizen.

But who is this child? According to article 4 of Resolution No. 5, of December 17, 2009, of the National Council of Education, which establishes the National Curriculum Guidelines for Early Childhood Education, it emphasizes that:

[...] It is a historical and rights-based subject who, in the interactions, relationships and daily practices he experiences, builds his personal and collective identity, plays, imagines, fantasizes, desires, learns, observes, experiments, narrates, questions and constructs meanings about nature and society, producing culture. (BRASIL, 2009, p. 1).

Thus, it is understood that the child, in daily practice and in interaction with other individuals, builds his identity, with imagination and fantasies being integral parts of this process. In this context, the formation of the reader is fundamental for child development, and Early Childhood Education is configured as a privileged space, where the teacher has the opportunity to awaken interest in reading. Even if the children do not know how to read, as the teacher develops, on a daily basis, the reading of stories and promotes contact with children's books, they become interested in handling them, as well as trying to unravel the written content. It is at this point that children's literature plays an essential role in the process. Abramovich (1995) emphasizes the importance of reading stories to children:

It is being able to smile, laugh, laugh with the situations experienced by the characters, with the idea of the story or with the way of writing of an author and, then, being able to be a little accomplice in this moment of humor, of play, of fun [...]. It is also to arouse the imagination, it is to have curiosity answered [...]. (ABRAMOVICH, 1995, p. 20).

Based on the author's words, it is observed that, when developing reading practices with children, the teacher involves them in a different way in the universe of writing and reading, as the children's imagination leads them to insert themselves in the story, experiencing the experiences of the characters throughout the narrative. In this playful process, the child questions, positions himself and makes new discoveries. Thus, the

relevance of storytelling in Early Childhood Education is highlighted, since it is an essential resource for stimulating children's development.

Therefore, the objective of this research was to analyze the importance and contributions of children's literature and storytelling in Early Childhood Education. Specifically, it sought to understand how teachers highlight the relevance of children's literature, how they perceive the relationship between Early Childhood Education and storytelling, in addition to identifying the strategies they use in this process.

In the theoretical framework, the research was based on authors such as Abramovich (1995), Cademartori (2010), Frantz (2011), among others. A qualitative approach was chosen, based on the studies of André and Lüdke (1986) and Bogdan and Biklen (1994).

CHILDREN'S LITERATURE AND ITS CONTRIBUTIONS

Through emotions, playfulness, imagination and fantasies, the child apprehends and understands reality, attributing a meaning to it. In a globalized world, in which the media exerts a massifying power, it is extremely important that parents and teachers act together to awaken, from Early Childhood Education, the desire for reading in children. In this way, as they mature, they will be able to become adults capable of carrying out a critical and reflective reading of what is presented to them.

Children's literature represents a path that leads children to the universe of reading in a playful and engaging way, because, through its magical character, it captures the attention of young readers. However, many times, the school has not been able to offer this charming and playful aspect of children's literature. Reading is not presented to the child as a beautiful and pleasurable activity, resulting in a poor formation of readers. Consequently, adults will be formed who do not experience the pleasure of reading or recognize it as an indispensable social practice. Thus, it is up to teachers to promote playful activities and develop diversified methodologies in their classes that awaken in students the pleasure of reading.

In the mid-1980s, the period in which the first edition of "What is children's literature" was published, the literary genre aimed at children began to be the subject of discussions and to gain value in the academic community. During this period, the Ministry of Education distributed literary books to children in the country's schools and libraries. This pioneering initiative, called the Reading Rooms Program, was developed by the Student Assistance Foundation. (CADEMARTORI, 2010).

Coelho (1986) argues that literature is an art form and a creative act that, through the word, creates an autonomous, realistic or fantastic universe, where beings, objects, facts,



time and space, although they resemble what is recognized in the concrete world, are transformed into language and assume a different dimension: they belong to the universe of fiction.

Children's literature plays a fundamental role in various aspects of education, especially in the formation of students who enjoy reading, as it encourages them to read through the attraction and beauty that are present in literary texts. Cunha (1974, p. 45) states that "children's literature influences and wants to influence all aspects of the student's education. Thus, in the three vital areas of man (activity, intelligence and affectivity) in which education must promote changes in behavior, children's literature has means of acting".

According to Frantz (2011), the history of Brazilian children's literature begins with Monteiro Lobato, who was the first author to write stories of literary quality aimed at Brazilian children. Previously, literature aimed at children was mainly composed of classic works of European literature, translated or adapted into Portuguese. In 1921, Monteiro Lobato published the work that inaugurated Brazilian children's literature, entitled *The Girl with the Snub Little Nose*.

According to Carvalho (1989), literature is one of the noblest achievements of humanity, representing the conquest of man himself. It provides the knowledge, transmission and communication of the adventure of being. Only this reality can offer literature its true dimension and allow man the certainty of being. Zilberman (1994, p. 22) argues that:

Literature synthesizes, through the resources of fiction, a reality, which has wide points of contact with what the reader lives daily. Thus, no matter how exacerbated the writer's fantasy or how distant and different the circumstances of space and time within which a work is conceived, the symptom of its survival is the fact that it continues to communicate with the current recipient, because it still speaks of its world, with its difficulties and solutions, thus helping him to get to know him better.

It is essential that each child develops a taste and pleasure for reading, since this is an essential dimension in the life of any human being. Reading exercises the mind and sharpens the intelligence. According to Moric (1974), literature is an art form, but it also represents a means of educating the young reader, developing their aesthetic perception of the world, refining their qualities, revealing their intelligence, their worldview, their ideas and their taste. In the words of Góes (2010, p. 47):

The development of reading among children will result in a progressive enrichment in the field of moral values, language culture and in the rational field. The habit of reading will help in the formation of opinion and a critical spirit, especially the reading of books that form the critical spirit, while the repetition of stereotypes impoverishes.



Literary texts are fundamental for children, as they stimulate their fantasies, emotions and intellect, presenting themselves with an attractive aesthetic and involving playfulness. In the educational scenario, literary texts acquire a unique and singular function: they combine information with the pleasure of play, involving reason and emotions in an integrative activity, conquering the reader as a whole and not only in his cognitive sphere.

THE IMPORTANCE OF STORYTELLING

Even before entering the school environment, the child already has some knowledge about the world of writing, whether through advertisements he sees on television, signs on the streets, magazines, newspapers, or books used by the family, among other means. Thus, it is extremely relevant that the child is encouraged to read from an early age. Thus, we emphasize the importance of reading practices carried out at home, because when the child grows up in an environment where he sees, on a daily basis, people who enjoy reading, he tends to develop greater interest in the act of reading.

It is at school that this stimulus should be intensified, as many children do not have the opportunity to live with constant reading and writing practices, which are essential for them to become critical, reflective and autonomous readers and writers. Resolution No. 5, of December 17, 2009, in its article 9, explains that the pedagogical practices that make up the curricular proposal of Early Childhood Education must have interactions and play as guiding axes. Specifically, in items II and III, it is emphasized that experiences must be guaranteed that:

II - Favor the immersion of children in different languages and their progressive mastery of various genres and forms of expression: gestural, verbal, plastic, dramatic and musical; III - Enable children to experience narratives, appreciation and interaction with oral and written language, and contact with different oral and written textual supports and genres. (BRASIL, 2009, p. 4).

In this sense, to stimulate children's contact with oral and written language, the relevance of storytelling is highlighted. This practice reveals itself as an important resource, which can and should be widely explored, especially in Early Childhood Education, since it promotes immersion in different languages and provides other essential experiences. Parallel to the construction of various fundamental knowledge for child development, the child is inserted into the world of reading and writing in a playful and pleasurable way.

It is in this context that children's literature comes into action, with its playful importance. The teacher, when working with storytelling, stimulates the child's imagination, leading him to travel through the world of fantasy. According to Frantz (2011, p. 20), "we cannot forget that the child in this age group lives the phase of playful thinking and magical

thinking. Playing, fantasizing and questioning are ways that this child uses to know and explore his reality, building his knowledge." Children's stories influence the learning process of children, contributing significantly to their development and the construction of their personality. Faced with the situations presented in the stories, the child is confronted with moral and ethical dilemmas, and needs to take a stand in front of them.

Thus, it is essential to implement reading practices in the classroom that promote children's development. The teacher should select children's books that contribute effectively to this goal, as this will help with initial learning related to reading and writing. As Cademartori (2010, p. 63) emphasizes:

[...] Books and reading, presented to children in their early years, can offer them a seductive reason for the effort undertaken in the literacy process. The role of literature in the early years is fundamental for establishing an active relationship between speaker and language, which does not occur without the involvement of affection and emotions.

In addition, from the beginning of schooling, children need to actively participate in reading and writing acts. Consequently, as the child listens to the reading of stories, he progressively develops his linguistic repertoire and appropriates the characteristics of oral and written language.

Therefore, Early Childhood Education, as a fundamental stage of development, should involve students in practices that lead them to understand writing and reading, facilitating the process of literacy and literacy.

METHODOLOGY

Storytelling is an important resource to be used in Early Childhood Education. In view of this, this study seeks to analyze the relevance and contributions of children's literature and storytelling in this stage of basic education, based on the observation of two classes, kindergarten IV and V, in a public school in the city of Parnaíba-PI. Qualitative research was chosen, characterized as an attempt to understand in detail the meanings and situational characteristics presented by the subjects involved (RICHARDSON, 2009).

In this sense, Bogdan and Biklen (1999) point out that this type of research works with the natural environment and involves obtaining descriptive data from the researcher's direct contact with the situation studied. The qualitative research of the descriptive type was chosen, which seeks to explain and describe the investigated object faithfully. According to Oliveira (2010), this type of research offers a detailed description of the way the phenomenon is presented, characterized by a deep analysis of the observed reality.

The following instruments were used for data collection: semi-structured interviews, observation and questionnaire. The semi-structured interview was chosen because it allows a more meaningful dialogue with the interviewee, enabling the spontaneous exposure of knowledge and opinions on the topic in question. According to André and Lüdke (1986), the interview creates a relationship of interaction between the researcher and the interviewee, allowing an atmosphere of reciprocal influence. Although it follows a basic outline, the semi-structured interview allows for the adaptation of questions as needed.

With regard to the questionnaire, Oliveira (2010, p. 83) explains that it is "[...] a technique for obtaining information about feelings, beliefs, expectations, situations experienced and about any and all data that the researcher wishes to record to meet the objectives of his study". The questionnaires applied to the teachers were elaborated with open questions, aiming to obtain more subjective information.

The observation technique was also used in data collection, and was considered by André and Lüdke (1986) to be the main instrument of investigation. Observation allows the researcher to resort to personal knowledge and experiences to assist in the understanding and interpretation of the phenomenon studied. Thus, through observation, it is possible to verify and analyze the object of investigation in practice.

RESULTS AND DISCUSSION

The research was carried out in a municipal school in the city of Parnaíba, Piauí, which offers Early Childhood Education. The analysis was conducted in two classes, kindergarten IV and V, at the Ciranda school. The two teachers who work in these classes were assigned as Lily and Sunflower. Lírio has a degree in Pedagogy from the Federal University of Piauí and has nine years of experience in Early Childhood Education. Girassol, also with a degree in Pedagogy from the State University of Piauí, has been working for five years.

At the beginning of the research at the Ciranda school, the performance of teachers Lírio and Girassol was observed, who, with the objective of encouraging the taste for children's stories, organized a presentation of the play "The Three Little Pigs". Together with other teachers, they prepared the scenario, built the characters' houses and characterized themselves as the characters in the story. The children, gathered in the courtyard, followed the staging carefully and had fun with the entrance of the "villain", the big bad wolf.

The teachers reported that these moments are fundamental to encourage the taste for children's books and awaken the desire to learn to read. Both highlighted the importance



of storytelling in Early Childhood Education, stating that this stage is ideal for developing activities that provide good results. Lírio commented:

Early Childhood Education is the most important phase in a child's life, as it is there that he is graduating. So, at this stage, it is time for the teacher to explore all the potential of this child. And when we talk about the importance of storytelling, it's a moment we can't ignore. It is impossible for a teacher to develop a work in Early Childhood Education without using this resource. I use children's storybooks a lot, I take a lot of books to do storytelling. So, there is always that moment of storytelling, it is the moment they like the most. When I say: 'I'm going to tell you a story', the children cheer. It is wonderful to see their joy. I always try to tell the story in a different way. I've already taken a story with very large illustrations. I made sure to print the images; Then I would tell and show the figures. They liked it very much. Another strategy to do this storytelling is to take puppets. My classroom is very large, so I put a rug, and every time, at the time of the story, the children sit there. They simply love. (PROFESSOR LILY).

The analysis of teacher Lírio's speech shows how storytelling is an essential pedagogical resource in Early Childhood Education, directly impacting the cognitive, emotional and social development of children. By using storytelling in a creative and engaging way, Lírio not only arouses the interest and enchantment of students, but also promotes the development of fundamental skills, such as imagination, problem-solving, and the ability to make decisions based on the situations experienced in the narratives.

By highlighting the positive reaction of children to the announcement of a new story, Lírio's account shows how storytelling acts as a moment of pleasure and expectation in the school routine, creating an atmosphere conducive to playful learning. Children are thrilled to know that they will participate in this activity, which reveals the importance of creating environments and learning experiences that are fun and engaging, especially at this stage of training. The use of visual elements, such as large illustrations and puppets, reinforces the interactive character of storytelling, further stimulating children's engagement and enhancing learning.

Another point highlighted by the teacher is the physical interaction with the space: by organizing a special carpet for the moment of storytelling, she creates an environment that symbolizes the importance of that moment, establishing a kind of playful ritual that children value and look forward to. This type of pedagogical strategy goes beyond the simple reading of a story, transforming the moment into a sensory and social experience, where children can get together, share the space and experience the stories together. This socialization also contributes to the development of socio-emotional skills, such as cooperation, empathy, and communication.

Lírio's speech also highlights the role of storytelling as a bridge between the school and the family environment. When exposed to this practice at school, children tend to

reproduce what they experience, whether telling stories to their family and friends or asking adults to read to them. Even without knowing how to read yet, the simple act of retelling the story based on the images they have seen or the elements they have heard demonstrates the significant impact that this resource has on the development of emerging literacy. This reproduction of what is experienced at home school promotes the affective bond with books and reinforces the importance of encouraging reading in the family environment, creating continuity in the educational process.

The involvement of children in storytelling also favors the expansion of their linguistic and cultural repertoire, since they come into contact with new words, expressions and concepts through narratives. This contributes to building a solid foundation for literacy and literacy, as well as stimulating intellectual curiosity. Children's literature, in this context, not only introduces children to the universe of reading, but also acts as a vehicle for the transmission of values, culture and ethics, essential aspects for the integral formation of the individual.

The diversity of strategies used by Lírio highlights the importance of varying the methods of presenting the stories to maintain the interest of the children and stimulate different forms of learning. By including visual and tactile aids, the teacher caters to the diverse forms of learning and the specific needs of children, providing a rich and inclusive experience. This multidimensional approach reinforces the idea that the teacher in Early Childhood Education must be creative and flexible, adapting methodologies to meet the interests and development of children more broadly.

Thus, storytelling presents itself as a versatile and powerful pedagogical tool, which goes beyond the mere narration of texts and becomes an instrument for the integral development of the child. Through it, children not only learn to like books, but also develop essential skills for life in society, such as critical reflection, the ability to solve problems, and the construction of a broader and more complex worldview.

Girassol also emphasized the importance of storytelling in his pedagogical work, stating:

I love working with Early Childhood Education, but I also know that it is a lot of responsibility for the teacher, because it is the moment when we must stimulate the integral development of this child. So, if he does not have a well-developed Early Childhood Education, he will have problems in the first year and so on. Our responsibility is great. When people ask me about which activities I give more emphasis to, I immediately mention storytelling, because this moment is something that cannot be missed in my classes. I always like to read a story during the class or at the end. What I can't do is stop doing the telling, because the children are euphoric for this moment. As a strategy for storytelling, I always like to wear my storyteller's hat. When I say I'm going to put on the hat, the children already know that I'm going to tell a story. I also use the magic box, from which I take the characters from the stories and, as if by magic, they appear. Using storytelling is



very important to encourage children to read, after all, our goal should be to enable these children to learn to read. (PROFESSOR GIRASSOL).

Girassol's speech reinforces the role of storytelling as a stimulus to reading, highlighting the importance of teachers promoting children's daily contact with children's literature.

The reading corner, where the books are available, was mentioned by both teachers as an essential space in the Early Childhood Education classrooms. Teacher Lírio highlighted the importance of this environment as a place of freedom and choice for children, where they can interact with books autonomously and spontaneously, even if they do not yet know how to read. This practice is fundamental for the construction of future readers, since early contact with books, in a playful and pleasant environment, stimulates interest in reading and creates a positive relationship with literature. By emphasizing the importance of starting the stimulation in early childhood, Lírio warns of the challenge of encouraging the habit of reading in more advanced stages if this practice is not worked on from an early age:

The reading corner cannot be missing in an Early Childhood Education room. I gather several books, and the children, every day, have a moment to enjoy this environment that is theirs, that was made for them. We must work with the construction of the child reader. When we do storytelling, we work with children's literature, and this literature is very important. In the reading corner, there are several books, and the children go there to choose the books they want to read. Even if they don't know how to read, this is the right time to encourage them. Because, if we don't stimulate it now, then it becomes much more difficult. (PROFESSOR LILY).

Creating a pleasant and accessible environment, where children can explore books autonomously, is essential to encourage a taste for reading. Girassol also highlighted the importance of this space in his living room:

The reading corner is the place where the child becomes a person who enjoys reading. We see different realities here at school. Many parents do not encourage this at home, but there are also those who help a lot. So, we have to reinforce this taste for reading here at school. In my classroom, the reading corner occupies a prominent place. I made the space very pleasant, which makes the children want to be there every day. When the child grows up with the habit of reading, he becomes a different, critical person, who knows how to interpret and will not have difficulties in society, because this was well worked on in Early Childhood Education. It is exciting for me, as a teacher, to see my students using the books. They pretend they can read; When they pick up the books, they show the pictures and tell the story with such joy, as if they were really reading. But, in fact, they are reading, through the images, and they say what is happening in history. That's why I love working with children's literature and storytelling, which are fundamental resources. (PROFESSOR GIRASSOL).

Professor Girassol's speech reveals a deep understanding of the role of children's literature in the formation of critical and reflective readers, capable of facing the challenges



of society in a more conscious way. The reading corner, which she highlights as a prominent space in her classroom, is not just a physical place, but an environment for the construction of rich and meaningful experiences for children. There, they connect with books in a pleasant and natural way, which reinforces the development of the reading habit from the first years of life.

This welcoming and attractive environment plays an important role in early childhood education, especially for those children who are not encouraged to read at home. The teacher observes that many parents do not promote reading, which makes the school an even more vital space for contact with literature. Girassol's speech also points to the need for the school not only to introduce reading, but also to reinforce the taste for reading continuously, being a regular and engaging practice in the school routine. This perception emphasizes the school as a central space in the formation of readers and in the development of essential skills for life.

In addition, the report about children "pretending" that they read by manipulating books and telling stories from images reveals an important stage in the literacy process. Even if they do not yet know how to decode words, these children are developing emerging literacy skills, such as understanding the plot, constructing meaning from images, and connecting emotionally with stories. This behavior shows that reading goes beyond the decoding of symbols; It is a cultural practice that involves imagination, interpretation and social interaction.

By creating a playful and stimulating space, Sunflower is fostering an environment that validates children's natural curiosity and their willingness to explore the world of stories. The reading corner, therefore, becomes a powerful pedagogical tool, capable of awakening the desire for reading, in addition to contributing significantly to the development of linguistic and cognitive skills.

Children's literature, in this context, acts as a mediator between the world of fantasy and reality, allowing the child to develop their critical and interpretive capacity. Through storytelling and access to books, children learn to construct narratives, interpret what they see and hear, and expand their vocabulary and understanding of the world. What Girassol describes as the joy of children when interacting with books reflects the aesthetic pleasure that literature can provide, and it is this pleasure that often serves as a basis for the formation of assiduous readers and, consequently, more critical and conscious citizens.

Thus, the teacher's responsibility in this process goes beyond the simple introduction of books and stories; It is up to him to create environments and practices that stimulate children's engagement with reading in a meaningful way. The role of the teacher is therefore

essential to ensure that children's literature is more than an educational resource, but an integral part of the child's integral development, promoting both academic learning and emotional and social development.

CONCLUSION

This study aimed to analyze the importance and contributions of storytelling in Early Childhood Education, seeking to understand how teachers emphasize the relevance of children's literature and the strategies they use. From the data collected and the analysis carried out, it was found that storytelling is an essential resource to awaken interest in reading and contribute significantly to the literacy process. This process, which begins in the first years of schooling, favors the insertion of the child in the world of reading and writing in a playful and pleasurable way.

The statements of teachers Lírio and Girassol indicate that both value and emphasize storytelling, recognizing its fundamental role in the formation of child readers. The strategies used by them, such as the reading corner and creative storytelling, stand out as practices that involve and motivate children, contributing to the formation of critical, reflective and autonomous citizens.

In addition, storytelling enables the construction of affective bonds between children and educators, creating a welcoming environment that favors emotional expression and socialization. This aspect is essential, as children's literature not only enriches vocabulary and comprehension skills, but also develops empathy, a fundamental skill for living in society.

Narratives told in a dynamic and interactive way promote imagination and creativity, allowing children to explore different perspectives and expand their cultural repertoire. By engaging with stories, they also learn about values, diversity, and respect for differences, aspects that are fundamental in the formation of a more just and egalitarian society.

Another point to be highlighted is the importance of continuous training of educators, which should include training in storytelling methodologies. Investing in teacher training is essential for them to feel safe and creative when introducing children's literature into their pedagogical practices. Thus, it will be possible to ensure that storytelling becomes a regular and enriching component in everyday school life, positively impacting the children's learning experience.

In short, storytelling in Early Childhood Education is not just a recreational activity, but a rich pedagogical practice that plays a fundamental role in the integral development of the child. The strategies used by the teachers, combined with the valorization of children's




literature, promote not only the encouragement of literacy and literacy, but also the formation of critical, creative individuals who are sensitive to social issues.



REFERENCES

1. ABRAMOVICH, F. (1995). *Literatura infantil: gostosuras e bobices* (5th ed.). São Paulo: Scipione.
2. ANDRÉ, M. E. D. A., & LUDKE, M. (1986). *Pesquisa em educação: abordagens qualitativas*. São Paulo: EPU.
3. BOGDAN, R., & BIKLEN, S. (1994). *Investigação qualitativa em educação: uma introdução à teoria e aos métodos*. Coimbra, Portugal: Porto Editora.
4. BRASIL. Ministério de Educação e Cultura. (1996). LDB - Lei nº 9394/96, de 20 de dezembro de 1996. Estabelece as diretrizes e bases da Educação Nacional. Brasília: MEC.
5. BRASIL. Ministério da Educação. Conselho Nacional de Educação. Câmara de Educação Básica. (2009). Resolução CNE/CEB n. 5, de 17 de dezembro de 2009. Institui as Diretrizes Curriculares Nacionais para a Educação Infantil. *Diário Oficial da República Federativa do Brasil*, Brasília, DF, 18 dez.
6. CADEMARTORI, L. (2010). *O que é literatura infantil* (2nd ed.). São Paulo: Brasiliense.
7. CARVALHO, B. V. de. (1989). *A literatura infantil: visão histórica e crítica* (6th ed.). São Paulo: Global.
8. COELHO, N. N. (1986). *Literatura e linguagem* (4th ed., pp. 29-31). São Paulo: Quíron.
9. CUNHA, M. A. A. (1974). *Como ensinar Literatura Infantil* (3rd ed., p. 45). São Paulo: Discubra.
10. FRANTZ, M. H. Z. (2011). *A literatura nas séries iniciais*. Petrópolis, RJ: Vozes.
11. GÓES, L. P. (2010). *Introdução à Literatura para crianças e jovens*. São Paulo: Paulinas.
12. OLIVEIRA, M. M. de. (2010). *Como fazer pesquisa qualitativa* (3rd ed.). Petrópolis, RJ: Vozes.
13. RICHARDSON, R. J. (2009). *Pesquisa social: métodos e técnicas* (3rd ed.). São Paulo: Atlas.

ENSURING ETHICS IN THE USE OF SENSITIVE DATABASES: A SCOPING REVIEW

 <https://doi.org/10.56238/sevened2024.029-033>

Leonardo Costa Pereira¹, Ana Paula Franco Pacheco², Iolanda Bezerra dos Santos Brandão³, Beatriz dos Santos Faria⁴, Lucas Dalle Rocha⁵, Lidia de Oliveira Xavier⁶, Margo Gomes de Oliveira Karnikowski⁷ and Mariana Sodário Cruz⁸

ABSTRACT

Introduction: Despite the legal guidelines, it is necessary to detail the strategies used by controllers and operators of health databases, with a view to directing future studies and to inform institutions involved in the protection of research participants. **Objective:** To identify the main problems for the protection of patient data and strategies to mitigate the problems pointed out, through a scoping review. **Methods:** In this study, the Joanna Briggs Institute (JBI) methodology for scoping reviews was followed. The PCC (Population, Concept and Context) strategy was used to formulate our research question: "How to conduct research in health databases, ensuring anonymity and attention to patients?" To identify relevant articles, the following search algorithm was applied: (research or "Research Ethics Committee") and (Ethics) and (technology or responsibility or security for "protecting information" or "Big Data" or "Patient Safety" or "Electronic patient record"). Original articles available in English, Portuguese and Spanish were selected from the Scielo, Pubmed and Scopus databases. The inclusion criteria were: articles that addressed problems and alternatives related to data security, in addition to explaining the origin of the research group. Individual searches were conducted, articles were selected, and agreement between reviewers was verified. The complete reading of the selected articles and the extraction of the data were done with the help of the Mendeley software and the Rayyan website. **Results:** A total of 947 articles were found. Of these, 88 were duplicates; The reviewers showed 86% (n=815) agreement between the articles that met the inclusion criteria, resulting in a total of 43 articles included. The 43 articles were read in full, in order to apply the exclusion criteria, resulting in the selection of 17 works. The prevalence of the problems identified was focused on the lack of a standardized system that can guarantee the confidentiality and reliability of the data collected. The alternatives to mitigate the problems identified showed prevalence in the implementation of specific legislation, for research involving the use of sensitive databases. **Conclusion:** The lack of standardized systems to ensure the reliability and confidentiality of the collected data was the main problem identified. As a mitigation strategy, the implementation of specific laws for research that uses sensitive databases was suggested.

¹ Euro American University Center – UNIEURO, Brasília, Distrito Federal, Brazil
UniSER/UnB Integrated Research Center - CIU, Brasília, Federal District, Brazil

² Euro American University Center – UNIEURO, Brasília, Distrito Federal, Brazil

³ Euro American University Center – UNIEURO, Brasília, Distrito Federal, Brazil

⁴ UniSER/UnB Integrated Research Center - CIU, Brasília, Federal District, Brazil
Universidade de Brasília - UnB, Brasília, Distrito Federal, Brazil

⁵ University of Brasilia - UnB, Brasília, Distrito Federal, Brazil

⁶ Euro American University Center – UNIEURO, Brasília, Distrito Federal, Brazil

⁷ UniSER/UnB Integrated Research Center - CIU, Brasília, Federal District, Brazil
Universidade de Brasília - UnB, Brasília, Distrito Federal, Brazil

⁸ University of Brasilia - UnB, Brasília, Distrito Federal, Brazil



Keywords: Research Ethics. Database. Digital Security.

INTRODUCTION

Sensitive data can be defined as sensitive information that requires protection due to its private nature and potential for misuse. This concept encompasses data related to an individual's medical history, treatments, and conditions that, if disclosed without consent, could lead to discrimination or stigmatization. Protecting this data is crucial for maintaining patient confidentiality and trust in healthcare systems (Prasser *et al.*, 2018). Sensitive data on racial or ethnic origin, religious belief, political opinion, membership of unions or organizations, data about sex life, and genetic or biometric data may also be considered (Brazil. Presidency of the Republic., 2018).

International regulations for the protection of sensitive patient data in databases are shaped by a complex interplay of privacy laws, public health needs, and technological advancements. These regulations aim to balance the protection of individual privacy with the need for data sharing for research purposes and public policy decision-making.

A relevant aspect in this discussion is the ownership of data, that is, who has the right to access and use such information, as well as the ethical implications of this ownership. Rodwin and Rodwin (2010) (Rodwin, 2010) advocated for public ownership of patient data to avoid monopolies and ensure that data is used for advancements in health and safety. The authors suggested that federal laws require the anonymous communication of data to public authorities, which can then oversee its use by private entities. For the authors, public ownership allows for greater oversight and protection of patient confidentiality compared to private ownership, which could restrict public and private use of data. This approach would not only promote transparency but also encourage collaborative research efforts that could lead to significant advancements in medical science.

However, the implementation of such policies raises questions about the balance between patient privacy and the potential benefits of data sharing for research and public health initiatives. In this context, regulatory restrictions on access and manipulation of data are important. In several countries, the use of clinical data is strongly regulated to protect patient privacy. These regulations are crucial to prevent misuse, but they also pose challenges for translational research (Ahalt *et al.*, 2019). Thus, innovative approaches should be developed for scientific knowledge of clinical data and, at the same time, for adherence to these regulatory constraints, such as an integrated clinical and environmental exposure service, which would allow open access to observational patient data integrated with environmental exposure data.

In the United States of America (USA), the protection of patients in databases is mainly governed by the Health Insurance Portability and Accountability Act (HIPAA),

published in 1996, which established national standards for the privacy and security of health information, including the need for data use consent and de-identification processes. Despite the initial framework, the U.S. also regulates privacy by industry and by state, which means that different laws apply to different domains. This fragmented approach can lead to inconsistencies and gaps in protection, prompting calls for a more unified framework that addresses the complexities of digital data sharing and privacy in the modern era (Kaplan, 2016).

Despite the criticisms and limitations, HIPAA is considered a regulatory milestone in the area. An example is the age limit of subjects to allow access to their data. Age is information that can help identify subjects, since the population tends to decrease in higher age strata and the identification of older people becomes feasible, especially in smaller communities. According to HIPAA, the age limit for accessing and handling data is 90 years old. To Moffatt and Leshin (Moffatt; Leshin, 2024), this determination must undergo constant revision, as population longevity increases and the implications for data privacy must accompany such changes. The authors suggest increasing the upper age limit for access to and manipulation of health data for at least two more years, with regular updates of these limits in line with new demographic data and ethical standards considerations.

In the European Union (EU), the main regulatory framework is the General Data Protection Regulation (GDPR) - approved in 2016 and in force since 2018 - which defined a standard for data protection and privacy, influencing how researchers can access and use clinical data in member states. The GDPR represented a significant reform of data protection laws, emphasizing strict privacy standards and influenced global data privacy laws (Behrendt *et al.*, 2018).

As for recommended strategies, both the U.S. and the EU focus on de-identification as a method for privacy protection. This aspect involves removing or changing information that can identify individuals. However, the effectiveness and sufficiency of de-identification is debated, as it assumes that no harm to privacy occurs if individuals are not identified (Kaplan, 2016).

Thus, there is a global trend to harmonize data privacy standards, with increased adherence of countries to the elements of the GDPR. This convergence is driven by both legal obligations and voluntary business practices (Greenleaf, 2018). However, challenges remain, such as regional agreements with lower standards and free trade agreements that may run afoul of strict data protection laws. A strategy that tries to promote the ethical exchange of sensitive data between countries was the so-called "*Safe Harbor*". This program was created by the U.S. Department of Commerce and the European Commission

to overcome differences in approach to data privacy between the two continents by facilitating the secure sharing of information.

In Brazil, the General Data Protection Law (LGPD) emphasized the need for free and informed consent for the acquisition and handling of personal and/or sensitive information, as well as the formulation of security measures aimed at protecting databases. These guidelines included restrictions on access and unauthorized exploitation, audits to maintain the integrity and confidentiality of data, and anonymization or pseudonymization protocols, in accordance with good data governance (Brazil. Presidency of the Republic., 2018).

While national and international regulations strive to protect patient data, they must also adapt to the evolving landscape of digital health and so-called "big data." The balance between privacy and data utility remains a critical challenge, requiring ongoing dialogue and innovation in regulatory frameworks and local database management strategies. Despite the legal guidelines, it is necessary to detail the strategies used by controllers and operators of health databases, with a view to directing future studies and to inform institutions involved in the protection of research participants, such as Research Ethics Committees. Thus, the objective of the present study was to identify the main problems for the protection of patient data and strategies to mitigate the problems pointed out, through a scoping review. This review will cover methodologies and frameworks currently in use, highlighting best practices and potential areas for improvement in data governance.

METHODS

The conduct of this study followed the Joanna Briggs Institute (JBI) Evidence Synthesis methodology for Scoping Reviews of the (Peters et al., 2020). For the preparation of the present study, the Preferred Reporting Items for Systematic Review and Meta-Analysis for Scoping Review (PRISMA-ScR) protocol was adopted (Tricco et al., 2018; Page et al., 2021).

Likewise, the Population, Concept and Context (PCC) strategy was also used to formulate the research question, which was defined as follows: a) Population: research; b) Concept: ethics; c) Context: data security. The guiding question of the research was: How to conduct investigations in health databases ensuring anonymity and protection of patients?

Such a question reflects a crucial challenge at the intersection of ethics, technology, and public health. As the volume of data collected and stored increases, the need to ensure the privacy of individuals becomes even more urgent. Effective investigations must balance the pursuit of scientific knowledge with the responsibility to protect sensitive information, avoiding unwanted exposures that could compromise patient safety. In addition, this

problem requires the analysis of ethical practices and the development of guidelines that guide researchers in the manipulation of data, ensuring that the solutions adopted respect the autonomy and dignity of the individuals involved. Therefore, the investigation not only seeks answers, but also proposes an ongoing dialogue on best practices in a rapidly evolving landscape.

For this purpose, a search was carried out in the National Library of Medicine - PubMed databases and in the Virtual Health Library (VHL) website to identify relevant keywords, resulting in the following search algorithm: (research or "Research Ethics Committee") and (Ethics) and (technology or responsibility or security for "protecting information" or "Big Data" or "Patient Safety" or "Electronic patient record").

SAMPLE SELECTION

The inclusion criteria established were: original articles, available in full, in English, Portuguese and Spanish, located in the SciELO, PubMed and Scopus databases, which dealt with the management of patient data. On the other hand, the exclusion criteria were defined as articles that did not effectively address the topic, that did not simultaneously discuss the problems and alternatives for data security, or that did not specify the origin of their research group.

This exclusion aimed to maintain a standard of quality in the sources used, ensuring that only rigorous and well-founded studies were considered. In this way, we sought to eliminate potential biases and ensure that the evidence presented was robust and contributed significantly to the discussion on ethics in the management of patient data.

PROCEDURES

The study adopted the peer review strategy to ensure rigorous verification and proper application of the inclusion and exclusion criteria. Each reviewer performed some steps individually: Stage a) Searches in the selected databases, using the algorithm for identifying relevant words in the titles, abstracts and keywords, applying the filters for the Portuguese, English and Spanish languages; for experimental designs of observational articles and clinical trials; for the articles available in full. Stage b) Selection of articles according to the inclusion criteria. Stage c) Verification of the agreement between the reviewers in relation to the inclusion criteria. Step d) Application of the exclusion criteria by each reviewer. Stage e) Verification of the agreement between the reviewers on the exclusion criteria. Stage f) Completion of the full reading of the selected articles. Stage g) Discussion and extraction of data from the chosen articles. Stage h) Data extraction and analysis using the Mendeley

reference management software and the specialized revision management platform Rayyan.

This strategy sought to ensure that each stage of the article selection and analysis process was carried out with greater precision and impartiality. The combination of thoughtful search strategies and cross-reviewer validation not only aimed to strengthen the quality of the evidence collected, but also to ensure the relevance and integrity of the extracted data.

OUTCOMES

For each selected article, several aspects were recorded, such as the origin of the publication group, the impact factor of the published journal, the number of citations until August 2024, the year of publication, the identification of problems related to data security, the proposed solutions, and the relevant legislation in force.

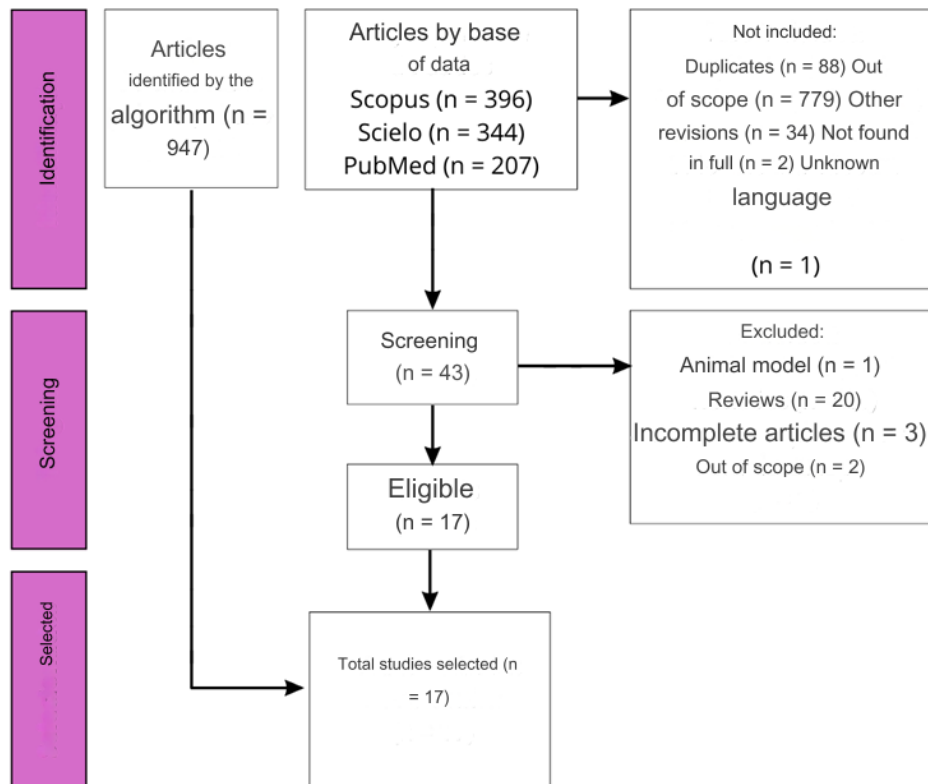
Problems and mitigation strategies were recategorized to facilitate identification by frequency and analyzed with the help of the "<https://wordart.com/create>" platform. To assess the repercussion of each article, the number of citations up to September 2024, obtained from the "<https://scholar.google.com/>" website, was considered. The "<https://researchrabbitapp.com/home>" site was used to verify the impact of the works, where the relationship between them of the selected studies was necessarily observed, as well as their potential to influence studies with similar themes.

This approach allowed for a comprehensive and systematic analysis of the data, contributing to a deeper understanding of the research questions.

RESULTS

In Pubmed, 207 articles were identified, in Scopus 396 and in Scielo 344, with a total of 947 articles. 88 duplicates were identified, the 3 reviewers who participated in the selection phase regarding the readings of titles, abstracts and keywords showed 86% (n=815) agreement between the articles that met the inclusion criteria, the 14% (n=128) of the articles that presented divergence in at least one of the decisions were reread, and the conflicts were resolved, resulting in a total of 43 items included. The 43 articles were presented to the rest of the authors and read in full, in order to apply the exclusion criteria, resulting in the exclusion of 26 works and the selection of 17 works, as shown in figure 1.

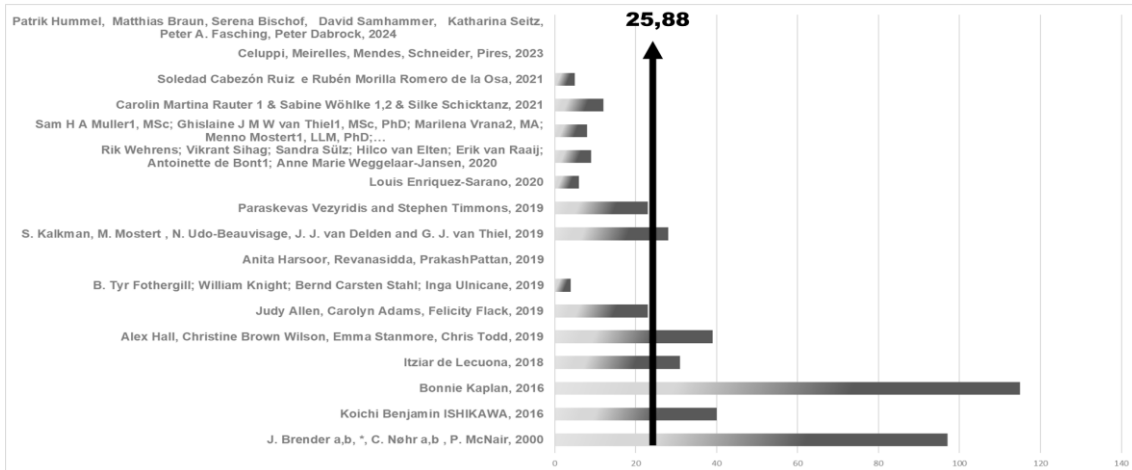
Figure 1. Flowchart for the selection of the works identified in the different databases.



The 17 selected articles were published between the years 2000 and 2024, where 82.4% are available in English, 11.8% in Spanish and 5.9% in Portuguese. As for the origin of the study groups, only one multicenter study was identified, 11 studies were developed in Europe, 2 studies from Asia, 1 from South America and 2 from North America. Its experimental designs showed a predominance of qualitative studies (n=13), followed by 2 qualitative/quantitative studies, 1 cross-sectional study and one case study.

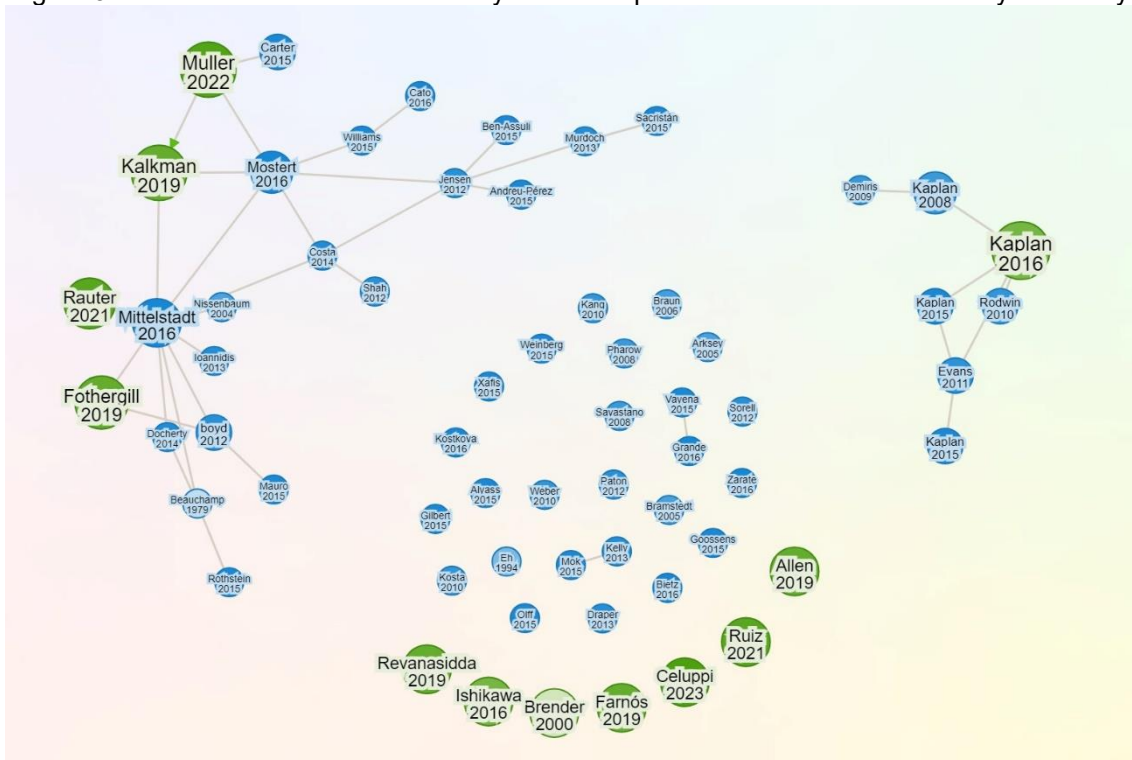
The number of citations of each selected article was evaluated, thus there was a variation where 2 articles did not present any citations so far, and one article presented 115 citations, and with an average of 25.88 citations, as shown in figure 2.

Figure 2. Absolute frequency of citations (up to September, 2024), showing the degree of repercussion of each study.



The works selected by this article generate a worldwide impact, deliberating on the similarity between other works that address the same theme, as presented in figure 3.

Figure 3. Web of influence of the similarity relationship due to the studies selected by this study.



All articles presented different concerns related to the use of sensitive databases, however the prevalence of the problems identified was focused on the lack of a standardized system that guarantees the confidentiality and reliability of the data collected. The alternatives to mitigate the problems identified were also diverse, but with prevalence in the implementation of specific legislation, for research involving the use of sensitive databases, as identified in figure 4.

Figure 4. Word clouds, referring to the incidence of problems and strategies to mitigate the problems (n=17).



DISCUSSION

A database with information about people's health, as well as all research, must lend itself to contributing to the good of humanity (Mann; Savuscu; Sahakian, 2016), must be able to *feedback* concise and accurate about the patient's health status, regardless of the time when the collection was carried out (Fothergill, B. Tyr *et al.*, 2019; O'Brien *et al.*, 2019), ensuring that diagnosis, treatment and prognosis are offered efficiently.

Some studies point to difficulties in ensuring that these data are not used with the objective of manipulating unwanted outcomes in relation to their confidentiality (de Lecuona, 2019; Ishikawa, 2016; Kalkman *et al.*, 2019; Rauter, Carolin Martina; Wöhlke; Schickltanz, 2021). In a review conducted by Fernández-Alemán (Fernández-Alemán *et al.*, 2013), the group points out the need to use protocols in the ISO 27799 standard, where they present international guidelines for data security regarding personal health information.

Data management still goes through a structure where data are collected by technicians who will not necessarily be responsible for patient care, therefore, they must be redirected to the competent health team, capable of interpreting, treating and deliberating on the therapeutic alternatives arising from the data (Lisbon *et al.*, 2023; Wen, 2008). This data transfer process was pointed out as a recurrent problem in the studies selected by this review (Celuppi *et al.*, 2023; Harsur; Revanasiddha, 2019; Hummel, Patrick *et al.*, 2024; Kalkman *et al.*, 2019; Soledad Cabezón Ruiz; Rubén Morilla Romero de la Osa, 2021).

Following the line of the need to develop a data management system, pointing out both the need for anonymization and de-identification, the encryption of data transfer and data curation by a legal guardian, point out the need for an integrated system with standardized language (Allen, Judy; Adams; Flack, 2019; Brender, J.; Nøhr; McNair, 2000; Harsoor; Revanasidda, 2019; Hummel, Patrik *et al.*, 2024; Ishikawa, 2016). An integrated management system for the data collected would facilitate access for both patients and

other professionals who can assist in the treatments, in addition to generating autonomy and allowing the management of their own data by the patient, as pointed out by the work of Cerami and collaborators (Cerami *et al.*, 2012), where the implementation of a database of cancer patients is investigated.

The present review sought not only to glimpse the scenario of ethical aspects of the use of sensitive data in a single country, but also observed different regulations responsible for regulating the legal guidelines of different parts of the world. In Brazil, the implementation of Law 14,874/2024 emerges with the need to register, inspect, and submit health databases to the system of Human Research Ethics Committees, in order to resolve the unwanted and/or inappropriate use of the data collected.

In this review, 5 studies point to the need to review local legislation, in order to generate objective, concise and cohesive regulation on the subject pointed out (Celuppi *et al.*, 2023; Hummel, P. *et al.*, 2024; Kalkman *et al.*, 2019; Ruiz; de la Osa, 2021; Wehrens *et al.*, 2020). The process of implementing a law is not only up to the regulatory entities, but also to all the active agents involved in the process of using health databases, in addition to taking advantage of the different systems, reflecting on the practices of data use (Favaretto; De Clercq; Elger, 2019).

The review presents interesting issues regarding the training for the use of the database, from the population, considered as the end user, to the professionals who manage them (Allen, J.; Adams; Flack, 2019; Brender, J; Nøhr; McNair, 2000; Celuppi *et al.*, 2023; Fothergill, B.T. *et al.*, 2019; Muller *et al.*, 2022; Rauter, C.M.; Wöhlke; Schick Tanz, 2021), must participate in continuing education, for the conscious and ethical use of the information inserted in this system. The study by Schillinger *et al.* (Schillinger *et al.*, 2002), presents data on health literacy on aspects related to people with diabetes, and states that people with skills to understand the instructions given by health professionals are more likely to benefit from an uncomplicated prognosis, and that professionals who have the necessary resources to manipulate data management systems have a better chance of successful treatment (Ad Hoc Committee on Health Literacy for the Council on Scientific Affairs, 1999; Koh *et al.*, 2008; Veras *et al.*, 2024).

One future outlook observed and alerted by 3 studies was the monetization risk of healthcare databases (Louis Enriquez-Sarano, 2020; Ruiz; de la Osa, 2021; Vezyridis; Timmons, 2019). Having seen the context presented by the studies, it is worth emphasizing the need for regulation, protecting not only the use of data, but also the guarantee of access by patients to their own data and their protection against misuse and unauthorized use (Surroca; Tribó; Waddock, 2010).



CONCLUSION

Throughout this analysis, a variety of articles on issues related to the handling of sensitive data in research with human subjects were examined. The main problem identified was the lack of standardized systems to ensure the reliability and confidentiality of the data collected. However, options to mitigate these difficulties were also identified. The implementation of specific laws for research using sensitive databases proved to have been one of the solutions with the highest suggested incidence. This regulation not only protects participants, but also gives researchers clear guidelines to ensure that data is treated with respect and care. Finally, to preserve public trust and promote scientific advancements, it is essential to follow ethical research practices.

REFERENCES

1. AD HOC COMMITTEE ON HEALTH LITERACY FOR THE COUNCIL ON SCIENTIFIC AFFAIRS, A. M. A. A. H. C. on H. L. for the C. on S. A. A. M. A. (1999). Health literacy: Report of the Council on Scientific Affairs. **JAMA**, 281(6), 552–557. Disponível em: <https://jamanetwork.com/journals/jama/fullarticle/188749>. Acesso em: 30 set. 2024.
2. Ahalt, S. C., Fecho, K., & Carsey, T. M. (2019). Clinical data: Sources and types, regulatory constraints, applications. **Clinical and Translational Science**, 12(4), 329. Disponível em: [/pmc/articles/PMC6617834/](https://pubmed.ncbi.nlm.nih.gov/34811111/). Acesso em: 30 set. 2024.
3. Allen, J., Adams, C., & Flack, F. (2019). The role of data custodians in establishing and maintaining social licence for health research. **Bioethics**, 33(4), 502–510.
4. Allen, J., Adams, C., & Flack, F. (2019). The role of data custodians in establishing and maintaining social licence for health research. **Bioethics**, 33(4), 502–510. Disponível em: <https://onlinelibrary.wiley.com/doi/full/10.1111/bioe.12549>. Acesso em: 20 set. 2024.
5. Behrendt, C. A., Kreuzburg, T., Schmidt, K., & Debus, E. S. (2018). The challenge of data privacy compliant registry-based research. **European Journal of Vascular and Endovascular Surgery**, 55(5), 601–602. Disponível em: <http://www.ejves.com/article/S1078588418301163/fulltext>. Acesso em: 30 set. 2024.
6. Brasil. Presidência da República. (2018). Lei No 13.709, de 14 de agosto de 2018.
7. Brender, J., Nøhr, C., & McNair, P. (2000). Research needs and priorities in health informatics. **International Journal of Medical Informatics**, 58, 257–289. Disponível em: <https://www.scopus.com/inward/record.uri?eid=2-s2.0-0034282540&doi=10.1016%2FS1386-5056%2800%2900092-7&partnerID=40&md5=7a73e3fbb51e85ae6475eb33e99dd61a>.
8. Brender, J., Nøhr, C., & McNair, P. (2000). Research needs and priorities in health informatics. **International Journal of Medical Informatics**, 58–59, 257–289.
9. Celuppi, I. C., Melo, W. S., Santo, F. H. E., & Ferreira, G. E. (2023). Ethical problems in nursing teleconsultations for people living with HIV during the Covid-19 pandemic. **Revista Brasileira de Enfermagem**, 76, e20220754. Disponível em: <https://www.scielo.br/j/reben/a/dV9c5HYRjCvRPdj65nVF4vx/?format=html>. Acesso em: 20 set. 2024.
10. Cerami, E., Gao, J., Dogrusoz, U., Gross, B., Sumer, S. O., Aksoy, B. A., ... & Schultz, N. (2012). The cBio cancer genomics portal: An open platform for exploring multidimensional cancer genomics data. **Cancer Discovery**, 2(5), 401–404. Disponível em: <https://pubmed.ncbi.nlm.nih.gov/22588877/>. Acesso em: 29 set. 2024.
11. De Lecuona, I. (2019). Evaluación de los aspectos metodológicos, éticos, legales y sociales de proyectos de investigación en salud con datos masivos (big data). **Gaceta Sanitaria**, 32(6), 576–578. Disponível em: <https://doi.org/10.1016/j.gaceta.2018.02.007>. Acesso em: 20 set. 2024.
12. Favaretto, M., De Clercq, E., & Elger, B. S. (2019). Big data and discrimination: Perils, promises and solutions. A systematic review. **Journal of Big Data**, 6(1), 1–27. Disponível em: <https://journalofbigdata.springeropen.com/articles/10.1186/s40537-019->

0177-4. Acesso em: 30 set. 2024.


13. Fernández-Alemán, J. L., Señor, I. C., Lozoya, P. Á. O., & Toval, A. (2013). Security and privacy in electronic health records: A systematic literature review. *Journal of Biomedical Informatics*, 46(3), 541–562. Disponível em: <https://pubmed.ncbi.nlm.nih.gov/23305810/>. Acesso em: 29 set. 2024.
14. Fothergill, B. T., Anderson, R., Veale, M., Knoppers, B., Kaye, J., & Shipp, S. (2019). Responsible data governance of neuroscience big data. *Frontiers in Neuroinformatics*, 13.
15. Fothergill, B. T., Anderson, R., Veale, M., Knoppers, B., Kaye, J., & Shipp, S. (2019). Responsible data governance of neuroscience big data. *Frontiers in Neuroinformatics*, 13, 426225. Disponível em: www.frontiersin.org. Acesso em: 20 set. 2024.
16. Greenleaf, G. (2018). Global convergence of data privacy standards and laws: Speaking notes for the European Commission events on the launch of the General Data Protection Regulation (GDPR) in Brussels & New Delhi, 25 May 2018. *SSRN Electronic Journal*. Disponível em: <https://papers.ssrn.com/abstract=3184548>. Acesso em: 30 set. 2024.
17. Harsoor, A., & Revanasidda, P. (2019). Cloudlet-based medical data sharing with privacy protection. *International Journal of Innovative Technology and Exploring Engineering*, 8(9). Disponível em: <https://www.academia.edu/download/108361547/17770078919.pdf>. Acesso em: 20 set. 2024.
18. Hummel, P., Braun, M., Tretter, M., Dabrock, P., & Fritsch, M. (2024). Perspectives of patients and clinicians on big data and AI in health: A comparative empirical investigation. *AI and Society*.
19. Hummel, P., Braun, M., Tretter, M., Dabrock, P., & Fritsch, M. (2024). Perspectives of patients and clinicians on big data and AI in health: A comparative empirical investigation. *AI and Society*, 1–15. Disponível em: <https://link.springer.com/article/10.1007/s00146-023-01825-8>. Acesso em: 20 set. 2024.
20. Ishikawa, K. B. (2016). Medical big data for research use: Current status and related issues. *Japan Medical Association Journal: JMAJ*, 59(2–3), 110. Disponível em: [/pmc/articles/PMC5333614/](https://pubmed.ncbi.nlm.nih.gov/23305810/). Acesso em: 20 set. 2024.
21. Kalkman, S., Mostert, M., Gerlinger, C., van Delden, J. J., & van Thiel, G. J. (2019). Responsible data sharing in a big data-driven translational research platform: Lessons learned. *BMC Medical Informatics and Decision Making*, 19(1), 1–7. Disponível em: <https://link.springer.com/articles/10.1186/s12911-019-1001-y>. Acesso em: 20 set. 2024.
22. Kaplan, B. (2016). How should health data be used?: Privacy, secondary use, and big data sales. *Cambridge Quarterly of Healthcare Ethics*, 25(2), 312–329. Disponível em: <https://www.cambridge.org/core/journals/cambridge-quarterly-of-healthcare-ethics/article/abs/how-should-health-data-be-used/D3762C502A4C38EA79F1B516AD3665D2>. Acesso em: 30 set. 2024.
23. Koh, G. C. H., Khoo, H. E., Wong, M. L., & Koh, D. (2008). The effects of problem-based learning during medical school on physician competency: A systematic review. *CMAJ: Canadian Medical Association Journal*, 178(1), 34–41. Disponível em:

<https://pubmed.ncbi.nlm.nih.gov/18166729/>. Acesso em: 30 set. 2024.

24. Lisboa, K. O., Figueiredo, A. M., & Leon, C. (2023). A história da telemedicina no Brasil: Desafios e vantagens. **Saúde e Sociedade**, 32(1), e210170pt. Disponível em: <https://www.scielo.br/j/sausoc/a/htDNpswTKXwVr667LV9V5cP/>. Acesso em: 29 set. 2024.
25. Enriquez-Sarano, L. (2020). Data-rich and knowledge-poor. **Columbia Law Review**, 120(8), 2319–2358. Disponível em: <https://www.jstor.org/stable/26965837>. Acesso em: 20 set. 2024.
26. Mann, S. P., Savulescu, J., & Sahakian, B. J. (2016). Facilitating the ethical use of health data for the benefit of society: Electronic health records, consent and the duty of easy rescue. **Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences**, 374(2083). Disponível em: <https://pubmed.ncbi.nlm.nih.gov/28336803/>. Acesso em: 29 set. 2024.
27. Moffatt, C., & Leshin, J. (2024). Best practices in evolving privacy frameworks for patient age data: Census data study. **JMIR Formative Research**, 8(1), e47248. Disponível em: <http://www.ncbi.nlm.nih.gov/pubmed/38526530>. Acesso em: 30 set. 2024.
28. Muller, S. H. A., Epstein, D. A., Catalano, R. F., & Delamater, A. M. (2022). Patients' and publics' preferences for data-intensive health research governance: Survey study. **JMIR Human Factors**, 9(3), e36797. Disponível em: <http://www.ncbi.nlm.nih.gov/pubmed/36069794>. Acesso em: 20 set. 2024.
29. O'Brien, E. C., Rodriguez, A. M., Ma, Y., & Johnson, C. (2019). Patient perspectives on the linkage of health data for research: Insights from an online patient community questionnaire. **International Journal of Medical Informatics**, 127, 9–17.
30. Prasser, F., Kohlmayer, F., Kuhn, K. A., & Bild, R. (2018). A scalable and pragmatic method for the safe sharing of high-quality health data. **IEEE Journal of Biomedical and Health Informatics**, 22(2), 611–622.
31. Rauter, C. M., Wöhlke, S., & Schicktanz, S. (2021). My data, my choice? – German patient organizations' attitudes towards big data-driven approaches in personalized medicine: An empirical-ethical study. **Journal of Medical Systems**, 45(4).
32. Rauter, C. M., Wöhlke, S., & Schicktanz, S. (2021). My data, my choice? – German patient organizations' attitudes towards big data-driven approaches in personalized medicine: An empirical-ethical study. **Journal of Medical Systems**, 45(4), 1–10. Disponível em: <https://link.springer.com/article/10.1007/s10916-020-01702-7>. Acesso em: 20 set. 2024.
33. Rodwin, M. A. (2010). Patient data: Property, privacy & the public interest. **American Journal of Law & Medicine**, 36(4), 586–618. Disponível em: <https://www.cambridge.org/core/journals/american-journal-of-law-and-medicine/article/abs/patient-data-property-privacy-the-public-interest/652A5ED64D1A46380139C1A711761B7F>. Acesso em: 30 set. 2024.
34. Ruiz, S. C., & De la Osa, R. M. R. (2021). Big data in health: A new paradigm to regulate, a challenge for social justice. **Revista Española de Salud Pública**, 95. Disponível em: <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85171737780&partnerID=40&md5=b086b2b42dd0923bddaf0afc250611f0>.

35. Schillinger, D., Grumbach, K., Piette, J., Wang, F., Osmond, D., Daher, C., Palacios, J., Sullivan, G. D., & Bindman, A. B. (2002). Association of health literacy with diabetes outcomes. **JAMA**, 288(4), 475–482. Disponível em: <https://pubmed.ncbi.nlm.nih.gov/12132978/>. Acesso em: 30 set. 2024.
36. Cabezón Ruiz, S., & Morilla Romero de la Osa, R. (2021). Big data in health: A new paradigm to regulate, a challenge for social justice. **Revista Española de Salud Pública**, 95, 1–13. Disponível em: <https://pubmed.ncbi.nlm.nih.gov/34617519/>. Acesso em: 20 set. 2024.
37. Surroca, J., Tribó, J. A., & Waddock, S. (2010). Corporate responsibility and financial performance: The role of intangible resources. **Strategic Management Journal**, 31(5), 463–490. Disponível em: <https://onlinelibrary.wiley.com/doi/full/10.1002/smj.820>. Acesso em: 30 set. 2024.
38. Veras, A. P. da S., Alves, D. M., Menezes, D. C., & Borges, F. F. (2024). Experiência gamificada como estratégia educacional sobre obesidade para acadêmicos em nutrição. **Educação, Formação & Tecnologias**, 12(1), 35–62. Disponível em: <https://eft.educom.pt/index.php/eft/article/view/240>. Acesso em: 30 set. 2024.
39. Vezyridis, P., & Timmons, S. (2019). Resisting big data exploitations in public healthcare: Free riding or distributive justice? **Sociology of Health and Illness**, 41(8), 1585–1599.
40. Wehrens, R., van Zoonen, L., Zöllner, Y. F., & Halkoaho, A. (2020). Understanding the uptake of big data in health care: Protocol for a multinational mixed-methods study. **JMIR Research Protocols**, 9(10).
41. Wen, C. L. (2008). Telemedicina e telessaúde – Um panorama no Brasil. **Informática Pública**, 10(2), 7–15.

THE PURSUIT OF EXCELLENCE

 <https://doi.org/10.56238/sevened2024.029-034>

Leonardo Perovano-Camargo¹

ABSTRACT

This article addresses the application of the Olympic values, with emphasis on the search for excellence, in the educational context. The central problem of the research revolves around the tension between the traditional concept of excellence, focused on performance, and the need for an educational approach that promotes the integral development of individuals, respecting cultural diversity and ethical and environmental issues. The objective of the research is to analyze how the Olympic values can be applied in pedagogical practices in a critical way and adapted to local realities, without losing sight of the principles of inclusion and sustainability. The methodology adopted was a qualitative analysis based on the literature review, focusing on the contributions of Binder (2020) on Olympic education and Krenak (2019) on the criticisms of the progress and development model. The results indicate that, although the search for excellence is an essential value in Olympism, its application in education needs to be reconfigured to include the promotion of critical awareness and respect for diversity. The research concludes that true educational excellence must be integrated with pedagogical practices that recognize environmental and social needs, proposing training that goes beyond competition and addresses broader issues of sustainability and social responsibility.

Keywords: Olympism. Excellence. Olympic education. Values. Sustainability.

¹ Doctor in Physical Education, in the line of Historical and Sociocultural Studies of Physical Education, Sport and Leisure.

Educational institution: Federal University of Espírito Santo - UFES

E-mail: leonardoperovano@gmail.com

INTRODUCTION

"The legacy of Olympic Education should serve as a 'bridge' between the pursuit of excellence represented by elite athletes and the pursuit of a child's dreams." (Binder, 2012).

The pursuit of excellence is one of the fundamental principles of the Olympic movement, which claims to promote values that transcend sport and are directly connected to the integral development of the human being. However, in an educational context, the concept of excellence goes beyond physical performance and encompasses ethical, moral, and social training, which aims to build critical and socially responsible individuals. This essay proposes a reflection on the values that sustain Olympism and its application in the educational environment, with emphasis on the impact of the search for excellence as an instrument of personal and collective development.

Based on the theoretical contributions of Binder (2020), who highlights the role of Olympic values, such as respect, friendship and the search for excellence, in the educational process, and the contributions of Krenak (2019), who problematizes the notions of progress and development from a critical perspective, the essay explores how these values can be integrated into teaching in order to promote a balance between academic training and the construction of an ethical conscience. In addition, the work seeks to identify the limits and dilemmas of this incessant search for results, proposing an analysis of the challenges that emerge in the attempt to balance sports performance with education for citizenship.

THEORETICAL FOUNDATION

Olympism claims to promote values that transcend sport and are closely linked to the integral development of the human being. According to Binder (2020), Olympic values, such as respect, friendship and the search for excellence, are fundamental in the educational process and constitute a path for the formation of critical and socially engaged individuals. The author points out that, historically, Olympism has always sought to integrate ethical principles into sports performance, promoting a balance between body, mind and spirit.

These values are essential for building an educational environment that prioritizes not only victory but also the learning process and moral development. In the context of pedagogical practices, the search for excellence goes beyond the limits of physical performance, implying an education aimed at personal and social growth. Binder (2020) points out that this approach has been applied in various educational programs, using sport as a teaching tool to develop cognitive and social skills.

On the other hand, Krenak (2019) offers a critical perspective on the concepts of progress and development in contemporary societies, which can be related to the discussion about the search for excellence in Olympism. Although the author's focus is on sustainability and the need to rethink the patterns of consumption and exploitation of nature, his ideas dialogue with the reflection on the ethical limits of the search for excellence. Krenak's vision invites us to reflect on the extent to which the incessant search for results and performance in sport can lead to an imbalance in the educational process, bringing to light the importance of values that respect diversity and collective well-being.

Thus, when considering the contributions of Binder (2020) and Krenak (2019), it is possible to observe a theoretical convergence that highlights the importance of integrating the concept of excellence into education in a broad way, promoting not only individual overcoming, but also social responsibility and respect for human limitations.

CRITICAL ANALYSIS

The values promoted by Olympism, especially the pursuit of excellence, are widely recognized for their educational potential. However, when critically analyzing these values in the educational context, questions arise about how such principles are applied in practice and what are their real implications for the integral development of individuals.

As highlighted by Binder (2020), the search for excellence in Olympism transcends simple technical and physical improvement, being intrinsically linked to the development of ethical and social values. However, the increasing commodification of sport and the pressure for results can distort these principles, leading to a reductionist understanding of excellence as a mere synonym for competitive success. This limited view can divert the focus from sports education, placing performance above ethical training, which contradicts Coubertin's original proposal.

In addition, Krenak's (2019) critique of contemporary models of progress and development highlights the importance of rethinking the incessant search for results. His perspective suggests that the search for excellence, if decontextualized from a broader vision of sustainability and collective well-being, can generate imbalances, both in the educational and sports spheres. The pressure to achieve high levels of performance can lead to the marginalization of essential values such as solidarity, respect for differences, and the appreciation of the process, to the detriment of the final result.

By interpreting the results in light of these reflections, it is possible to identify a tension between the pursuit of excellence and the need to maintain a balance between performance and ethics. Although excellence is an essential value in the Olympic context,

its application in the educational environment must be adapted to prevent it from becoming a competitive imperative that compromises the integral education of students. In this sense, the integration of Olympic values into pedagogical practices requires a critical and contextualized approach, which recognizes the limitations and challenges imposed by contemporary reality.

In this context, the implementation of an education that values excellence must necessarily consider cultural differences and the local conditions in which this education occurs. One cannot treat the Olympic values as universal and immutable, without taking into account the particularities of each community and educational context. As Neise Abreu (2009, p. 208) points out, the proposal for a multicultural Olympic education needs to balance the macro and micro spheres, recognizing the coexistence between global values and the cultural adaptations that are necessary:

"[...] In the praxis of any implementation of a multicultural Olympic education proposal, both macro and micro spheres must be considered. Considering the characteristics of the macro concept of a set of values, composed of coding and control, global interconnections and immutable values. These categories are around Olympic universalism. However, the characteristics of the micro concept are composed of particular interpenetrations, plural, conditional and dependent adaptations, cultural differences, composing an Olympic pluralism."

Marta Gomes (2009, p. 173-174), when addressing the need for plural adaptations in Olympic education, suggests a proposal to systematize this theoretical-practical transition, emphasizing that:

"Universal values need to be contextualized in everyday life to be treated and made pedagogically viable; sport should be treated as a sport, a component of the Body Culture of Movement, which has competition as its essential principle and characteristics of conflict generation/aggregation, violence/peace, among other antagonistic emotions that are generated especially in sports situations."

Thus, the values listed as priorities by the Olympic Movement need a pedagogical approach for their adaptation to the various social realities existing in contemporary plural societies. It is necessary to go beyond just proposing the diffusion of values in a single direction, but also to dialogue with these realities about the values that permeate their daily lives. Stigger (2005, p. 73-74) reinforces that:

"[...] Although we must recognize that sport is a cultural phenomenon spread globally in the form of official sports competitions – through which it brings with it meanings hegemonically placed, especially by the mass media – it should also be considered from its particular expressions, when, inserted in different sociocultural contexts, it acquires other meanings."

Although there is no single way of working with Olympic education, there is an effort to create a pedagogy of education in educational themes of Olympism at a global level, by aligning the practices stimulated by the intrinsic perspective of sport with the values that would guide the extrinsic perspective, being improved by the local experiences found.

Deanna Binder, a specialist in curriculum, was guided by the idea that the practical application in Olympic education projects would determine the general understanding of this pedagogical proposal, seeking to explore the dialectics between theory and application in Olympism-oriented projects (Binder, 2012). In each of the projects, specific fields of educational theory were applied, and the insights and findings generated were then applied to the improvement of the following projects, ultimately leading to the development of a "toolkit" for the International Olympic Committee's (IOC) Olympic Values Education Program (OVEP). The author suggests that the collective contributions in this developing curriculum have the potential to promote a theoretical foundation for the creation of a pedagogy of education in Olympic values (Binder, 2012).

Several questions were raised during the discussions of the projects, for example: how would children and young people learn positive behaviors and values, and what teaching methodologies would support this learning? Would Olympic values have relevance in cultural contexts different from those of European and American traditions? Are these values universal, as the Olympic Movement professes? Would the methodologies proposed to teach values in European and American contexts be appropriate to be used in other cultural contexts? How could international Olympic education and fair play initiatives represent global cultural perspectives? (Binder, 2012).

Each of the Olympic education projects was developed from the following perspectives: scenario, rationalization, questions, theoretical basis, application, understandings and criticisms. The construction of these projects is treated by the author as an evolution of the "approach to the world of life" proposed by Naul (2008), with these approaches:

The knowledge-oriented approach: seeks to explain the Olympic ideal from its history and educational legacy, being the most widespread in the world and focusing on presenting information about the Ancient, Modern and Contemporary Games, which may include excursions to the historic Olympic sites and emphasizing names, dates and facts;

The experience-oriented approach: seeks to provide experiences of children and young people in festivals and "Olympic" competitions, international cooperation and communication between educational institutions, emphasizing teaching fair play and cultural understanding;

The approach oriented to physical achievements: seeks individual and personal development from physical efforts and competitions with others, promoting systematic physical practices and training, being a platform for the holistic development of mind, body and spirit;

The approach oriented to the "world of life": it seeks to relate sports experiences with the different contexts of life of young people, not only expands the relevance of sport in integral education, but also inserts a reflective dimension in the educational process. In this sense, the concept of understanding, interpretation and reflection, as proposed by Gadamer (1989), becomes essential to understand how individuals attribute meaning to their sports experiences and to the ethical lessons associated with Olympic ideals. These processes of understanding and signification are inseparable from ethical choices and practical actions, since the concrete application of the Olympic values would "co-determine" the understanding that young people have of these ideals.

This choice for the approach oriented to the "world of life" (Naul, 2008) was due to the author's pedagogical perception that she seems to know "what" needs to be taught to students to develop a good character through sports participation, but little about "how" to teach these values (Binder, 2012).

The author admits the various criticisms that the projects suffered during their implementation and that served as inspiration for the improvement of the next ones. One of them would be that the promotion of the Olympic ideal would be an "ideological inscription" (Wamsley; Heine, 1996, p. 88) that would educate citizens for a pre-arranged future for various aspects of Olympic consumption, being a "composition of narratives in an Olympic ethos created and celebrated by its adherents" (DaCosta, 2002, p. 28).

However, facts pointed out as negative could serve as a way to propose improvements, as in the "Fair Play for Children" project, which was inspired by a fact that occurred at the 1988 Olympic Games in South Korea, where Ben Johnson (former Canadian sprinter) tested positive for a performance-enhancing drug, losing his gold medal in the 100-meter dash.

Other reflections were raised when exporting this model of Olympic education to various global realities, such as the representatives of the South African committee, who related the values of Olympism to the concept of "Ubuntu" (respect, understanding, sincerity), and the Chinese Olympic educators, who also related the values of Olympism to a particular concept of 和合 (hé hé, peace, kindness, integration and harmony). In this sense, Binder (2012) provokes us with the question of how to adapt, in a "local" way, values

that initially seemed universal, but that need to undergo local resignifications to be better accepted.

Binder's (2012) proposal for an Olympic education that reconciles the universal and local spheres, respecting cultural specificities and adapting pedagogical practices to the needs of groups, reflects the complexity and challenges of integrating Olympic values in an inclusive and contextualized way. However, this view finds strong opposition in more radicalized criticisms, such as those of Helen Jefferson Lenskyj (2012), who sees Olympism and Olympic education from a more critical and reflective perspective. For Lenskyj, Olympism becomes an instrument for the colonization of children's minds, elevating Coubertin's ideals to an almost religious rhetoric, which calls into question its applicability in a universal and often imposing way.

Lenskyj states that under the guise of moral education or peace education, the development of critical skills ends up being absent due to this dogmatic thinking and simple answers. She recognizes that sports competition is only the tip of the "iceberg" of the Olympic Movement, and sees the word "Movement" as initially positive, as it would denote an intention of continuous change in the curriculum and pedagogy. However, she points to a "tarnished" history of what she considers the "Olympic industry" and argues that relying on Olympic sport and Olympic athletes, without criticizing them, to impart moral and ethical lessons to children and young people is problematic.

Therefore, the criticisms raised by Lenskyj (2012) in relation to the commodification of Olympic educational programs and their relationship with the Olympic industry point to a crucial point: the disconnect between the ideal values of Olympism and its practical application in educational contexts. The author, by classifying the Olympic system as corrupt, emphasizes the incoherence of an education that intends to form critical and engaged individuals in an environment predominantly focused on commercial interests. His recommendation to progressive educators, who seek to challenge this hegemony, highlights the need for a deep reflection on the foundations that sustain Olympic education.

As discussed throughout this study, the results indicate that, for education based on Olympic values to be truly effective, it is essential that it promotes a balance between the search for excellence and the construction of a critical consciousness in individuals. This balance, however, will only be achieved if Olympic education is able to transcend the limits of physical and competitive performance, incorporating ethical reflection, respect for diversity, and commitment to broader social issues, which are fundamental for the formation of responsible and socially engaged citizens.

CONCLUSION

This study sought to investigate the role of Olympic values, focusing on the search for excellence, and its application in educational pedagogical practices. From the analysis of the literature, it was possible to perceive that excellence, traditionally understood as an individual value and focused on performance, needs to be reconfigured to meet the needs of a comprehensive education, which goes beyond personal overcoming and also addresses respect for cultural diversity and social ethics.


The reflection on the concepts proposed by Binder (2020) and Krenak (2019) revealed the tension between the search for excellence in Olympism and the ethical issues that involve the formation of critical citizens engaged with the collective well-being and sustainability of the planet. Binder highlighted the importance of integrating Olympic values into pedagogical practices in a contextualized way, while Krenak provoked a reflection on the limitations of the Western vision of progress and the need to rescue ancestral knowledge, which promotes excellence more aligned with the balance between humanity and the environment.

By integrating these perspectives, we conclude that true arete, excellence today, must be built from a holistic vision that respects cultural diversity and promotes environmental sustainability. The study points to the need to reimagine Olympic education in a critical way, capable of going beyond the mere search for results and aligning with practices that recognize the multiple cultural and ecological realities in which we are inserted.

This move towards a more integrated and critical Olympic education has profound implications for pedagogical practices, challenging educators to consider sport not only as a tool for physical development, but as a means to promote ethical, social and environmental values that are essential for the formation of conscious, critical citizens committed to the future of the planet.

REFERENCES

1. ABREU, N. G. (2009). Educação olímpica multicultural: da pesquisa à prática. Proposta curricular e metodológica e resultados relativos de observações empíricas. In A. Reppold et al. **Olimpismo e educação olímpica no Brasil** (pp. 201-210). Porto Alegre: Editora da UFRGS.
2. BINDER, D. L. (2012). Olympic values education: evolution of a pedagogy. **Educational Review**, 64(3), 275-302. <https://doi.org/10.1080/00131911.2012.667389>
3. BINDER, D. (2020). Pathways to Olympic Values Education: Historical Perspectives. In M. Krüger & A. Hofmann (Eds.), **Sportgeschichte in Deutschland - Sport History in Germany** (Vol. 22, pp. 1-12). Wiesbaden: Springer VS. https://doi.org/10.1007/978-3-658-27822-9_11
4. DaCOSTA, L. P. (2009). Educação olímpica como metalinguagem axiológica: revisões pedagógicas e filosóficas de experiências internacionais e brasileiras. In A. R. Reppold Filho, L. M. S. Magalhães Pinto, R. P. Rodrigues, & S. Engelman (Eds.), **Olimpismo e educação olímpica no Brasil** (pp. 17-28). Porto Alegre: Ed. UFRGS.
5. GADAMER, H. G. (1989). **Truth and method** (2nd rev. ed.). New York: The Crossroad Publishing Corporation.
6. GOMES, M. C. (2009). Por uma Educação Olímpica em movimento: notas de pesquisa e avaliações. In A. Reppold et al. **Olimpismo e educação olímpica no Brasil** (pp. 171-184). Porto Alegre: Editora da UFRGS.
7. KRENAK, A. (2019). **Ideias para adiar o fim do mundo**. São Paulo: Companhia das Letras.
8. LENSZYJ, H. J. (2012). Olympic education and Olympism: still colonizing children's minds. **Educational Review**, 64(3), 265-274. <https://doi.org/10.1080/00131911.2012.667389>
9. NAUL, R. (2008). **Olympic education**. Aachen: Meyer & Meyer Verlag.
10. STIGGER, M. P. (2005). **Educação Física, Esporte e Diversidade**. Campinas: Autores Associados.
11. WAMSLEY, K., & HEINE, M. (1996). Tradition, modernity, and the construction of civic identity: The Calgary Olympics. **Olympika: The International Journal of Olympic Studies**, 5, 81-90.

**MULTIDISCIPLINARITY AS A STRATEGY IN THE FACE OF THE PANDEMIC.
FROM SCHOOL EXAM TO REALITY TEST** <https://doi.org/10.56238/sevened2024.029-035>**Gabriela Fernández Saavedra¹, María Oralia Acuña Dávila², Ana María Vázquez Álvarez³, Rodrigo Miranda Zamora⁴ and Beatriz Georgina Montemayor Flores⁵****ABSTRACT**

Introduction. The health crisis (Covid19) has been a global challenge in the field of health, its impact on anthropogenic activities is undeniable, it is important to note that the pandemic could only be contained through multidisciplinary work. Multidisciplinary and the mastery of knowledge (Morín E., 1999; Delors, 2013), form a robust framework to address complex problems. It is necessary to review the available information, in order to identify where we failed, what we got right, and what adjustments and innovations are necessary. The objective of this research is to search for evidence that supports the usefulness of multidisciplinary and knowledge in the solution of complex problems. Methodology: The Google Scholar search engine was used, selecting complete texts, free of charge, from the period 2022 to 2024, with the keywords: multidisciplinary, educational knowledge, knowing how to be, knowing how to learn, knowing how to do, knowing how to live with others, pandemic, confinement, medicine, and Covid 19. The documents that were obtained were analyzed, identifying evidence of multidisciplinary. Duplicate papers, or without free access or that did not deal directly with multidisciplinary, were discarded. Results: The search yielded 41 results, we selected those that consistently showed evidence of Multidisciplinary, finding 21 enriching experiences even in very complex scenarios, highlighting that skills and abilities are required, as a whole they represent Knowledge and these are essential to advance towards multidisciplinary collaboration. Conclusions: Since the last century, the teaching of knowledge for the global world has been promoted and educational centers have promoted it, the examination of such learning was not in writing, the exam was the reality, the lesson shows us that only with multidisciplinary collaboration was it possible to contain the pandemic.

Keywords: Multidisciplinary. Knowledge. Complexity. Pandemic.

¹ Doctor in Education. Department of Pharmacology, Faculty of Medicine, National Autonomous University of Mexico

² Bachelor's degree in Social Work. Department of Public Health, Faculty of Medicine, National Autonomous University of Mexico

³ Master in Biomedical Sciences, Pharmacology. Department of Physiology. Faculty of Medicine, National Autonomous University of Mexico

⁴ Pharmaceutical Chemist Biologist. Department of Biochemistry. Faculty of Medicine, National Autonomous University of Mexico

⁵ Doctor in Education. Department of Anatomy, Faculty of Medicine, National Autonomous University of Mexico



INTRODUCTION

When the pandemic began in China, it was believed that quarantine would be sufficient, but the progression of the disease only left the way to confinement, (Sánchez-Villena, A. R., and De La Fuente-Figuerola, V., 2020), in addition to the perception that the implementation of social distancing measures, work from home, use of face masks, etc., it would be enough to underestimate the real risk, (Mencheta, C., 2020). For the inhabitants of the other continents there seemed to be a certain distance, before facing Covid in their own territory; The accounting of deaths, disability subsequent to the disease, financial losses, and the many social expressions of the pandemic force us to reflect on how prepared we are for global challenges. Although the work of Edgar Morin (1999) and Jacques Delors (2013) was widely disseminated in terms of the knowledge required for the third millennium, we must self-evaluate, we do not present the written exam, but an examination of "reality" where we must collect evidence and account for the human and financial losses of each region, analyze the hard data and ask ourselves what are we going to do? How did it go? What can we improve? The search for culprits as would be done in dark ages does not take us anywhere, correction and innovation in the different environments is the answer. We can start by learning about the experiences lived during the pandemic and identifying the strategies that gave the best results. The **objective** of this research is to search for evidence that supports the usefulness of multidisciplinary and knowledge in the solution of complex problems.

METHODOLOGY

We searched for publications in Spanish, in full text, free of charge, from the period 2022 to 2024 with the Google Scholar search engine, combining the following keywords: multidisciplinary, educational knowledge, knowing how to be, knowing how to learn, knowing how to do, knowing how to live with others, pandemic, confinement, medicine, and Covid 19. Duplicate papers, or without free access or that did not deal directly with multidisciplinary, or multidisciplinary collaboration during the pandemic, were discarded. We thank the Medical Intern Erasmo Maldonado Sánchez and the Technician Rosa María del Carmen Gómez Guerra, for their support in the capture and selection of the preliminary abstracts.

RESULTS

The search yielded 41 results, we selected those that had collaborative actions at various levels, being 21 publications, since knowledge is acquired formally in school and

informally during socialization in other environments, we also recovered the works that made multidisciplinary explicit, in *Table 1. Type of document and summary of the content* the results are displayed. Graph 1. *Concerns and proposals during and after the pandemic*, corresponding to the period 2022-2024, shows the range of social expression during the health crisis, generated from the documents consulted.

ANALYSIS

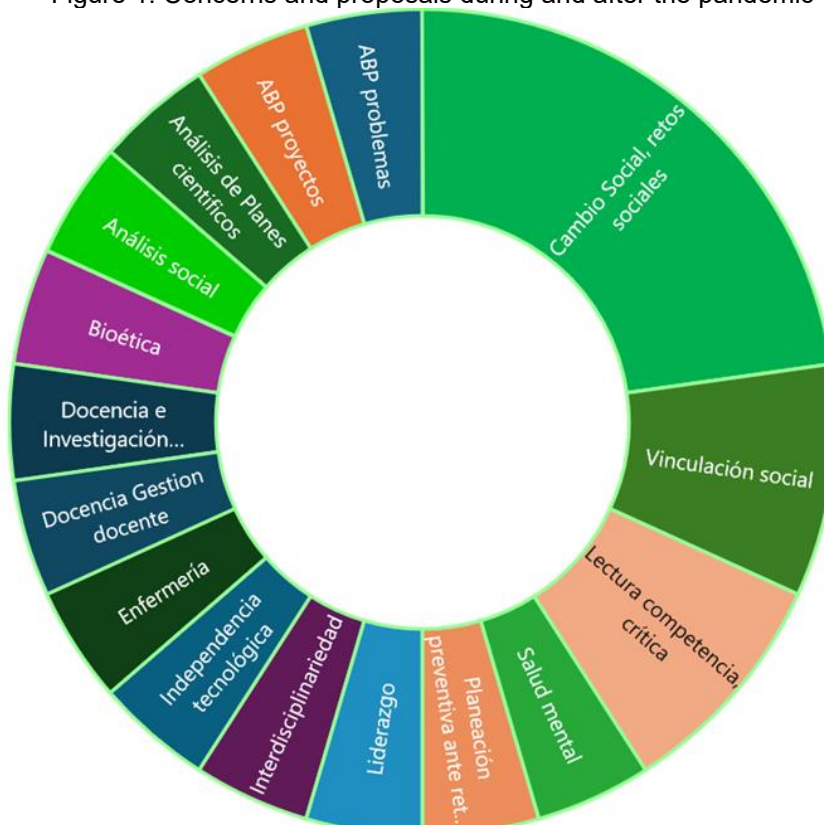
Graph 1. *Concerns and proposals during and after the pandemic* shows us the range of social expression after the health crisis, highlighting the voice of *social change*, followed by *social bonding*, the next associated content is the *analysis of scientific plans*, training from educational centers, touching on the issue of *reading* as an indispensable skill, that is, the importance of *reading competence* and the obligatory change migrating from memorization to comprehension, reflection and application of what was learned in the classroom to solving real problems.

Table 1. Type of document and summary of content

Book. The authors propose PBL as a way to optimize learning and put it into practice, addressing real problems and making effective the transfer of knowledge from the classroom to another scenario to apply it, (Baltazar, M. P. D., et al., 2023).
Book. This work describes the historical events that led to the state of perpetual crisis and that the pandemic was only part of the continuity of a path in which the financial sector had the baton and direction over social interests, (De Guzmán, M. G. C. N., et al., (2023).
Book. The Mexican Network of Bioethics Education (REDMEB), share their experience and knowledge of the field of bioethics education and its application, different states of Mexico participate, the use of the lexicon is promoted and easy to understand for the public. (Alanís, M.M.R., et al., 2021).
Thesis. It addresses the complex problem of reading, with competence being comprehensive reading essential to acquire any type of knowledge and the sociocultural factors that prevent the acquisition of a taste for reading, which directly impacts the development of individuals, (Anido, J. C. R., 2022).
Master's Thesis Understands the learning experiences of nursing interns, within the framework of complexity, during their professional training at a Peruvian public university. Following the postulates of the complex thought of Edgar Morín and Paulo Freire. (Arias, G. F. G., 2023).
Book Chapter. With the arrival of Covid, there were changes, borders were closed, and the prices of computer equipment increased by almost 100%, it is proposed to develop our own factories from design, manufacture and production, distribution and sale, (Ávila, M. G., Esquivel, V. V., & Esquivel, P. V., 2022).
Academic Congress. During the Academic Interaction Day, interaction between members of the university community was promoted through the socialization of students' academic experiences, exposing progress and results of work carried out by students from 5th to 9th semester, to present it to the Community, (Bahamon Muñetón, M., et al., 2020).
Book. It is a work aimed at the need to create new teaching strategies, here they focus on Project-Based Learning (PBL), the use of technology in times of COVID-19 is emphasized, the initiatives are urgent, (Baltazar, M. P. D., et al., 2023).
Doctoral Thesis. This dissertation deals with reading comprehension, the purpose of reading, presents a demand for strategies that allow the reader not only to interpret and infer the content of a text, but also to criticize, compare and apply what is read to the social context to transform it in a creative way, (Casamayor Rubio, D. N., 2022).
Book. The work addresses the ravages of Covid19 on mental health (De-Santis, A., et al., 2021).

Book. It is a work that includes interdisciplinarity, interculturality, innovation and the sustainable development of teaching and educational research, its objectives are to promote critical thinking, (Fernández Mora, V.D., et al., 2023).
Communication between members of Latin American social movements evidenced problems that worsened during the pandemic: poverty, violence, environmental exploitation, unemployment, etc., (Guevara Hernández, VA, & Ramírez Torres, V., 2022).
Book. It presents the work carried out at the university and its social linkage, (Huaca, C. G. P., & Riofrío, M. B. E., 2022).
Book. This work discusses the social complexity and how the quality of life of the population has deteriorated in the face of a set of events that relapse as a result of policies unrelated to social needs, (Leonor, V. P., Elena, L. R. L., & Escobosa, A. P., 2023).
Website. Community actions are narrated through a collaborative network in various regions of Ibero-America, (Martelotte, L., Mascheroni, P., & Rulli, M., 2023).
Book. Despite the information that was received months before the arrival of Covid, when the measures arrived they were overcome, modifying the perception of reality, states such as anguish, anxiety and despair were very frequent, (Mencheta, C., 2020).
Book. A review of the experience of the pandemic, a critical orientation of scientific programs and their relationship with social problems is perceived (Mendoza Arenas, R. D., et al., 2023).
Doctoral Thesis. It raises the importance of teaching management in the area of Social Work, with its complexity, rich in interactions, it takes up the importance of practice with the learning of the groups with which it interacts, (Noguero, F. L., 2022).
Book. The authors take up social challenges, security, the development of people, education, etc., in a constructionist exercise (Rangel, B. D. L., et al., 2023).
Book. It is oriented to the importance of interdisciplinarity (Ruelas, C. S. T., et al., 2023).
Article. Actions from the government, rector and head of department to build various academic activities during the isolation by Covid. During the pandemic, the university community was confined, and from face-to-face to virtuality, in these circumstances various inclusive projects were developed, favoring group cohesion and resilience, (Saavedra, G.F., 2023).
Book. Social events are carefully reviewed and the essential changes through innovation are reflected on (Vilate Uribe, A., 2022).

Figure 1. Concerns and proposals during and after the pandemic



The implementation of goals to soften the impact of the crisis was a success (Vilate Uribe, A., 2022; Mendoza Arenas, R. D., et al., 2023; Saavedra, 2023), the reflection reflected in proposals such as Problem-Based Learning and Project-Based Learning, is to reaffirm that the best way to learn is to direct teaching towards problem solving or the fulfillment of specific goals. This is of great importance because collective goals are promoted, addressing problems that affect societies or sections of them.

While it is true that the available resources are not enough, it is essential to advance in the planning and management of resources, to make efficient use of everything, trained personnel, consumable items, vaccines and in the face of the extreme limitation of resources, make decisions based on evidence and careful planning. The social demand has just begun, it has been a violent awakening, but changes are already beginning to be glimpsed from society in the election of its representatives to those social currents, for many what has happened is the progression of wrong decisions in the general policy oriented to the financial sector and far from social welfare, (Mendoza Arenas, R. D., et al., 2023; Leonor, V. P., Elena, L. R. L., & Escobosa, A. P., 2023).

Multidisciplinary associated with the mastery of knowledge is the strategy that made it possible to contain the health crisis, learning has been forceful: "*we need others*", this leaves a lesson of how fragile societies are, of the importance of planning and continuous review of the curricula of all educational centers at all levels, demonstrating how important it is to promote skills to work in harmony, to understand that we work as a team not by the constant search for like-minded people, but by conviction in the face of social response.

Disenchantment and social discontent must be translated into actions to change, both the policies that seem not to serve the population, but to serve the population, which is disappointing. Using democracy to later deliver epic failures has been a very hard lesson, there are therefore many pending and changes are coming that will transform geopolitics (Valenzuela Feijoo, J. C., 2021; Almar, E. R., 2022; Toro Maureira, S., & Noguera, A., 2024).


CONCLUSIONS

The pandemic is the first global challenge that could be contained with multidisciplinary collaboration, failures must become objectives for their correction. It is essential to include educational strategies to strengthen the acquisition of skills aimed at collaboration and updating, as well as to abandon the reductionist vision that prevents us from seeing society in all its expressions and needs. We have gone from the written exam in the classroom to the examination of reality.

REFERENCES

1. Almar, E. R. (2022). El mundo de la pandemia de la COVID-19 en 5D. Desmaterialización, deshumanización, desigualdad, desencanto y desasosiego en los tiempos del viroceno. *Posición. Revista del Instituto de Investigaciones Geográficas*(7).
2. Alanís, M. M. R., Valle, R. F. C., Gallardo, L. C. H., Sánchez, J. A. M., Mendoza, O. M., Cabrera, N. G. L., ... & Alanís, J. R. (2021). Pautas bioéticas para el protocolo de intervención en las emergencias de la salud pública. Pandemias: H1N1, SARS-CoV-19. *IIB Instituto de Investigaciones AC*.
3. Arias, G. F. G. (2023). *Experiencias de aprendizaje de los internos de enfermería, en el marco de la complejidad, durante su formación en una universidad pública peruana* (Doctoral dissertation, Universidad Nacional Mayor de San Marcos).
4. Anido, R. C., & Félix, A. J. (2022). *Desarrollo humano y cultura de la autoestima a través de la literatura y cuentos clásicos en versión infantil (Estudio de caso: Desarrollo humano y motivación personal en niños de Quinto Grado. Escuela 23 de Junio, San Antonio del Ciprés, Pánuco, Zacatecas)*. <http://ricaxcan.uaz.edu.mx/jspui/handle/20.500.11845/3142>
5. Ávila, M. G., Esquivel, V. V., & Esquivel, P. V. (2022). La economía de las familias mexicanas respecto al consumo de equipos de cómputo en tiempos de COVID-19. *DISEÑO*, 79.
6. Bahamon Muñeton, M., Alarcón Vásquez, Y., Martínez de Biava, Y., Fontalvo Cayón, G., Ahumada Jaramillo, E., Porto Escorcia, A., & Polo Martínez, I. (2020). IX Jornada de Interacción Académica en Psicología. *Barranquilla/Colombia - noviembre, 23 de 2020*.
7. Baltazar, M. P. D., Loyaga, S. R. A., Santisteban, J. S. G., Diaz, J. E. Z., Rojas, C. N. R., & Zárate, C. E. B. (2023). El reto de la transdisciplinariedad y el aprendizaje basado en proyectos en el contexto del Covid-19.
8. Casamayor Rubio, D. N. (2022). *Comprensión lectora de textos académicos en idioma inglés en las Ciencias Médicas* (Doctoral dissertation, Universidad de Sancti Spíritus José Martí Pérez).
9. De Guzmán, M. G. C. N., Sánchez, W. P. C., Jiménez, S. L. R., Apaza, F. M., Arriola, G. C. P., & Vega, E. D. (2023). El reto de la transdisciplinariedad en el contexto COVID-19: Discernimiento metodológico.
10. Delors, J. (2013). *Los cuatro pilares de la educación*. Galileo.
11. De-Santis, A., Álvarez-Rodas, L., Jara-Cobos, V., & Verdugo-Sánchez, A. (2021). *Pandemia desde la academia: Experiencias transdisciplinarias de la universidad cuencana en tiempos de COVID-19*. Editorial Abya-Yala.
12. Fernández Mora, V. D. J., Jasso Alfieri, R. D., & Gadea Aiello, W. F. (2023). Los objetivos de desarrollo sostenible desde el modelo de las Naciones Unidas: pensamiento crítico e interdisciplinariedad.

13. Guevara Hernández, V. A., & Ramírez Torres, V. (2022). Análisis sistemático de literatura sobre la influencia de la comunicación para el cambio social en la comunicación alternativa y los movimientos sociales de Colombia, México, Chile, Perú y Ecuador del 2018 al 2022.
14. Huaca, C. G. P., & Riofrío, M. B. E. (2022). Fortaleciendo capacidades locales para transformar sociedades a través de la vinculación. **Vinculación con el Territorio: Formar es Transformar**, 54.
15. Leonor, V. P., Elena, L. R. L., & Escobosa, A. P. (2023). Narrativas de mujeres con hijos desaparecidos: un análisis desde el trabajo social. **Movilidad, inseguridad y desarrollo: Un análisis desde el trabajo social**, 152.
16. Martelotte, L., Mascheroni, P., & Rulli, M. (2023). Una mirada crítica a las experiencias comunitarias de cuidados. **Iniciando, Trenzando Cuidados**.
17. Mencheta, C. (2020). **Fide: Reflexiones Sociedad Civil (V)**.
18. Mendoza Arenas, R. D., Casazola Cruz, O. D., Aguilar Loyaga, S. R., Garay Torres, J. M., Ruiz Salazar, J. M., & Torres Alvarado, S. K. (2023). El reto de la transdisciplinariedad y el pensamiento crítico en el contexto Covid-19.
19. Morín, E. (1999). **Los siete saberes necesarios para la educación del futuro**.
20. Noguero, F. L. (2022). La Gestión docente en el Prácticum de la carrera de Trabajo Social.
21. Rangel, B. D. L., Saucedo, M. D. L. L. L., & Padilla, A. D. A. (2023). La participación en población vulnerable: Experiencia bajo un enfoque constructorista y de derechos humanos. **Movilidad, inseguridad y desarrollo: Un análisis desde el trabajo social**, 178. <https://acanits.org/assets/img/libros/Movilidad%20inseguridad%20y%20desarrollo.pdf#page=178>
22. Ruelas, C. S. T., Gutiérrez, R. I. P., Varela, M. A. M., & Castro, I. G. (2023). Docencia e investigación educativa con enfoque interdisciplinario. **Comunicación Científica**.
23. Saavedra, G. F., Álvarez, A. M. V., Zamora, R. M., & Flores, B. G. M. (2023). Actions carried out during the health crisis in higher education cycles. **Challenges shaping leadership**. Seven Editora.
24. Sánchez-Villena, A. R., & de La Fuente-Figuerola, V. (2020, julio). COVID-19: cuarentena, aislamiento, distanciamiento social y confinamiento, ¿son lo mismo? **Anales De Pediatría (Barcelona, Spain: 2003)**, 93(1), 73. Elsevier.
25. Toro Maureira, S., & Noguera, A. (2024). Chile: la deriva del sistema político y el fracaso del nuevo proceso constitucional. **Revista de Ciencia Política (Santiago)**, (AHEAD).
26. Vilate Uribe, A. (2022). **Reflexionar para innovar**. Editorial Universidad del Rosario.
27. Valenzuela Feijoo, J. C. (2021). Elecciones en Chile: la rabia no basta.

METHODOLOGICAL INTERSECTIONS: SCHOOL OF ANNALES, "CONTENT ANALYSIS" AND CONTROLLED HERMENEUTICS <https://doi.org/10.56238/sevened2024.029-036>**Daniel Florence Giesbrecht¹****ABSTRACT**

Recorded at least since the 1960s, the approximation of History with Linguistics and Anthropology began to dialogue more intensely in historical research. With the methodological assumptions introduced by the *Annales* School, the most diverse languages have become privileged objects for analysis, increasingly seen as metaphors for reality. The various discourses (written, oral, architectural, urbanistic, iconographic, musical, gestural and ritual) began to be decoded more frequently, seeking to apprehend their elements of social tension and their historical meanings, their production and their circulation in each social environment. From this variety of sources, new analytical tools began to provide instruments of historiographical making, such as Laurence Bardin's method of "Content Analysis". Starting from the premise that historiography is the result of reflection on the nature of the historical, it is between the lines of the discourses of the sources that the historian is able to calculate the frequencies provided by the ciphered data, which makes it possible to extract categories and models, in a "controlled hermeneutics" process. This article invites the academic community to reflect on such methodologies and their importance for the analysis of the types of discourses used as sources in historiography.

Keywords: Methodology of History. Historiography. "Content Analysis". Annales School. Hermeneutics.

¹ Doctoral student in Contemporary History
Institution: Centre for Interdisciplinary Studies of the University of Coimbra (CEIS20/UC)
E-mail: daniel.giesbrecht@uc.pt

INTRODUCTION

Since the mid-1960s, the breaking of the boundaries between History and the other sciences had intensified. This fact made it possible to favor the construction of bridges and epistemological appropriations that triggered fruitful approximations of History with Anthropology and Linguistics, as well as the appropriation of multiple concepts, expanding the universe of political action and rational intervention in society.

The rigid structure arising from crystallized scientific models, such as, for example, that of "culture", treated until then in its erudite aspect easily perceived in the texts of Jacob Burckhardt (1990), began to be glimpsed from the subaltern groups, in their popular ramifications, which allowed dialogue and counterpoint to the culture of the elites, a fact signed by the works of Edward Thompson (1981), Peter Burke (1989) and Michel Vovelle (1983), to name a few.

The complexification of concepts such as the "present time" reinforced mainly with the third phase of the *Annales* represented a new selection of objects of study towards themes considered trivial: greetings; etiquette; food; oral communication; gesturalization; sexuality. Around these themes, the researchers sought to establish connections and unveil social articulations as determinant and decisive for collective life as the economic conjunctures or the social structures derived from the two previous phases, through the proposals of historians entitled *Annalists*.

In the search for meanings and the functioning of societies, the most diverse languages have become privileged objects for analysis, increasingly seen as metaphors of reality. The various discourses (written, oral, architectural, urbanistic, iconographic, musical, gestural, ritual) began to be decoded more frequently, seeking to apprehend their elements of social tension and their historical meanings, their production and their circulation in a given social environment. In other words, there was an expansion of the traditional territory of politics and social struggles, from the most evident places (State, unions, parties, associations) to areas to which great relevance had not been attributed until then (school, family, culture). In other words, the identification of elements of "micro-history" as shown by Anthony Levi (1992) has its valorization in the face of traditional "macro-history". Sociocultural history imposes, in this sense, a revaluation of politics and its identification in all the plots of the social fabric (GIESBRECHT, 2019, p. 16).

The maximum expression of the *Annales School*, Marc Bloch (2001) defends the need to carry out historical research with the help of the other sciences, resignifying the condition of dispute between them, having, based on dialogue, the archetype that encourages responses to research. We have here a proposal for interdisciplinarity.

However, the union of History with the Social Sciences is regulated by a new conception of time that is incompatible with the unique, singular, unrepeatable, linear and progressive temporality of the so-called "traditional History". Based on these assumptions, it is our objective in this article to think about the possible relationships between the methodological principles of the "Annales School" and the techniques of "Content Analysis", postulated by Laurence Bardin (2011).

As it is an epistemology of science and the indissolubility between History and Historiography, we will use both terms in our reflections, however, we highlight History as being that which is linked to human cultural production and experience in the face of a delimited time and space; and, Historiography, as that constituted through narrative, circumscribed by methodological rigor, which reflects the context and intertext of what is historical, that is, the "social" and the "temporal" (RÜSEN, 2015).

FROM "ANNALES" TO "CONTENT ANALYSIS": METHODOLOGICAL CONVERGENCES AND HERMENEUTIC CAPACITY

The most important contribution of the Annales group, including the three generations, was to expand the field of history into several areas. (...) They are also associated with collaboration with other sciences, linked to the study of humanity, from geography to linguistics, from economics to psychology. This interdisciplinary collaboration has been maintained for more than sixty years, an unprecedented phenomenon in the history of the social sciences. (BURKE, 1991, p. 112-113)

All sciences are characterized by the use of systematized and rigorous methods; On the other hand, not all branches of study that employ these methods are sciences. From this statement we can conclude that the use of scientific methods is not the exclusive purview of science, but there is no science without the systematized use of these methods (LAKATOS & MARCONI, 1991). In the case of History, it is no different.

As Gaston Bachelard (1977) pointed out, the epistemology of scientific history has certain specificities, given that its construction is intrinsically articulated with the social, spatial and temporal fabric. Knowledge of the methods that help historiographical production, regardless of what they are, has acquired a fundamental role in its complex form of theory, justifying or compromising it. If the researcher's choices are inadequate, an entire work can collapse, since the lack of methodological concern can decree fatal mediocrity (DEMO, 1995, p. 12).

In the History of Science, paradigmatic changes do not always fit into watertight models of analysis (KUHN, 2021). When it comes to History, its scientific assumptions changed relatively quickly, taking into account its first phase of systematization, which

occurred in the mid-nineteenth century, through the efforts of positivist and/or historicist historians in search of a "universal axiom".

Such an axiom, as proposed by Émile Durkheim (1999), could be salutary in a History that possessed the same rigor as the exact sciences, based on truths and immutable, governed by universal laws, with an untouchable structure, free of pre-judgments and any interpretation in the light of its individual reality. Or, as Wilhelm Dilthey (1999) argued, an imaged model as a cultural, social and political phenomenon that must be understood through, and in its historicity, in which natural contradictions coexist among those who study it, given that each subject expresses his or her own point of view, a historically conditioned but true version of one of the various dimensions of the concrete.

It is to the detriment of these models that the movement known as *Annales* is unleashed. Its first and notable creators were the Frenchmen Lucien Febvre and Marc Bloch, who bet on the foundation of a magazine that would revolutionize the way of seeing and making History: in 1929 the *Annales d'histoire économique et sociale*² was born. Bloch and Febvre led the "New History" movement in France, a History written as a deliberate reaction against positivism and "conservative" historicism, endowed with new methodological resources, such as hermeneutics, now seen as a possibility of breaking with the factual in historiographical construction (GIESBRECHT, 2019).

Among the main proposals of this movement, we can highlight the following: a) replacement of the traditional narrative of events by a "Problem-History"; b) search for the History of all human activities and not just political History; c) expansion of the use of historical sources beyond writing; d) collaboration with other disciplines, aiming to contemplate the first three objectives, such as geography, sociology, psychology, economics, linguistics, social anthropology, among others.

Overcoming the determinisms of the nineteenth century that hierarchized human beings, cultures, and also the sciences, the necessary space for the dialogue of History with other apparently competing methodologies was opened up in the French cultural effervescence of the twentieth century, especially those derived from the Applied Social Sciences, such as the case of "Content Analysis", coming from psychosociology, widely tested and disseminated by Professor Laurence Bardin, holder of the chair of Psychology at the University of Paris V.

Since the end of the 1940s and 1950s, techniques of "Content Analysis" have been elaborated, even if they are still restricted to the limits of the objective, systematic and

² A revista possuiu mais três títulos além deste: *Annales d'histoire sociale* (1939-1942-45); *Mélanges d'histoire sociale* (1942-44) e *Annales: économies, sociétés, civilisations* (1946-).

quantitative description of the content present in the documentation collected during research procedures in the Social Sciences (BERELSON & LAZARSELD, 1948; BERELSON, 1952). According to Bardin (2011, p. 26), it was from the end of the 1950s, especially with the discussions held in several congresses, that "Content Analysis" gained the breath it needed to enter the universe of the other Human Sciences, as in the case of Ethnology, Psychiatry, Psychoanalysis, Linguistics, and also of History.

In the case of the Annales School, one of its most significant epistemological foundations is translated by the principle of hermeneutics, which is the interpretation of the deep and careful meaning of what is considered historical from the sources (material or immaterial), the raw material of the historian's craft. It remains for us, then, to reflect on which methodologies and/or techniques would be able to handle the complexity of materials that are often so heterogeneous.

Contemplating the open and interdisciplinary character of *Annalist* historians, "Content Analysis", if properly applied, can be one of the possibilities of technical and procedural response, as it presents a diversified and constantly improving methodological set, applicable to the most diverse types of "discourses" contained in the primary sources of investigation, equipping the historian with a range of resources that allow calculating the frequency of data were used, to extract structures and models and, through deductive paths, to promote a "controlled hermeneutics", that is, "inference" (BARDIN, 2011, p. 15). "Inferring" is the ability to compose a systematic and logical explanation of discourse. When aiming to produce a narrative that aims to understand a certain theme through the sources that one has, "inferring" is the procedure that makes it possible to interpret the available documentation with a level of excellence.

Once the research problem(s) have been defined and based on the documentary sources collected, it is common for the historian to follow the paths offered by the qualitative and, when necessary, quantitative approach.

In quantitative analysis, what serves as information is the frequency with which certain characteristics of the content appear. In qualitative analysis, it is the presence or absence of a content characteristic or a set of characteristics in a given message fragment that is taken into account. (BARDIN, 2011, p. 26-27)

According to "Content Analysis", both approaches can interact around the validation of "inference". Such a condition can achieve promising results in the search for the "presences" and "absences" of the sources and overcome the descriptive reach. This is if we assume that the "inference" is carried out "based on frequency indicators, or, increasingly assiduously, with the help of combined indicators" (*Idem*, 2011, p. 27).

FOR A METHODOLOGY OF SOURCES IN LINE WITH HISTORIOGRAPHICAL PRODUCTION

What is usually called historical "documents" or "sources" are not necessarily produced by individuals with the aim of leaving testimonies for those who will live in the future. It is up to historians to understand a certain document/source and "infer" about it, which is not an easy task.

Regarding the complexity of the process of unveiling the past through human remains, the *Annales* movement reached a high level of production, hence we agree with the premise postulated by Jacques Le Goff (1988, p. 33-34) that, "more than ever, the 'Annales' want to make understood. To pose the problems of History: to provide a History that is not automatic, but problematic".

According to José D'Assunção Barros (2010), the Annales School, in its three generations³, maintained the initial concern of considering historical documents and sources not only from their singularities, but also from the possible links of similarities and differences between them, a fundamental hypothesis for the effectiveness of the practice of what many *Annalist historians* have called "Comparative History" (temporal and spatial).

It can be seen, so far, that the multifactorial opening of the process of selection of sources suggested by *the Annales* has shifted the axis of "traditional history" from its neutrality to a "New History", more interdisciplinary, less hierarchical and less ethnocentric. New interpretative possibilities have opened up, as well as the need to coexist with other methodological realities, which has made "Content Analysis" a tool for some *annalists*.

A historiographical production that intends to benefit from the technologies derived from "Content Analysis" begins with the so-called "pre-analysis" phase. It is in it that the organization of the investigative framework that the historian proposes to focus on occurs, defining the type of documentation that will form the basic structure of the project to be executed.

We emphasize that in the construction of the narrative based on *Annalithic foundations*, the documentary supports are diverse, and these can transit, for example, between official documents (laws, contracts, accounting records, notary records), private

³ Its first phase, from 1920 to 1945, was characterized by being small, radical and subversive, conducting a guerrilla war against traditional history, political history and the history of events. In the second phase of the movement, the historians of the *Annales* made a "leap" in the construction of historical knowledge by taking possession of concepts (particularly structure and conjuncture) and new methods (especially the "serial history" of long-term changes), in which the contributions of Fernand Braudel (1902 – 1985) were very important. A third phase begins around 1968, deeply marked by fragmentation, emphasizing sociocultural history, the return to political history and narrative. There is an incorporation of themes for studies such as dreams, bodies, odors, women, death, sex, among others. At this time, psychology is widely used, as well as economic history, popular and regional culture (GIESBRECHT, 2019, p. 49).

(company or personal), music lyrics, inscriptions on monuments, statistical data, paintings, sculptures, constructions, films, photographs, scientific publications, household utensils, jewelry, coins, in short, any object created by the human being. If this range of options were not enough, the historian also has as a documentary resource various types of oral sources, such as interviews, reports, tales, legends, myths, fables, among other verbal manifestations.

With the universe demarcated (the type of documents on which the analysis can be carried out), it is often necessary to proceed to *the constitution of a corpus*. The *corpus* is a set of documents taken into account to be submitted to analytical procedures. (BARDIN, 2011, p. 126)

It is from the initial contact with the *documentary corpus* that we have the first opportunity to systematize and catalog the inventory (recognition of the type of document and its location; the exact or approximate dating; the definition of the main theme; who are the interlocutors; in addition to the attribution of an identification code).

After defining the *corpus*, the hypotheses and objectives are formulated. The hypothesis consists of the provisional statement that we propose to verify using the analytical tools and, the objectives, the general purpose of the project. Only after these definitions is it possible to move on to the last stage of the "pre-analysis" phase, which consists of referencing the indexes and elaborating the indicators that will enable the cutting of the sources into comparable units of categorization and for thematic analysis (BARDIN, 2011, p. 130).

Starting from the premise that the operations described so far have been carried out with due rigor, the historian is able to begin the procedure of exploring his documentation. The most laborious phase of an investigation, it is summarized, based on pre-established criteria, in the execution of coding, decomposition and/or enumeration operations.

Once the exhaustive work of organization and exploration has been overcome, it is possible to move on to the "categorization" phase. This approach is feasible, because the Annales School, especially from its second generation onwards, established approximations with concepts derived from Anthropology, notably structuralism. The social structure defined by Levi Strauss is related to the theoretical elaboration capable of giving meaning to the empirical data of an observed reality and is capable of distributing and ordering this information (REIS, 2008). With due reservations, it was from this logic that Fernand Braudel was able to propose the resizing of historical time, configuring two twin concepts: that of "long duration" and that of the "multiplicity of historical times" (BARROS, 2010, p. 152).

Social structure and resizing of historical time are elements that need categorization and "Content Analysis" can be fruitful by offering a technique for this. Bardin (2011, p. 138) defines that it is through the identification of "presences" and "absences" that we can "infer" indicators that refer to the interpretation of the contents analyzed through frequency measurements.

The choice of frequency indices is not something fortuitous and, if well applied by the *Annalist historian*, "the appearance of an item of meaning or expression will be all the more significant – in relation to what is sought to be achieved in the description or interpretation of the intended reality – the more this frequency is repeated" (*Idem*, 2011, p. 139).

With the frequency indices identified, the researcher will be able to concatenate them with categorization models; establish an interpretative structure that can start from *a priori* categories; perceive more accurately the elements frequently found, excerpts and interconnections between one or more elements; *a posteriori categories*; interlocutions with other researchers; and, finally, the logical deductions that result from his analysis.

Once Content Analytics decides to code your material, it must produce a system of categories. The first objective of categorization (in the same way as documentary analysis) is to provide, by condensation, a simplified representation of the raw data. (BARDIN, 2011, p. 149)

Once the categorization phase has been overcome, we can glimpse the achievement of the last stage of the analysis process: that of "inference as a result". When we reach this stage, it is necessary to show that the *Annales* movement proposes the success of the "Problem-History", a combative element that seeks to demolish merely descriptive History. It is the turn of an "interpretive, problematized, hypothetical, hypothetical, capable of cutting out the event by means of new reading tables, being able to problematize this very gesture of cutting out an event" (BARROS, 2010, p. 109). In "Content Analysis" such a conjecture is called "pole of analysis".

The process of searching for "inference as a result" starts from "problematization". On the one hand, the meaning, code and support of the documentation and, on the other, the sender and receiver of it. Regardless of who the sender (individual or group) was, we have the act as an expressive or representative function of a communication, hence the hypothesis that the message expresses or literally represents its sender. By stimulating a dialectical procedure, logic is inverted as to the receiver of the message who, in reaction, acts or adapts to it. Here we arrive at the most concrete convergence between the

"Annales School" and "Content Analysis": "Problem-History" becomes synonymous with "inference" and its result is "controlled hermeneutics".

FINAL CONSIDERATIONS

A historian who refuses to think about the human fact, a historian who professes pure and simple submission to these facts, as if they were not of his making, as if they had not been previously chosen, in every sense of the word 'chosen' (and they cannot but be chosen by him)—is a technical aid. Which can, by the way, be excellent. But he is not a historian. (FEBVRE, 1978, p. 106)

The excerpt above is combined with the main objective of this article, which sought to reflect on the possibilities of dialogues and convergent methods between the "Annales School" and "Content Analysis". The Annales School, since its emergence, has brought a renewing perspective to the field of History. Lucien Febvre and Marc Bloch, founders of this movement, proposed a break with traditional historiography, which focused on the narration of political facts and chronological events. Instead, the *Annales* sought a "Problem-History", focused on social and cultural phenomena, which required dialogue with other sciences, such as Sociology, Anthropology and Psychology. The central idea was that History could not be understood in isolation, but should be investigated in a network of interactions between different spheres of knowledge.

In this context, "Content Analysis", a methodological technique widely applied in the Social Sciences, has proved to be a powerful tool to assist historians in the investigation of historical sources. Created by Laurence Bardin, "Content Analysis" offers a rigorous and systematic methodology that allows the interpretation of discourses in a quantitative and qualitative way. It aims to explore the "presences" and "absences" in documents, enabling inferences that expand the understanding of the sources. The main convergence between the *Annales* and "Content Analysis" lies in hermeneutics, that is, in the interpretative capacity that both approaches share. While the *Annales* promote an interpretative History, focused on problematizations and hypotheses, "Content Analysis" offers the technical means to organize and decode historical discourses, facilitating the reading and understanding of the complex data that make up the historical narrative. The "controlled hermeneutics", promoted by "Content Analysis", dialogues directly with the epistemological principles of the *Annales*, especially with regard to the deep and detailed interpretation of the sources.

Throughout the article, it was highlighted how interdisciplinarity, promoted by the *Annales*, revolutionized historiographical practice by incorporating new objects of study and methodologies. The study of themes previously considered marginal, such as gestures,



food and sexuality, revisited the importance of everyday practices in the construction of the social fabric. This focus on "Social History" has led historians to seek methods capable of dealing with the variety and heterogeneity of data, a role that "Content Analysis" has played effectively. "Content Analysis", when applied to historical documents, proves to be a potent means to encode and categorize large volumes of information in order to make it interpretable. This categorization process is essential for the analysis of complex sources, such as written texts, images, oral discourses, and even material objects. By categorizing and decomposing information, "Content Analysis" allows the historian to identify patterns, relationships, and contradictions in the sources, contributing to a deeper understanding of the historical context analyzed.

In addition, the concept of inference, central to "Content Analysis", allows the historian to go beyond the simple description of facts and explore the interpretive layers of discourses. This inference makes it possible to develop hypotheses and the creation of explanatory models about social and cultural behavior, so that historical events are understood in their entirety. The concept of "Problem History" in the *Annales* fits perfectly into this perspective, as both reject a purely factual view and seek more complex interpretive explanations.

Despite the potential of "Content Analysis" in the historiographical field, its practical application faces some challenges. The first of these is the need for methodological rigor in the collection and organization of sources. Unlike other fields, where sources are produced specifically for research (such as in laboratory experiments), historical documents are not always produced with the intention of being sources of study. This requires the historian to pay special attention to the selection, categorization and interpretation of data, requiring time and resources.

In addition, there is the challenge of applying the categories of "Content Analysis" to sources that were not originally thought of as textual discourses, such as images, objects, and immaterial cultural manifestations. The transposition of a technique originated in the analysis of texts to these other types of sources requires methodological adaptations and an interdisciplinary vision, which in turn, also requires training in other areas of knowledge. Even so, the Annales School, by advocating a more open and interdisciplinary History, offers the basis for these adaptations to be made in a conscious and productive way.

Another point of challenge lies in the subjectivity inherent to the process of interpretation. As much as "Content Analysis" offers a systematic method, the inference and categorization of data involve interpretative decisions that may vary according to the researcher. This does not mean that the method is flawed, but it highlights the need for



transparency in the research process, with the explicitness of the choices and criteria used. In the *Annales*' mold, this subjectivity should not be seen as a limitation, but as an intrinsic part of the historiographical craft, since the construction of History will always involve some level of personal and contextual interpretation.

Both the *Annales* School and "Content Analysis" share a common point: the desire to expand the frontiers of historical knowledge, breaking with rigid paradigms and opening space for new approaches and perspectives. The use of "Content Analysis" in the field of History is just one of the many ways in which contemporary historians can explore interdisciplinary potentialities in constructing more complex and profound historical narratives.

In conclusion, the dialogue between the *Annales* School and "Content Analysis" is not only possible, but fruitful. The union between historical hermeneutics and the quantitative and qualitative methods offered by "Content Analysis" allows for a deeper and more comprehensive investigation of historical sources, promoting a richer and more multifaceted historiography. The new generations of historians can, by following this path, contribute to the construction of a more inclusive, interdisciplinary History that is sensitive to the complexities of historical time.




REFERENCES

1. Ariès, P. (1990). *O homem diante da morte*. Rio de Janeiro: Francisco Alves.
2. Bachelard, G. (1977). *A epistemologia*. Rio de Janeiro: Zahar.
3. Bardin, L. (2011). *Análise de conteúdo*. Coimbra: Edições 70.
4. Barros, J. D. (2010). A Escola dos Annales: considerações sobre a história do movimento. *Revista História em Reflexão*, 4(8), 1-29.
5. Berelson, B., & Lazarsfeld, P. F. (1948). *The analysis of communications content*. Chicago-New York: University of Chicago and Columbia University.
6. Berelson, B. (1952). *Content analysis in communication research*. The Free Press.
7. Bloch, M. (2001). *Apologia da história ou o ofício de historiador*. Rio de Janeiro: Jorge Zahar.
8. Burckhardt, J. (1990). *A cultura do renascimento na Itália*. São Paulo: Companhia das Letras.
9. Burke, P. (1991). *A Revolução Francesa da historiografia: a Escola dos Annales (1929-1989)*. São Paulo: Editora da Universidade Estadual Paulista.
10. Demo, P. (1995). *Metodologia científica em ciências sociais*. São Paulo: Atlas.
11. Dilthey, W. (1999). *O surgimento da hermenêutica*. Numen.
12. Durkheim, E. (1999). *As regras do método sociológico*. São Paulo: Martins Fontes.
13. Giesbrecht, D. F. (2019). *A história e seu universo paradigmático: epistemologia no centro do debate*. São Paulo: Editora Lux.
14. Kuhn, T. S. (2021). *A estrutura das revoluções científicas*. Lisboa: Guerra e Paz Editores.
15. Le Goff, J. (1988). *A história nova*. São Paulo: Martins Fontes.
16. Febvre, L. (1978). *Sobre uma forma de história que não é a nossa: a história historizante*. Campinas: Ática.
17. Levi, A. (1992). *Guide to french literature: 1789 to the present*. London: Saint James.
18. Reis, J. C. (2008). História da História (1950/60). História e Estruturalismo: Braudel versus Lévi-Strauss. *International Journal of Theory and History of Historiography*, 1(1), 8-18.
19. Rösen, J. (2015). *Teoria da história: uma teoria da história como ciência*. Curitiba: Editora da Universidade Federal do Paraná.
20. Thompson, E. P. (1981). *A miséria da teoria ou um planetário de erros: uma crítica ao pensamento de Althusser*. Rio de Janeiro: Zahar.



21. Triviños, A. N. S. (1987). *Introdução à pesquisa em ciências sociais*. São Paulo: Atlas.
22. Vovelle, M. (1983). *La mort et l'Occident: de 1300 à nos jours*. Paris: Gallimard.

CLINICAL AND EPIDEMIOLOGICAL STUDY OF HIV CO-INFECTION AND PARACOCCIDIOIDOMYCOSIS IN A BRAZILIAN TEACHING HOSPITAL <https://doi.org/10.56238/sevened2024.029-037>**Juliana Rezende¹, Aécio Sebastião Borges² and Marcelo Simão Ferreira³****ABSTRACT**

Introduction: Paracoccidioidomycosis (PCM) is the most prevalent systemic mycosis in Latin America. Despite this, the association with the Human Immunodeficiency Virus (HIV) is poorly described. HIV infection has been recognized as a factor that modifies the natural history of fungal diseases, among which PCM is included, with clinical particularities and greater severity being observed. **Methods:** The clinical, epidemiological, and evolutionary findings of PCM in 21 patients co-infected with HIV, treated at a Brazilian teaching hospital, between January 2000 and December 2023, were evaluated. **Results:** Of the 21 patients studied, 14 (66.7%) were men. The mean age was 37.04 years. Thirteen (61.9%) patients reported living in a rural area, current or previous, and 5 (23.8%) of them performed agricultural activities at the time of diagnosis. Thirteen (61.9%) patients were smokers and 7 (33.3%) were alcoholics. For 57.14% of the cases, PCM was the first manifestation of AIDS. The mean CD4+ T lymphocyte count was 90.8 cells/mm³. Most patients (12; 57.14%) presented concomitant manifestations of the two classic clinical forms of PCM. Amphotericin B was the most commonly used treatment, in single, combined or sequential therapy (14 patients; 66.7%). Eighteen patients (85.7%) had a good evolution with the treatment administered. Mortality was 14.3% of the cases, with 2 deaths (9.5%) attributed to PCM. **Conclusions:** This study corroborates the existence of particularities in HIV-PCM co-infection, with greater severity and overlapping of clinical forms, in addition to a wide differential diagnosis in our setting, requiring early diagnosis and treatment.

Keywords: Paracoccidioidomycosis. AIDS. HIV. Coinfection.

¹ Infectious Disease Physician from the Federal University of Uberlândia
Institution: Federal University of Uberlândia
E-mail: julyana_rezende@yahoo.com.br

² Master in Medicine from USP-Ribeirão Preto with specialization in Infectious Diseases
Institution: Federal University of Uberlândia
E-mail: aerciosb@yahoo.com.br

³ Doctor and associate professor in tropical medicine
Institution: Federal University of Uberlândia
E-mail: marcelosferreira@gmail.com



INTRODUCTION

It is estimated that since the beginning of the Acquired Immunodeficiency Syndrome (AIDS) epidemic, 74.9 million people have been infected by the human immunodeficiency virus (HIV)¹. Brazil is the country with the highest detection rate of new cases of the disease in Latin America, accounting for more than 40% of all new HIV infections in the region^{2,3}.

As HIV infection progresses and the CD4+ T lymphocyte count drops to values below 200 cells/mm³, patients become predisposed to the emergence of opportunistic diseases, caused by fungi, viruses, protozoa, and bacteria, in addition to other comorbidities, with systemic mycoses being considered one of the main causes of morbidity and mortality in these patients.

Among the endemic mycoses in Brazil, Paracoccidiodomycosis (PCM) is one of the most prevalent, but its association with HIV is little described. Endemic throughout the country, where it predominates in the states of the Southeast, Midwest, and South, it is a systemic infection caused by fungi of 2 main species: *Paracoccidioides brasiliensis* and *Paracoccidioides lutzii*, being the eighth cause of death due to chronic infectious-parasitic diseases in the country, which allows us to infer its great magnitude^{4,5}.

PCM is clinically classified into 2 forms: acute or subacute (juvenile type), responsible for 5% to 25% of cases; and chronic (adult type), found in 74% to 96% of cases. The first preferentially affects young patients, up to 30 years of age, with rapid dissemination of the fungus, predominantly compromising the phagocytic-mononuclear system. The chronic form, frequently observed in male adults between 30 and 50 years of age, arises from a quiescent focus, with a slow course of evolution, affecting a single organ (unifocal) or multiple organs (multifocal), with pulmonary involvement in approximately 90% of cases^{5,6}.

HIV-induced CD4+ T-cell lymphocytopenia has been recognized as one of the factors that modify the natural history of fungal diseases, among which PCM is included. This may be the first manifestation of AIDS, usually in patients with CD4+ T lymphocyte counts below 200 cells/mm³. Overlap of the two clinical forms is observed in the few published studies on PCM-HIV co-infection, with disseminated disease, generally consisting of bilateral reticulonodular pulmonary infiltrate, lymphadenomegaly, skin lesions, hepatosplenomegaly, ulcerations of the oral mucosa, and other less frequent visceral lesions⁶⁻¹¹.

PCM-HIV co-infection is rarely reported in the literature. This may be partly explained by the use of trimethoprim-sulfamethoxazole or azoles for prophylaxis or treatment of opportunistic infections, since these medications also act on *Paracoccidioides sp.* In

addition, HIV and PCM have different epidemiological profiles, with the former predominating in urban centers, and the latter in rural areas. However, there has been a progressive spread of HIV infection to small and medium-sized municipalities and rural areas, places with high prevalence of PCM. Therefore, a significant increase in the number of cases of this co-infection would be expected⁸⁻¹³. However, apparently, this has not yet been observed.

The objective of this study was to evaluate the clinical, epidemiological and evolutionary findings of PCM among AIDS patients, reporting its particularities.

PATIENTS AND METHODS

This study retrospectively evaluated, through the review of medical records, the clinical and laboratory data of patients co-infected with PCM-HIV, over 18 years of age, of both sexes, assisted from 01/01/2000 to 12/31/2023, at the Hospital das Clínicas of the Federal University of Uberlândia – Minas Gerais, Brazil.

The case definition of co-infection was established by evidence of HIV infection, by a positive ELISA test, confirmed by Western Blot test or quantification of viral RNA, and observation of fungal structures similar to *Paracoccidioides* sp by direct examination, histopathology or culture of fluids, secretions or tissues, from patients with clinical suspicion of PCM.

Data were collected on: gender, age, place of birth, origin, profession, contact with rural areas (current or previous), lifestyle habits (smoking and alcoholism), duration of symptoms, clinical forms, diagnostic methods, date of diagnosis of HIV infection, CD4+ T lymphocyte count and viral load, treatment used, and evolution of cases, considering hospital discharge as a favorable outcome.

The project was submitted to analysis and approved by the Research Ethics Committee of the Federal University of Uberlândia.

RESULTS

In the period analyzed, 21 cases of HIV-PCM co-infection were diagnosed.

Males accounted for 66.7% of the total cases (14/21), with a ratio of 2 men for every woman, with a mean age of 37.04 years, with sexual intercourse being the main form of HIV acquisition, in 95.2% of cases (n: 20). Four of these (20.0%) reported the use of inhaled illicit drugs, and 1 (5.0%) reported injecting drugs.

Thirteen (61.9%) patients stated that they had lived in a rural area or had never had contact with a rural area (4.8%). Five (23.8%) patients were performing agricultural

activities at the time of diagnosis. Chronic smoking was reported by 13 patients (61.9%) and 7 reported chronic alcoholism (33.3%).

The mean time elapsed between the onset of symptoms and treatment was 114.21 days, and most patients (12; 57.14%) had an association of the two classic clinical forms of Paracoccidioidomycosis, characterizing a mixed form of the disease (Table 1).

The main clinical manifestations were fever (17; 80.95%), weight loss (14; 66.7%), lymph node enlargement (13; 61.9%), hepatomegaly (14; 66.7%), cough (12; 57.14%), splenomegaly (10, 47.6%) and disseminated skin lesions (7; 33.3%).

The skin lesions were disseminated, described as papular or ulcer-crusted (Figure 1).

Figure 1 – Disseminated ulcer-crusted skin lesions in a patient co-infected with HIV-PCM



Source: Prepared by the authors

Pulmonary involvement was observed in 12 patients (57.14%). The radiological alterations described were varied, with a predominance of micronodular infiltrate associated with cavitated consolidations (25%); bilateral interstitial infiltrate (16.7%); diffuse interstitial-nodular infiltrate (16.7%); and diffuse micronodular infiltrate (16.7%). (Figure 2).

Figure 2 – Computed tomography scan of the chest showing diffuse micronodular infiltrate and nodular consolidation in the left lower lobe in a patient coinfecting with HIV-PCM.



Source: Prepared by the authors

Bone involvement occurred in 1 patient (4.76%) whose plain X-ray showed an osteolytic lesion in the ulna head and the biopsy confirmed osteomyelitis. The fungus was identified through direct histopathological and mycological examinations, as well as in the culture of the bone fragment (Figure 3).

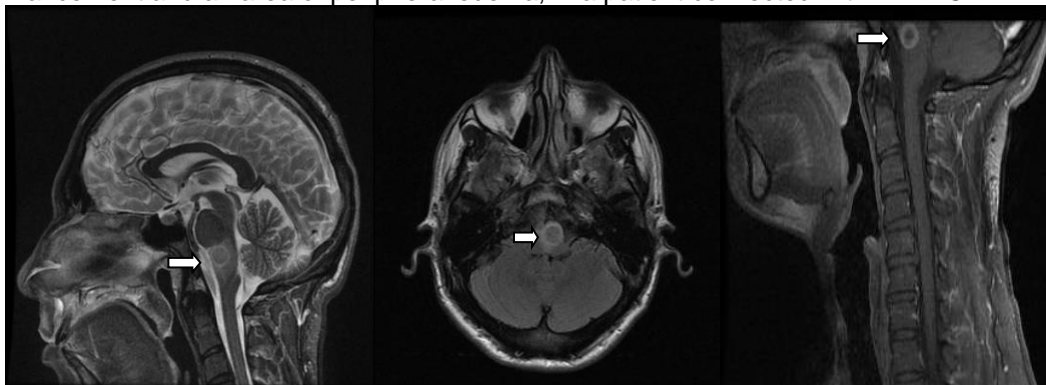
Figure 3 – Plain X-ray of the right wrist, showing an osteolytic lesion in the ulna head, in a patient co-infected with HIV-PCM.



Source: Prepared by the authors

Another patient (4.76%) presented clinical manifestations of central nervous system involvement, with focal signs, whose cranial magnetic resonance imaging is shown in Figure 4.

Figure 4 – Magnetic resonance imaging of the skull, showing a rounded medulla oblongata lesion with ring contrast enhancement and an area of peripheral edema, in a patient coinfected with HIV-PCM.



Source: Prepared by the authors

Gastrointestinal manifestations were reported by 2 patients (9.5%), clinically characterized by abdominal pain, diarrhea, with and without blood, nausea and vomiting. His endoscopic examinations revealed lesions in the colon, cecum, duodenum, stomach and esophagus.

Most patients (16; 76.2%) had other opportunistic infections, either at admission or developing them during hospitalization. Oral moniliasis/esophageal (8; 38.1%),

cryptococcosis (2; 9.5%), histoplasmosis (2; 9.5%), and genital herpes (2; 9.5%) were the most frequent co-infections in this series.

Nonspecific laboratory abnormalities evidenced at the time of diagnosis were anemia, hypoalbuminemia, and elevated liver enzymes, with a predominance of canalicular enzymes.

In 12 patients (57.14%), Paracoccidioidomycosis was the first manifestation of AIDS and the mean CD4+ T lymphocyte count at the time of diagnosis was 90.8 cells/mm³, ranging from 1 to 368 cells/mm³. Only 2 patients (9.5%) had values above 200 cells/mm³. The mean quantification of HIV viral load was 106,732.2 copies/ml (254 to 641,183.0 copies/ml).

Regarding antiretroviral treatment (ART), among the 14 patients (66.7%) with a previous diagnosis of HIV infection, 2 (14.3%) had recently started using the medications (1 week, and 2 weeks before hospitalization); 3 (21.4%) were abandoned; 1 (7.1%) in irregular use; 1 (7.1%) who had been in regular use for 3 months, with an undetectable viral load and 205 TCD4+ lymphocytes/mm³ at the time of PCM diagnosis; 1 (7.1%) in regular use for 7 months, with an increase in TCD4+ lymphocytes from 14 cells/mm³ to 88 cells/mm³, and suppression of viremia (from 171,666 copies/ml to undetectable); and 1 (7.1%) had been in regular use for 6 months, with immune recovery from 73 TCD4+ lymphocytes/mm³ to 367 cells/mm³, and reduction in viremia from 310,329 copies/ml to 291 copies/ml.

The mean time elapsed from the patient's admission to the diagnosis of Paracoccidioidomycosis was 12 days (1 – 39 days), which was established through mycological and/or histopathological examination of samples obtained by biopsy, puncture, lesion scraping, bronchoscopy, sputum samples, and serological testing (radial immunodiffusion).

Amphotericin B was the most commonly used treatment, in single, combined or sequential therapy (14 patients; 66.7%). Other medications used were sulfamethoxazole-trimethoprim, itraconazole, and ketoconazole.

Most patients (18; 85.7%) had a favorable outcome, and were discharged from the hospital in good condition after a variable period of treatment. Three patients (14.3%) died during hospitalization, 2 of them (9.5%) were directly attributed to Paracoccidioidomycosis.

DISCUSSION

In the present study, thirteen (61.9%) patients reported contact with rural areas, current or previous. Chronic smoking and alcoholism were reported by thirteen (61.9%) and 7 (33.3%) patients, respectively. These findings reinforce the evidence that the

management of soil contaminated by the fungus favors the acquisition of the infection, as well as the habits mentioned can contribute to the emergence of the disease^{4,5}.

Regarding the clinical presentation, we observed the coexistence of manifestations of the two classic clinical forms of PCM in most cases (57.14%), such as symptoms of involvement of the phagocytic-mononuclear system, in association with pulmonary, cutaneous, and mucosal involvement, characterizing a more severe form of clinical presentation of this mycosis, as an opportunistic disease. This reinforces the idea of including PCM associated with immunosuppression as a third clinical form, called mixed, as previously suggested by some authors^{7,8,10,13,14}.

Most patients (14; 66.7%) had CD4+ T lymphocyte counts below 100 cells/mm³ at the time of diagnosis of Paracoccidioidomycosis. For 12 patients (57.14%), PMC was the first manifestation of AIDS, and concomitance with other opportunistic infections was observed in most cases (76.2%). This data, together with the fact that most patients (57.14%) did not perform activities related to the risk of infection by *Paracoccidioides sp.* at the time of diagnosis, reinforce the hypothesis that mycosis results from reactivation of latent infection^{7,8,10,14}.

In this study, only 2 patients had CD4+ T lymphocyte counts above 200 cells/mm³ at the time of PCM diagnosis. One of them, with a CD4 count: 368 cells/mm³ and viral load: 291 copies/ml, had already been on ART for 6 months when generalized adenomegaly appeared. The CD4+ T lymphocyte count and viral load prior to the initiation of ART were, respectively, 73 cells/mm³ and 310,329 copies/ml. The other patient had a CD4 count: 205 cells/mm³ and viral load: undetectable, and had been on ART for 3 months. She already had skin lesions at the time of the start of ART, which worsened concomitantly with the onset of fever, cough, oral lesions, hepatomegaly and lymph node enlargement. In another case, the patient had been diagnosed with HIV and Histoplasmosis 7 months before the onset of PCM symptoms. The CD4+ T lymphocyte count at the time of HIV diagnosis was 14 cells/mm³, with a viral load of 171,666 copies/ml. ART was started in the same month of diagnosis. Three months later, the CD4+ T lymphocyte count was 42 cells/mm³ and the viral load was undetectable, and at the time of PCM diagnosis, the CD4+ T lymphocyte count was 88 cells/mm³ and the viral load remained undetectable. Immunological recovery and virological response, coinciding with the onset or recrudescence of mycosis symptoms, strongly suggests the diagnosis of Inflammatory Immune Reconstitution Syndrome (IRIS) associated with PCM. Only one case of IRIS associated with PCM was retrospectively defined based on a review of a report of neuroparacoccidioidomycosis in an HIV-positive patient published by other authors¹⁵.

In this study, PCM was diagnosed through histopathological analysis in 18 patients (85.7%). The direct mycological test had a yield of 47.6%, while the culture had a yield of 33.3%. Serological tests were performed in only 2 patients, with 100% positivity.

Amphotericin B was the most commonly used treatment, in single, combined or sequential therapy (14 patients; 66.7%), with a favorable outcome in 85.7% of the cases. The lethality attributed to co-infection varies among the few national reports, ranging from 12.2% to 66.66%^{7,8,10,14,16}. In the present series, mortality attributed to PCM was relatively low, 9.5%.

The association between PCM and AIDS is rarely reported in the literature, unlike what has been observed with other endemic mycoses in our country, such as histoplasmosis and cryptococcosis. This finding, as already mentioned, may be a consequence of epidemiological differences between infections, as well as the use of active drugs against the fungus, for other purposes^{7,8,10,11,13,14}.

The present study corroborates the existence of particularities in HIV-PCM co-infection, such as systemic dissemination, greater severity, and overlapping clinical forms, which, as already mentioned, together with other findings, suggest another form of clinical presentation of PCM.

Table 1 – Clinical presentation, diagnosis and evolution of patients with HIV-Paracoccidioidomycosis co-infection.

PATIENTS	GENDER	AGE (YEARS)	CLINICAL FORM	CD4 (cells/mm ³)	DIAGNOSIS	TREATMENT	EVOLUTION
# 1	Male	46	Chronicle	146	Skin biopsy	Amphotericin B	Good
# 2	Female	34	Acute/ Subacute	122	Phygate biopsia	Amphotericin B/ Sulfametoxazol-trimetropim	Good
# 3	Male	29	Mixed	45	Lymph node biopsy; Direct mycological and culture (sputum and lymph node aspirate)	Amphotericin B/ Ketoconazole	Good
# 4	Male	57	Chronicle	57	Laryngeal biopsy	Amphotericin B/ Itraconazole	Good



# 5	Male	27	Mixed	Not carried out	Mycological direct skin and sputum; Blood culture	Amphotericin B/ Sulfametoza- zol-trimetropim	Death
# 6	Male	34	Aguda/ Subaguda	26	Biopsy, direct mycology and lymph node culture; Radial immunodiffusion reagent	Amphotericin B/ Itraconazole	Good
# 7	Female	48	Chronicle	96	Bronchial mucosa and lung biopsy	Amphotericin B/ Sulfametoza- zol-trimetropim	Good
# 8	Male	28	Acute/ Subacute	21	Cholon and liver biopsy	Amphotericin B	Death
# 9	Male	43	Mixed	1	Skin and bone biopsy; Direct mycology and culture (gas-tric aspirate, skin and bone fragment)	Sulfametoza- zol-trimetropim	Good
PATIENTS	GENDER	AGE (YEARS)	CLINICAL FORM	CD4 (cells/mm3)	DIAGNOSIS	TREATMENT	EVOLUTION
# 10	Male	35	Chronicle	82	Lung biopsy	Sulfametoza- zol- trimetropim	Good
# 11	Female	28	Acute/ Subacute	368	Lymph node biopsia	Itraconazole	Good
# 12	Male	43	Chronicle	96	Skin biopsy	Amphotericin B/ Sulfametoza- zol- trimetropim	Good
# 13	Female	31	Mixed	29	Tracheia biopsia	Sulfametoza- zol- trimetropim	Good
# 14	Female	51	Mixed	112	Biopsy of oral lesion and esophageal, gastric and duodenal mucosa	Amphotericin B	Death
# 15	Female	33	Mixed	35	Biopsy and Mycological direct skin	Amphotericin B/ Itraconazole	Good



# 16	Male	34	Mixed	32	Biopsy direct mycological and oral mucosal culture; Radial immunodiffusion reagent	Amphotericin B/ Itraconazole	Good
# 17	Male	29	Mixed	133	Biopsy and Mycological direct lymph node	Amphotericin B/ Itraconazole	Good
# 18	Male	39	Mixed	2	Biopsy, direct mycological and skin fragment culture	Sulfametoxazol-trimetropim	Good
# 19	Male	32	Mixed	205	Direct mycological and skin lesion scraping culture	Sulfametoxazol-trimetropim	Good
PATIENTS	GENDER	AGE (YEARS)	CLINICAL FORM	CD4 (cells/mm3)	DIAGNOSIS	TREATMENT	EVOLUTION
# 20	Female	45	Mixed	120	Mycological direct sputum	Sulfametoxazol-trimetropim	Good
# 21	Male	32	Mixed	14	Lymph node biopsy	Anfotericina B/Itraconazol	Good


Source: Prepared by the authors



REFERENCES

1. The Joint United Nations Programme on HIV/AIDS/World Health Organization (UNAIDS/WHO). (2019). *Global HIV & AIDS statistics*. Retrieved September 4, 2019, from <https://www.unaids.org/en/resources/fact-sheet>
2. The Joint United Nations Programme on HIV/AIDS/World Health Organization (UNAIDS/WHO). (2016). *The prevention gap report: UNAIDS*. Retrieved September 4, 2019, from https://www.unaids.org/sites/default/files/media_asset/2016-prevention-gap-report_en.pdf
3. Kerr, L., et al. (2018). HIV prevalence among men who have sex with men in Brazil: Results of the 2nd national survey using respondent-driven sampling. *Medicine*, 97(1S Suppl 1), S9–S15. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5991534/pdf/medi-97-s09.pdf>
4. Moreira, A. P. V. (2008). Paracoccidiodomicose: Histórico, etiologia, epidemiologia, patogênese, formas clínicas, diagnóstico laboratorial e antígenos. *Bol Epidemiol Paul*, 5(51), 1-24. http://periodicos.ses.sp.bvs.br/scielo.php?script=sci_arttext&pid=S1806-42722008000300002&lng=pt&nrm=iso
5. Shikanai-Yasuda, M. A., et al. (2017). Brazilian guidelines for the clinical management of paracoccidiodomycosis. *Revista da Sociedade Brasileira de Medicina Tropical*, 50(5), 715-740. http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0037-86822017000500715&lng=en&nrm=iso
6. Brasil. Ministério da Saúde: Secretaria de Vigilância em Saúde, Departamento de Vigilância, Prevenção e Controle das Infecções Sexualmente Transmissíveis, do HIV/Aids e das Hepatites Virais. (2018). *Protocolo clínico e diretrizes terapêuticas para manejo da Infecção pelo HIV em Adultos*. Brasília – DF: Ministério da Saúde. Retrieved September 7, 2018, from file:///C:/Documents%20and%20Settings/Usuario%20particular/Meus%20documentos/Downloads/pcdt_adulto_12_2018_web.pdf
7. Bernard, G., & Duarte, A. J. S. (2000). Paracoccidiodomycosis: A model for evaluation of the effects of human immunodeficiency virus infection on the natural history of endemic tropical diseases. *Clinical Infectious Diseases*, 31(4), 1032-1039. <https://doi.org/10.1086/318146>
8. Almeida, F. A., et al. (2017). Paracoccidiodomycosis in Brazilian patients with and without HIV infection. *American Journal of Tropical Medicine and Hygiene*, 96, 368-372. <http://www.ajtmh.org/content/journals/10.4269/ajtmh.16-0254>
9. Godoy, P., et al. (2006). Paracoccidiodomicose e síndrome de imunodeficiência adquirida: Relato de necropsia. *Revista da Sociedade Brasileira de Medicina Tropical*, 39(1), 79-81. http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0037-86822006000100016&lng=en&nrm=iso
10. Morejón, K. M. L., Machado, A. A., & Martinez, R. (2009). Paracoccidiodomycosis in patients infected with and not infected with human immunodeficiency virus: A case-control study. *American Journal of Tropical Medicine and Hygiene*, 80(3), 359-366.

11. Macedo, P. M., et al. (2018). Paracoccidioidomycosis due to *Paracoccidioides brasiliensis* S1 plus HIV co-infection. *Memórias do Instituto Oswaldo Cruz*, 113(3), 167-172. http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0074-02762018000300167&lng=en&nrm=iso
12. Pedro, R. J., et al. (1989). Paracoccidioidomicose e infecção pelo vírus da imunodeficiência humana. *Revista do Instituto de Medicina Tropical de São Paulo*, 31(2), 119-125. http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0036-46651989000200010&lng=en&nrm=iso
13. Paniago, A. M. M., et al. (2005). Paracoccidioidomycosis in patients with human immunodeficiency virus: Review of 12 cases observed in an endemic region in Brazil. *Journal of Infection*, 51(3), 248-252.
14. Silva-Vergara, M. L., et al. (2003). Paracoccidioidomycosis associated with human immunodeficiency virus infection: Report of 10 cases. *Medical Mycology*, 41(3), 259-263. <https://academic.oup.com/mmy/article/41/3/259/958963>
15. Almeida, S. M., & Roza, T. H. (2017). HIV immune recovery inflammatory syndrome and central nervous system paracoccidioidomycosis. *Mycopathologia*, 182(3-4), 393-396.
16. Goldani, L. Z., & Sugar, A. M. (1995). Paracoccidioidomycosis and AIDS: An overview. *Clinical Infectious Diseases*, 21(5), 1275-1281.

CANDUNGA, BY BRUNO DE MENEZES: A UTOPIAN AND UNIVERSAL NOVEL IN THE AMAZON OF PARÁ <https://doi.org/10.56238/sevened2024.029-038>**Willian Ferreira de Sousa¹ and Yurgel Pantoja Caldas²****ABSTRACT**

The present work makes some reflections on the novel *Candunga* (1954), by Bruno de Menezes (1893-1963), a black, poor writer born in the outskirts of Belém (PA), who used literature, cooperativism and unionism as a form of resistance and struggle for a just and egalitarian society. The book preserves the main characteristics of the second modernist generation, such as social themes, dialoguing with other works of this period, but the author from Pará and his production did not obtain the necessary prominence by the canon. This article aims to demonstrate the importance of the narrative and its author, highlighting them with universal characteristics, whose classification permeates regionalism. The reflections proposed here follow the utopian nature of Menezes' novel, which stands out for its libertarian and revolutionary content, as well as the concepts of *sedenarrative* and *aquonarrative* that emerge from the text. For this discussion, some authors were evoked: Bosi (1994); Cândido (2006); Jobim (2020; 2021); Eagleton (1976); Leão and Campos (2021); Lukács (2000); Nunes (2001; 2004) among others. Finally, this work has as its main basis of analysis the qualitative methodology and involves bibliographic research, whose information points to the importance of the novel on screen and its author for the Amazonian and Brazilian literary scenario.

Keywords: Amazonian literature. Universality. Utopia. Bruno de Menezes.

¹ Master's student in the Graduate Program in Letters (PPGLET), at the Federal University of Amapá (UNIFAP) and professor of Portuguese Language and Literature in the state network of Amapá.

ORCID: <https://orcid.org/0009-0009-5012-9439>.

LATTES: <http://lattes.cnpq.br/9445301577723968>

E-mail: willianfersousa1601@gmail.com

² Doctor in Comparative Literature from the Federal University of Minas Gerais (2007). She completed a postdoctoral internship at the Faculty of Arts and Humanities of the University of Lisbon (2011/2012). He works as a professor in the undergraduate course of Letters (with qualifications in English and French) at the Federal University of Amapá and in the postgraduate course in the Master's Degree in Letters (PPGLET) at the same institution.

ORCID: <https://orcid.org/0000-0002-0214-699X>

LATTES: <http://lattes.cnpq.br/7404598847087083>

Email: yurgel@uol.com.br

INTRODUCTION

Gunter Pressler, on the various occasions in which he wrote about Dalcídio Jurandir³, explained about the universality of the writer from Pará and his work. Paraphrasing the professor, the same can be said about another important writer of the Amazon: Bruno de Menezes. Recognized as one of the main names of Modernism in the North of Brazil, Menezes is the author of important works, such as the novel *Candunga*, published in 1954. The author and the work that are the object of this article span time and space in terms of the theme they address, which reveals a writer not only concerned with showing the "local color", but above all a man who found in literature a form of expression of his struggle and resistance against the forms of tyranny that the society of the time imposed and which are still perpetuated today in the most diverse realities.

In the context of Brazilian modernist literature (and here, at first, the literary periodizations brought by the manuals are used), numerous novels that address themes of a regional nature, pointing to universal aspects, stand out. There are several examples of works, especially those of the second phase. *Vidas Secas*, by Graciliano Ramos, is one of them: the book was published in 1938 and thematizes the adversities and difficulties of migrants in the northeastern hinterland, reporting the search of Fabiano and his family for a more dignified life. Although labeled as regionalist, Graciliano's novel is a universal work, due to its theme and importance.

At the same time (1939),⁴ the novel *Candunga*, by Bruno de Menezes, was written with characteristics markedly similar to the Gracilian narrative, that is, portraying the life of northeastern migrants, plagued by drought, in search of new life in other lands. However, why did this work never receive importance or prominence in the Brazilian literary canon?

A second aspect to consider (in addition to the discussion that is held around the expressions "Amazonian Literature", "Literature in/from the Amazon" or "Regional Literature") is the aspect of regionalism, a concept that was established in literary historiography to represent, mainly, that production set in regions such as the North, Northeast and South of the country. In this regard, it is worth reflecting on Leão and Campos (2021, p. 649) who affirm that there is a non-regionalism (since there is regionalism) and this would imply an overlapping of a center (non-regionalist) on the

³ Cf. the article: PRESSLER, Gunter K. O mundo universal do Marajó e da Amazônia na obra de Dalcídio Jurandir: uma introdução à leitura do romance *Marajó*. In: Estudos de Literatura Amazônica: prosadores paraenses. José Guilherme dos Santos Fernandes and Paulo Maués Corrêa (ed.). Belém: Paka-Tatu/EDUFPA, 2007.

⁴ Although officially published in 1954, the writer Eustachio de Azevedo (apud Corrêa, 2014), in *Literatura Paraense*, states that Bruno wrote in 1939 a novel with a naturalist style, *Candunga*.

margins (place of regionalisms), which gives rise to conflicts regarding this divergent way of analyzing Brazilian literature.

There are many works that portray this regional reality, while still dealing with universal themes, but which do not receive the literary and historical importance they deserve. Thus, more important than classifying literature as a center or margin, it is necessary to think about the human aspects that each work (re)signifies. The local elements, so often present in countless works, demarcate a space, but they cannot be more fundamental than human centrality, that is, people's lives.

A third aspect to consider is the figure of Bruno de Menezes: a black man, poor and peripheral. Born in the Jurunas neighborhood of Belém, Bruno's childhood was marked by poverty, a condition that legitimized the social contrast between the prosperity of the rubber barons and the begging that a large part of the population of Belém experienced. Menezes' restlessness in the face of his family's social and financial condition made him throw himself into hard work as a graphic apprentice and then in a bookstore. On many occasions, he suffered heavy punishments from his employers, but it was these jobs that made it possible for him to come into contact with books that helped him create a revolutionary and questioning mentality. Later, already married, still struggling against poverty, he stood against the capitalist system and found in trade unionism, cooperativism and literature his form of resistance and transformation.

Thus, this article aims to reflect on the importance of the novel *Candunga*, by Bruno de Menezes, for the Amazonian and Brazilian context, highlighting relevant aspects such as utopia, universality and other concepts that contribute to this discussion, such as the *sedennarrative* and the *aquonarrative*.

THEORETICAL FRAMEWORK

Having made these considerations, let's go through some important aspects of Bruno de Menezes' novel. The author chose, at the beginning of the production of his book, the title "Flagellas", but later changed it to *Candunga*, a narrative that is divided into two parts: the first contains 7 chapters, and the second, 22⁵. With the subtitle "Scenes of northeastern migrations in the Bragantina Zone", the book shows the protagonist Antônio Candunga, along with the family of his godfather Francisco Gonzaga, fleeing the severe droughts in the interior of Ceará and dreaming of a new life in Pará. Encouraged by the government, countless waves of migrants from the Northeast settled in the agricultural villages near the

⁵ In the 1993 edition, chapter XV does not appear, but it does not represent a compromise in the sequence of the narrative, constituting only a typographical error.



Bragança Railroad, in the Bragantina Zone (Northeast of Pará), in search of a better life, of a "new future".

This is how the account of the arrival of the migrants when they landed in Pará lands is made: "On land, the families are listed, they look for the mormacid shade of the sheds. And extending nostalgic glances to the anchored vessel, they say goodbye to their native cradle, because they have arrived in the Land of Promise" (Menezes, 1993, 103). The Northeast remained in his memories. The search now was for a fresh start in the new lands, but what these families would soon discover is that they would go through the scarcity and exploitation of those who claimed to own the land.

There are many similarities between this narrative and other neorealist narratives, with regard to northeastern migration, labor exploitation, hunger and misery. Each author, with his style, demonstrates the importance of denunciations against social injustices, a striking characteristic of the second phase of Brazilian modernism, but the author from Pará did not receive due recognition.

Intertextual relations can be established between *Candunga* and other modernist works. These are stories that intersect, show congruences, address themes such as migration, misery and exploitation. Such connections span time and space and perhaps have much in common, precisely because they are narratives written under the same pillars of neorealist Modernism: sociopolitical criticism; absence of idealizations; emotional character; social reflection; protagonism of people of the people; denunciation of social injustices; colloquial language.

However, Bruno de Menezes' novel and other narratives set in the Amazon do not appear (for the reading public) as reference works when it comes to these subjects. *Vidas Secas*, by the aforementioned Graciliano Ramos, *O Quinze* (1930), by Rachel de Queiroz, among others, are often mentioned. Northern authors have their own writing style, which protects the influences of Amazonian life, such as the power of the waters that leads the lives of the characters. Thus, it is not just about "regionalism", as it has long been established in the manuals.

Just for the record, Alfredo Bosi (2015), when referring to the Amazonian regional literature, states that it "assumes, in the happiest cases, an undeniable documentary value" (p. 339-340). With this view, Bruno de Menezes would fit into what the critic calls the "minor regionalist" (a nickname given by the same Bosi to Dalcídio Jurandir for his work). However, how can we call a universalizing literature minor or merely documentary, which offers important reflections, addresses necessary themes and demonstrates a concern with man and his existential and collective dilemmas?

At this point, it is worth noting that literature is often so close to reality that its literary aspects end up being confused with historical facts. In the view of some theorists, when this occurs, *mimesis* would be impaired.

However, Candido (2006, p. 12-13), when explaining the social aspect in literature, in the classic relationship between art and society, demonstrates that it is not possible to dissociate the social from the formal, that the most feasible thing is for these two to be integrated, in a text/context fusion. It is difficult to understand literature that is alien to social events. Nevertheless, Candido himself warns that an analysis is not merely made of the social stratum, which would constitute a superficial analysis of a narrative, for example.

Professor Jobim, following Candido's line of thought, explains that every narrative "belongs to a culture, is inscribed in a social history, is inserted in a system of conventions, which even regulate its form, its gender, etc." (1996, p. 98 apud Santos and Molina, 2021, p. 495). In this way, it is possible to interpret what is fictional/imaginary, also linking it to the historical and cultural aspects that contributed to the creation/existence of the text.

Expanding this discussion, it is worth remembering the words of the painter Henri Matisse – paraphrased by Eagleton – who, on one occasion, observed that "all art bears the stamp of its historical epoch, but great art is the one in which this stamp is most deeply marked" (1976, p.15). In other words, great art is precisely that which proclaims social and historical facts in a profound way, as a product of a certain era. A work is always timeless and will never cease to have the marks of a time. So, Bruno de Menezes, from his place and time, from his roots, his identities and his convictions, wanted to show his people to the world:

New batches have been arriving, in overcrowded trucks. The horns hoarse and the descendants of the martyr race, fulfilling – who knows – their fate, stretching out their withered arms, balance on their wobbly legs, and then, clinging to the body, slide to the ground, some of them falling helplessly (Menezes, 1993, p. 105).

Menezes' narrative is filled with excerpts that demonstrate his concern with the destinies of the man of the Amazon and those who arrived in the region, but if they are considered in other contexts, they speak of themes present in various times and spaces.

In *The Theory of the Novel*, Lukács (2000) will try to define three types of novel, which are distinguished by the relationship that subjectivity maintains with the outside world: the first is the one that presents a naïve relationship (called abstract idealism); the second is the relationship of refusal (called the romanticism of disillusionment); and the third is the relationship of equilibrium (as an attempt to synthesize the two previous models and the overcoming of both, which the author, at a given moment, will call the "novel of education",

since it aims to form other men). It is in the perspective of the third type of novel that *Candunga* fits, since the position of subjectivity in relation to reality is one of acceptance (arriving in a new land, dealing with new customs), but also of overcoming (fighting against those who claim to be owners of the land, working to overcome local poverty), in a true balance between action and contemplation.

The novel in this case is an "educational means", a way of providing a new vision of the world from its characters, as is the case of Romário Sérgio (an agronomist of humble origin in charge of taking care of the colony's production) and the protagonist of the narrative, Candunga, who gradually understands the engineer's ideas and creates critical awareness about the relationships established in the village until then. In a certain part of the narrative, the "doctor" arrives at Gonzaga's swidden for inspection and notes that the settlers are discouraged by having so many taxes to pay and still living with the figure of intermediaries. He replies to a settler and to everyone:

- That's right, that's how you say! I take responsibility for everything! The land is yours, it belongs to you who use it and pluck your bread from it, without sucking anyone's blood! Count on me! The day will come when they will not pay anymore! Work in faith! This will end! It doesn't take long!

At this dreamer's speech, the hillbillies look at each other. No one had ever told them these things. And as if they understood the visionary, they were dispersed, silent, believing that those words, without knowing how, would have to come true one day (Menezes, 1993, p. 158-159).

This fragment reinforces the feeling of utopia that outlines the entire book. To what Bogéa (1994, p. 75), inspired by Lukács, will designate as a "utopian novel", since it is flooded with ideas of social transformation, in the struggle for justice and equality. A fact that is largely due to Bruno's influences, his readings, his participation in anarcho-syndicalist movements and his passion for cooperativism.

Let's see what Professor Rodrigo Wanzeler says in this regard:

Bruno was a tireless fighter, a man directly linked to cooperatives related to land, concerned with existing social inequalities, a mind with revolutionary fervor that made visible blacks, prostitutes and scoured, denouncing iniquities through his writings, breaking the paradigm of speaking for the less favored class, because in Bruno the margin has a voice, history and importance (2016, p. 28).

Bruno is, so to speak, a writer-ethnographer. In the light of what Geertz (2008) states, the author from Pará practices ethnography (and it is not only a matter of methods – selecting, collecting, mapping, etc.), but mainly by using an "intellectual effort" (p. 4) to represent the reality he is faced with. Evidently, literature does not change the world, but it leads humanity to a transformative reflection. Perhaps this was one of Bruno's motivations:

to know that his writing would serve for a process of individual or collective change, at some time or in some place.

It is also Wanzeler (2016, p. 26) who states that Bruno is the "ethnographer of the Pará Amazon". The figure of the fictionist and the man concerned with the issues of his time are intertwined. The desire of agronomist Romário Sérgio glimpses the perspective of the character, but also that of the literary man:

They guess the Big Day! How ideal it would be if they knew how to discern what they expected... The spirit of emancipation dawned among them! And will this Coming Dawn arrive?! ... Today? Tomorrow? After? When will that day be?! ...
[...]

He sees a symbol of promise, in this offspring of a generation, which will be less suffering, as he thinks. And in an enthusiasm of his whole being, he takes the boy in his arms, transfigured and dreamy. Then, as if he were destined for Tomorrow, he exclaims with conviction: "You, yes, will belong to the New Humanity!" In you will be the free man, master of himself! The individual with dignity to live! You are one of the links of the true human family! – and kisses, tenderly, the child's silky hair (Menezes, 1993, p. 227-228).

The fragment refers to Lukács' thought on "The Romanticism of Disillusionment" in his *The Theory of the Novel*: "the utopian aspiration of the soul is only legitimate, it is only worthy of becoming the center of a configuration of the world, if it is absolutely incapable of satisfying itself in the present situation of the spirit, or, what comes to the same thing, in a world that is presently imaginable or configurable, whether past or mythical" (2000, p. 121). The Amazon was the center of Bruno's world. The "Amazonian world", to borrow Loureiro's (1995) term, is "a single, immense, near-distant whole, in the process of being parted, as if it were a world always coming to light" (p. 63). This world holds the culture, the diversity of a people, its roots, its myths, and despite being so rich, it is also a scenario of conflicts, exploitation, injustice, poverty... And it was against these ills that the author of *Batuque* fought, always questioning, engaged and challenging the structures of oppression that were presented to the life of the population.

METHODOLOGY

With this article, we want to propose an academic research on the nature of the literary text in *Candunga*, its multifaria, its cultural and historical contributions to the Amazon. But "this formless and elusive thing – literature" (Souza, 2014, p.474) needs to be analyzed, from a methodological point of view, differently from how it is done with the exact or natural sciences. In general, the Human Sciences (Letters) cannot be conditioned to a type of methodological tutelage that, at a given moment, can make them unfeasible.

However, studies related to the Humanities should not be treated as something without a method or that has an *anti-method*. According to Bunge (1976 apud Souza, 2014) there are two basic conceptions of method: the *monistic* (common to all sciences, whose procedures would invariably be: observation, experimentation, quantification, mathematical deduction); and the *pluralist* (in this one, the methods are very diverse, since they vary according to the specificity of the perspective or center of interest). Thus, the first conception seems more adequate for the exact sciences and those of nature. The second, on the other hand, is compatible with the Human Sciences, and it is possible to use expressions such as *historical method*, *sociological method*, *linguistic method*, etc.

That said, the methodological procedure used here was mainly based on bibliographic research (survey, selection, filing and archiving of information related to the study), using the qualitative method. The objective is to propose new approaches, review/expand concepts, as well as evaluate the results obtained after the various readings.

The sources consulted are diverse: books, scientific articles, dissertations, yearbooks, magazines, and other types of written sources already published, to build the ideas and reflections presented here.

ANALYSIS AND DISCUSSIONS

Bruno de Menezes is an author who has always been attentive to the literary winds that have arrived in Brazil. This was the case in his first work, *Crucifix*, from 1920, a book of poetry strongly influenced by Symbolism. But after getting to know the modernist style, the author proved to be one of its great propagators and brought this "new art" to his poems⁶, starting with the book *Bailado Lunar* (1924), on a path that found its apogee with the publication of *Batuque* (1931) and other poetic works. This modernity also reached fiction texts with two important books: *Maria Dagmar* (novel, 1950) and *Candunga* (novel), the subject of this article.

It is worth deepening a pertinent observation regarding the dialogue that Menezes' novel has with other neorealist books of the second phase of Brazilian Modernism, since it is written under the aegis of this generation. This is what happens, for example, in relation to the novel *Vidas Secas*, by Graciliano Ramos, in which the idea of continuity is perceptible. However, first, it is urgent to say that a comparative study is the result of the look that the comparatist casts from the place where he lives. Jobim states that: "The place

⁶ Bruno de Menezes wrote in 1920 a poem with the title "Art Nouveau", in which he already showed the desire for modernity: "I want an original art".

where the comparatist lives, and from where he looks at other places, projects in some way his particularities in the representation he elaborates of these other places" (2020, p. 67).

The comparatism presented here is understood, according to Jobim (2020, p. 35), as a structure in which two different objects are present (at least), and a theory or an idea that mutually relates them. And more: the related theories or ideas need to make sense, because what is under discussion are not only the objects – different authors and works – but the production of meanings that arises with the affinities, similarities, analogies, differences, contrasts, dissimilarities observed by comparatists.

And Jobim arremata:

This production of meanings, for various reasons (its rootedness in certain systems of thought, its epistemological limits, its capacity or inability to account for its objects) also has a historical meaning.

That is why it is important to critically analyze what is at stake in this production, based on the assumption that it attributes to the objects compared a series of qualities that are in fact elaborated in the very act of comparing, an act that also presents traces of a certain historical transmission of meanings from the past with effects on the present (2020, p. 35-36).

Thus, there is no way to disregard historical temporality in the comparison of objects, since historical, social and cultural conditionings make up the world of life where the comparables are inserted, whose analyses only make sense if the time and space of each work/author are taken into account. So, the look that is cast on Menezes' novel is precisely to place it in the proper place of a work that reflects on the problems of the drought cycle (a theme so dear to many modernist authors), in addition to presenting it from an Amazonian perspective, something innovative for this type of narrative.

So, in *Vidas Secas*, there are the migrants fleeing the drought, in the context of the Northeast, and at the end a moment of hope is presented in which Fabiano and his family seem to walk towards a land of promise. In the work *Candunga*, there is a continuation, a post-writing of Ramos' book, in which one sees northeastern families coming to the Bragantina Zone, in a dream fulfillment (the promised land was now a reality) to work in the fields and form towns and cities that settled along the Bragança Railroad, an essential setting for the construction of Menezes' narrative.

Regarding the characters of *Candunga*, it is essential to make a brief presentation about those considered most important for the text: Francisco Gonzaga is a 60-year-old from Ceará and godfather of Antônio Candunga – he is considered the "hero" of the novel and his surname gives the book its title. The character Tereza Rosa is a young mother, married to Francisco Gonzaga, who had two daughters, Ana and Josefa, two girls who attracted glances due to their traits of beauty of the northeastern woman.



The character Maria Assunção is the aggregate of the family, which stayed with them due to the death of her grandfather. Assunção began to be considered a member of the family, something that drove her to migrate to Pará. João Deodato is a character who, during the narrative, will guide the family from Ceará towards the agricultural lots. There were also those who claimed to be heads of the colonies: merchants who had a commercial monopoly on these agricultural spaces. They were: João Portuga, Salomão Abdala and Minervino Piauí.

Romário Sérgio, called Doctor Romário, graduated in Agronomic Engineering and was in charge of inspecting the colonial agricultural nucleus. This "coincidence" between the role of the agronomist in the narrative and the position that Bruno de Menezes assumed in the State Agriculture Service, makes us realize that the character represents the author's desires in the struggle against the oppressive capitalist system. Finishing the description of the characters in the narrative, there was also Rosinha, whose story is based on negotiations with João Portuga, in the practice of inserting work with prostitution.

Having outlined the brief description of the characters, it is worth returning to the aspect of continuity that exists between *Candunga* and *Vidas Secas*. Graciliano's cyclical narrative, in the last chapter, entitled "Escape", shows Fabiano and his family leaving in search of a better place. Although the narrator mentions that they "headed south", the destination is actually any other that makes a new beginning possible:

Little by little a new life, still confused, was outlined. They would settle in a small farm, which seemed difficult to Fabiano, who was raised free in the woods. They would cultivate a piece of land. They would then move to a city, and the boys would go to school, they would be different from them. [...] Fabiano was happy and believed in this land, because he did not know what it was like or where it was (Ramos, 2013, p.40).

In this excerpt, the characters, tired of the dry and arid environment, dream of a new time. Their lives are marked by this dryness. Here we enter the concept of "narrative thirst", coined by Nunes (2001), which is characterized by a type of history linked to drought. The text is strongly marked by "earthly" elements, both by the characterization of the setting, and by the lives of the characters who carry a story of suffering, misery, hunger, illiteracy, limited language and exploitation.

Now, in a dialogical and continuity perspective, Francisco Gonzaga's family is in *Candunga* "fleeing" from the strong northeastern droughts towards the interior of Pará, a scenario markedly full of forests, forests, rains, humid and fertile soils, rivers and streams. This whole environment already notices a change in the characters' expectations for the future. In this regard, Corrêa (2014, p. 95) states that "*Candunga* (...) it shows itself as if it

were the materialization of what had been announced in Ramos". In this context, the reader is immersed in the "aquonarrative", a concept also created by Nunes (2001) to refer to a narrative in which the element "water" stands out, with the use of longer periods, a language loaded with aquatic elements (rivers, rains, floods, etc.).

The characters arrive at the "Land of Promise", and are soon greeted by an unexpected rain, so common in the North of Brazil, in a kind of baptism, an initiation ritual:

Thus, in a mockery of fados, they, who fled in terror, before a cruel sun and a sky that was cotton in cirrus, when they came across the ambitious oasis, in the hospitable land of the Amazon, received in full, in shocking contrast, the unforeseen downpour, of a collapse of nimbus trees (Menezes, 1993, p.106).

The term aquonarrative was created by Paulo Nunes regarding the work of the writer Dalcídio Jurandir, particularly the novel *It Rains in the Fields of Cachoeira* (1941). For Corrêa (2004), "in the Amazon, water greatly influences/dominates the activities of local populations, an influence that ranges from behavior to food" (p.19).

In the same work in which Nunes discusses the aquonarrative, he says that Jurandir's texts are opposed to the "Gracilian thirst-narrative" (2001, p. 41), thus pointing to a leaner type of narrative in Ramos' text and which reveals the dramas of the migrants with the drought and aridity of the hinterland.

Nunes has sometimes written about this comparison to confirm the concepts of thirst-narrative vs. aquonarrative. But, more than that, he realizes that many authors from the Amazon region write influenced by their "*liquidoamplovivas*", that is, "they are aquatic by nature" (Nunes, 2004, p. 20). Thus, when showing their village/region, these texts are still universal; on the contrary, they are universal from the moment they present their backyards, their forests, their rivers, together with events that involve human behavior and conflicts.

Differing from Nunes, Corrêa will say that there cannot be a determinism that inserts the writers of the Amazon in the aquonarrative, but that there is a "line of tradition around this profile" (2014, p. 96), and it is possible to identify numerous writers, who follow the matrix used by Nunes, from Dalcídio.

Aquenarrativity thus emerges as something inherent to the region's authors. An ability to perceive/absorb the element of water in its most varied forms, and make it essential within the stories. Bruno de Menezes does so, in particular, in the first part of *Candunga*, perhaps to emphasize the transition from the dry and arid environment of the hinterland to the soaked and wet universe of the Amazon. In the second part, the narrative presents the families settled on their lots to work on the land and reports on the conflicts generated with the "owners" of those spaces in the Bragantina Zone. It is worth mentioning

that migration to this region is a historical phenomenon that has occurred since the time of Colonial Brazil and with emphasis on the period of construction of the Bragança Railroad.

CONCLUSION

Bruno de Menezes, when addressing in his novel one of the most painful and current themes, which is the scourge caused by the drought in the Brazilian Northeast, demonstrates with deep sensitivity the struggle and resistance of migrants who leave their lands, their stories behind, and go in search of a new beginning in the lands of the Amazon.

The novel is, therefore, universal and utopian to the extent that it crosses all borders to talk about a social (and economic) problem, while treating it with hope, pointing to the perspectives that dreams are achieved when one fights for them. Hence, we see the figure of Candunga, a young rustic and sensitive migrant, who learns that it is possible to build a new reality based on knowledge and class consciousness, thanks to the influence of agronomist Romário Sérgio, an idealist, dreamer and rebel against the injustices practiced by those who oppress the poorest.

Following the trail of the Amazonian waters, many men and women from the Northeast end up settling in the North region. The author of *Lua Sonâmbula* (1953) emphasizes the changes in scenery and life brought about by the arrival of migrants to the new lands, which reveals a writer who, from a very early age, made his writing a form of denunciation and social transformation. A writing that appears on the margins of history (and even today with little recognition by the canon), but which demonstrates a writer with an acute sense of observation and extraordinary concern for the destiny of humanity.

Finally, this research on the novel *Candunga* shows the relevance of the work, due to the numerous themes it addresses, and of its author, for his contributions to Brazilian Modernism from the Amazon. However, studies on this narrative are still few and need to be increasingly deepened so that the recognition of such an important work is increasingly amplified, inside and outside the academic scenario.


REFERENCES

1. Bogéa, J. A. (1994). Bruno de Menezes e os símbolos da Art Nouveau. In A. Rocha et al. **Bruno de Menezes ou sutileza da transição: Ensaios** (pp. 59-76). Belém: CEJUP/UFPA.
2. Bosi, A. (2015). **História concisa da literatura brasileira** (50ª ed.). São Paulo: Cultrix.
3. Candido, A. (2006). **Literatura e sociedade** (9ª ed.). Rio de Janeiro: Ouro sobre Azul.
4. Corrêa, P. M. (2004). **Inglês de Sousa em todas as letras**. Belém: Paka-Tatu.
5. Corrêa, P. M. (2014). **Sete ensaios sobre literatura: Palavras de água, fogo, sangue, dor...**. Belém: Paka-Tatu.
6. Eagleton, T. (1976). **Marxismo e crítica literária**. Porto: Edições Afrontamento.
7. Geertz, C. (2008). **Interpretação das culturas**. Rio de Janeiro: LTC.
8. Jobim, J. L. (2020). **Literatura comparada e literatura brasileira: Circulações e representações**. Rio de Janeiro: Makunaima; Boa Vista: Editora da Universidade Federal de Roraima. Disponível em <http://www.edicoesmakunaima.com.br/2022/07/20/literatura-comparada-e-literatura-brasileira-circulacoes-e-representacoes/>. Acesso em 25 ago. 2023.
9. Leão, A., & Campos, S. P. P. (2021). Regionalismo. In J. L. Jobim, N. Araújo, & P. P. Sasse (Orgs.), **(Novas) Palavras da crítica** (pp. 649-678). Rio de Janeiro, RJ: Edições Makunaima. Disponível em <http://www.edicoesmakunaima.com.br/2022/07/20/novas-palavras-da-critica/>. Acesso em 13 set. 2023.
10. Loureiro, J. de J. P. (1995). **Cultura amazônica: Uma poética do imaginário**. Belém: Cejup.
11. Lukács, G. (2000). **A teoria do romance**. São Paulo: Duas Cidades/Editora 34.
12. Menezes, B. de. (1993). **Obras completas – ficção** (Vol. 3). Belém: Secretaria Estadual de Cultura; Conselho Estadual de Cultura.
13. Nunes, P. (2004). Amazônia, verbo transitivo e aquonarrativas. In **Asas da Palavra: Revista da Graduação em Letras**. Seção Ensaios. Disponível em <https://revistas.unama.br/index.php/asasdapalavra/article/view/1910>. Acesso em 09 set. 2023.
14. Nunes, P. (2001). Aquonarrativa: Uma leitura de Chove nos Campos de Cachoeira, de Dalcídio Jurandir. In J. Fares & P. Nunes (Orgs.), **Pedras de encantaria**. Belém: Unama.
15. Ramos, G. (2013). **Vidas secas** (120ª ed.). Rio de Janeiro: Record.
16. Rocha, A. (1994). Bruno de Menezes: Traços biográficos. In A. Rocha et al. **Bruno de Menezes ou sutileza da transição: Ensaios** (pp. 7-36). Belém: CEJUP/UFPA.



17. Santos, F. S., & Molina, M. F. C. de O. (2021). Narrativa. In J. L. Jobim, N. Araújo, & P. P. Sasse (Orgs.), **(Novas) Palavras da crítica** (pp. 495-518). Rio de Janeiro, RJ: Edições Makunaima. Disponível em <http://www.edicoesmakunaima.com.br/2022/07/20/novas-palavras-da-critica/>. Acesso em 13 set. 2023.
18. Souza, R. A. de. (2014). A questão do método nos estudos literários. **Letras de Hoje*, 49*(4), 471-476.
19. Wanzeler, R. de S. (2016). Bruno de Menezes, etnógrafo da Amazônia: Zonas interculturais em Boi Bumbá: Auto popular. **Revista FSA*, 13*(1), 25-44.

DISSOCIATIVE IDENTITY DISORDER: A NARRATIVE REVIEW

 <https://doi.org/10.56238/sevened2024.029-039>

Felippo Ataíde dos Santos¹, Júlia Inácio Pedro Sampaio², Adoniram Nunes Pereira Junior³ and Ana Luiza Silva Lôbo⁴

ABSTRACT

Dissociative Identity Disorder (DID), formerly known as Multiple Personality Disorder, is a complex psychiatric condition characterized by the presence of two or more distinct identities or personality states that alternate in controlling an individual's behavior.

Keywords: Dissociation. Identity. Trauma. Diagnosis.

¹ University Center of Miners (Unifimes)- Trindade Trindade Unit- Goiás, Brazil
Graduating from Medicine
E-mail: metodologiacientifica42@gmail.com

² UFMT
Medical Graduate
E-mail: metodologiacientifica42@gmail.com

³ UNIRV - fields of Goianésia
Medical Graduate
E-mail: metodologiacientifica42@gmail.com

⁴ Evangelical University of Goiás - UniEVANGÉLICA
Medical Graduate
E-mail: metodologiacientifica42@gmail.com

INTRODUCTION

Dissociative Identity Disorder (DID), formerly known as Multiple Personality Disorder, is a complex psychiatric condition characterized by the presence of two or more distinct identities or personality states that alternate in controlling an individual's behavior.

DID often develops in response to severe trauma, especially during childhood, as a defensive strategy for coping with unbearable events. Its nature makes diagnosis challenging, since symptoms of dissociation, amnesia, and identity changes can overlap with other psychiatric conditions, further complicating the proper identification of the disorder.

This chapter seeks to explore the nature of DID, analyzing its clinical manifestations, the debates about the validity of this condition, and the challenges in diagnosis and treatment. In addition, it will be discussed how traumatic and cultural experiences influence the understanding of this disorder, highlighting the complexity inherent to its structure and therapeutic response.

NATURE OF DISSOCIATIVE IDENTITY DISORDER FROM THE

Dissociative Identity Disorder (DID) is a psychiatric condition marked by the presence of two or more distinct identities or personality states in the same individual. These identities can take control of behavior at different times, resulting in disruptions in memory and self-perception, which makes it difficult to diagnose and understand this complex condition. DID is often associated with traumatic experiences, especially in childhood, which raises questions about its origin, validity, and impact on the various spheres of the patient's life.

Maraldi (2019) highlights that DID is one of the most complex forms of dissociation, often related to traumatic childhood experiences, such as abuse or extremely stressful events. These experiences lead the individual to fragment their identity as a form of psychic protection, generating memory gaps and behaviors that vary between different identities. The discussion about the validity of DID also involves cultural aspects and the recognition of this condition in different contexts, which contributes to the diversity of opinions about the nature and authenticity of the disorder.

According to Dalpont and Spence (2023), DID manifests itself through symptoms such as amnesia, depersonalization, and derealization, which complicate the diagnosis, since these symptoms can overlap with other psychiatric disorders. Dissociation, in the case of DID, can be seen as a defensive strategy in the face of traumatic events, which reinforces the multifaceted character of the disorder. In addition, the difficulties in

recognizing the symptoms make treatment and clinical follow-up challenging, as it is necessary to differentiate DID from other psychiatric conditions.

Gulisz and Vieira (2022) explore dissociation as a defense mechanism that allows the individual to distance themselves from traumatic situations, creating identities to deal with unbearable experiences. These distinct identities can have their own memories, behaviors, and ways of seeing the world, fragmenting the perception of themselves. The complexity of DID lies exactly in the depth of this fragmentation, which affects patients' interpersonal relationships and daily lives, often causing significant suffering and preventing healthy functioning.

The analysis by Almeida, Ribeiro, and Benedetti (2020) highlights that DID has a diversity of symptoms that can vary between individuals, reflecting the multifaceted nature of this condition. The presence of dissociative amnesia and episodes of depersonalization and derealization are common signs, but the manifestations can be very different between patients, which makes the diagnostic process even more difficult. The multiplicity of personal experiences and variable symptoms challenge clinical approaches and suggest the need for personalized treatments.

Kabene, Balkir Neftci, and Papatzikis (2022) emphasize that, in addition to clinical difficulties, the complexity of DID is amplified by the controversy surrounding its validation in the medical and legal spheres. In legal contexts, the liability of individuals diagnosed with DID is often debated, especially in cases where different identities may be involved in illicit behaviors. The lack of consensus on the validity of the disorder contributes to the resistance to accepting diagnoses of DID, both in the medical and legal communities.

Dissociative Identity Disorder, therefore, is a psychiatric phenomenon of a complex and multifaceted nature. It involves a deep fragmentation of identity and memory, often associated with traumatic experiences. The diversity of symptoms, the difficulty in diagnosis, and the cultural and legal controversies about its validity make DID a challenging condition both for the field of psychiatry and for society in general.

DISSOCIATIVE IDENTITY DISORDER: CAUSES AND RISK FACTORS

The causes of DID are strongly related to traumatic experiences and an interplay of genetic, psychological, and social factors. A central point in studies on DID is the experience of intense trauma, such as physical, emotional, or sexual abuse, especially during childhood, which is considered a crucial phase for the development of this disorder (Maraldi, 2019; Almeida; Brook; Benedetti, 2020; Dalpont; Spence, 2023). These

experiences can trigger dissociative responses, allowing the individual to distance themselves from painful memories as a defense mechanism.

In addition to traumatic experiences, genetic predisposition also plays an important role. Studies indicate that certain genetic characteristics may increase vulnerability to the development of DID, especially when combined with early trauma (Dalpont; Spence, 2023). The presence of other mental disorders, such as depression and anxiety, as well as the lack of social support during critical periods of development, are factors that aggravate susceptibility to the disorder and its severity (Gulisz; Vieira, 2022).

Dissociation, which characterizes DID, can be seen as an adaptive response to situations of extreme stress, allowing the individual to deal with unbearable traumas. However, this mechanism can lead to the development of fragmented identities, each with its own memories, behaviors, and even personality traits, as a way of coping with suffering (Kabene; Balkir Neftci; Papatzikis, 2022). However, in addition to trauma, other factors, such as psychological predisposition and the absence of support networks during childhood, seem to potentiate the emergence and persistence of DID (Almeida; Brook; Benedetti, 2020).

In summary, DID results from a complex interplay between biological, psychological, and social factors. Severe childhood trauma, combined with genetic and psychological vulnerability, form the core causes of the disorder. These factors not only influence the manifestation of DID, but also affect its course and the severity of symptoms, evidencing the need for therapeutic approaches that consider this etiological complexity (Gulisz; Vieira, 2022; Kabene; Balkir Neftci; Papatzikis, 2022).

TREATMENT AND INTERVENTIONS FOR DISSOCIATIVE IDENTITY DISORDER

The treatment of DID involves multiple psychotherapeutic approaches that seek to integrate different identities and promote the emotional well-being of patients. Among these approaches, cognitive-behavioral therapy (CBT) stands out as one of the main techniques used, as it helps patients process past traumas, deal with dissociative symptoms, and develop coping skills. Maraldi (2019) points out that, in addition to addressing emotional regulation, CBT aims to promote the integration of different identities, enabling a significant improvement in the patient's quality of life. He also emphasizes the importance of an individualized approach and collaboration among mental health professionals, ensuring effective treatment that is sensitive to the specific needs of each case.

In addition to CBT, the use of other trauma-focused therapies is also common. According to Dalpont and Spence (2023), integration therapy is one of these approaches, to

assist patients in resolving trauma and integrating their identities. To guide treatment, the authors recommend the use of diagnostic tools, such as the Rorschach Test and the Dissociative Experience Scale, which help to more accurately assess the level of dissociation and personalize interventions. Through these evaluations, it is possible to structure a more assertive therapeutic plan, ensuring advances in treatment.

Another approach that has been shown to be effective in the treatment of DID is dialectical-behavioral therapy (BDT), as pointed out by Gulisz and Vieira (2022). BDT, along with therapy focused on compassion, aims at emotional stabilization, an essential aspect for patients to be able to deal more effectively with dissociative symptoms. In addition to focusing on the integration of identities, these therapies provide the patient with a space to develop coping skills, which contributes to a continuous improvement in quality of life. These authors reinforce the need for a therapeutic approach that prioritizes the construction of these skills, aiming at emotional strengthening and resolution of underlying traumas.

In turn, Almeida, Ribeiro, and Benedetti (2020) suggest that social support and education about the disorder should be included in treatment, complementing traditional psychotherapeutic approaches. They point out that, in addition to techniques such as cognitive-behavioral therapy and therapy focused on the integration of identities, offering educational support to patients and their families facilitates symptom management. In this way, the intervention becomes more complete, and the patient is better able to manage dissociative crises. These authors also emphasize the need for a treatment that, although it has a psychotherapeutic basis, takes into account external factors that influence the patient's well-being, thus promoting an individualized approach.

Kabene, Balkir Neftci, and Papatzikis (2022) explore the use of techniques such as hypnosis in the treatment of DID. They claim that this technique can facilitate communication between different identities, allowing the patient to work more actively on integrating these parts. Although hypnosis is not suitable for all cases, it can be an effective complement in certain patients, especially when conventional methods of therapy face limitations. The authors reinforce that, regardless of the technique chosen, it is essential to develop an individualized treatment plan, given that each case of DID has unique characteristics and requires a personalized approach.

The treatment of DID involves a combination of therapies aimed at integrating identities, resolving trauma, and developing coping skills. Interdisciplinary collaboration, accurate diagnostic assessment, and social support are essential for the success of treatment, which must be adjusted according to the individual needs of each patient.



FINAL CONSIDERATIONS

With this study, it was concluded that Dissociative Identity Disorder has a deeply complex and multifaceted nature, marked by a fragmentation of identity, often related to severe trauma.

The diversity of symptoms, which can range from amnesia and depersonalization to multiple identities with distinct memories and behaviors, reflects the complexity of its diagnosis and treatment. In addition, the cultural and legal controversies surrounding the validity of DID, added to the difficulty of distinguishing its symptoms from other psychiatric conditions, reinforce the need for individualized therapeutic approaches and a greater understanding of this condition.


The study of DID requires a close look at both the biological and psychosocial nuances that shape the experience of this disorder, emphasizing the importance of treatments that consider the uniqueness of each patient and the depth of the underlying traumatic experiences.



REFERENCES

1. Almeida, A. M., Ribeiro, A. B., & Benedetti, L. (2020). Transtorno dissociativo de identidade: Um mecanismo de proteção complexo. **Psicopatologia Crítica: Perspectivas do Sofrimento Existencial**, 1(1).
2. Dalpont, N. I., & Spence, N. C. F. M. (2023). Abordagens diagnósticas no transtorno dissociativo de identidade: Uma revisão sistemática da literatura. **Brazilian Journal of Health Review**, 6(3), 11481-11491.
3. Gulisz, I. C., & Vieira, F. de M. (2022). Um estudo de revisão sobre o transtorno dissociativo de identidade: Características e direções de tratamento. **Revista PsicoFAE: Pluralidades em Saúde Mental**, 11(1), 71-82.
4. Kabene, S. M., Balkir Neftci, N., & Papatzikis, E. (2022). Dissociative identity disorder and the law: Guilty or not guilty? **Frontiers in Psychology**, 13, 891941.
5. Maraldi, E. de O. (2019). Transtorno dissociativo de identidade: Aspectos diagnósticos e implicações clínicas e forenses. **Revista Fronteiras Interdisciplinares do Direito**, 1(2), 32-32.

ASH SOAP PRESERVING THE ENVIRONMENT

 <https://doi.org/10.56238/sevened2024.029-040>

Joselito Trevisan¹ and Ana Cristina Pereira dos Santos²

ABSTRACT

This work investigates the production of soap from wood ash and residual vegetable oil, focusing on the environmental and social benefits of this practice. The problem addressed considers the negative impact caused by the improper disposal of frying oils on the environment, and the research seeks to assess how soap production can mitigate these damages and promote sustainability. The overall objective is to analyze the benefits of recycling waste vegetable oil for soap making, highlighting its efficiency and potential as an eco-friendly alternative. The final considerations indicate that the production of soap from waste oil and ashes is a viable practice, with the potential to be expanded and adopted in needy communities, contributing to the reduction of environmental impacts and the promotion of sustainable practices. In addition, the research suggests that the implementation of this technique can generate economic benefits, by transforming waste into valuable products, and social benefits, by promoting environmental awareness and education.

Keywords: Ash Soap. Oil Recycling. Sustainability. Ecological Saponification. Environmental impact.

¹ Doctor in Analytical Chemistry
Institution: Farroupilha Federal Institute (IFFAR)
E-mail: joselito.trevisan@iffarroupilha.edu.br

² Graduated in Biological Sciences
Institution: Farroupilha Federal Institute (IFFAR)
E-mail: eleganciapg@hotmail.com

INTRODUCTION

The improper production and disposal of waste, such as vegetable oil used in frying, has raised growing concerns about the environmental impact and risks to public health. With the advance of industrialization and the increase in the consumption of fried foods, the amount of oil incorrectly disposed of in the environment has been growing alarmingly, polluting water bodies and compromising the quality of water resources. This scenario challenges the search for sustainable solutions that not only minimize these impacts, but also promote the reuse of this waste in an efficient and affordable way (Freitas and Salvalaio, 2023).

In this context, the production of soap from ashes and waste vegetable oil emerges as a viable and ecological alternative. Before the advent of caustic soda, ancient civilizations already used bleach – an alkaline solution obtained from the mixture of ash and water – to make soap. This traditional practice, combined with the reuse of frying oil, offers a double solution: the use of waste that would otherwise be discarded and the provision of a sustainable and low-cost cleaning product (Gaio, 2023).

Research on the production of ash-based soap and waste vegetable oil offers significant theoretical contributions, by revisiting ancient practices and relating them to contemporary principles of sustainability and circular economy. From a practical point of view, this work presents an affordable solution for low-income communities, promoting the use of waste in an efficient and environmentally responsible manner. In addition, by addressing soap production as a sustainable practice, the study also contributes to raising awareness about the importance of proper waste management and the promotion of viable alternatives to improper disposal.

The theme outlined in this research aims to investigate the soap production process using ashes and residual vegetable oil, analyzing its benefits both from an environmental and economic point of view. The research problem that arises is: how can the production of soap from ash and waste oil contribute to the reduction of environmental impacts and promote sustainability in low-income communities?

The general objective of this work is to analyze the benefits of soap production from ash and waste vegetable oil, considering its environmental, economic and social impacts, and to evaluate how this practice can be implemented effectively in different contexts.

DEVELOPMENT

The production of soap from waste vegetable oils has been explored as a viable solution for the reuse of waste that would otherwise be improperly disposed of in the



environment. The reuse of vegetable oils, especially those used in frying, in the manufacture of homemade soap offers a sustainable alternative that contributes to the preservation of water resources and to the reduction of negative environmental impacts associated with the disposal of these oils. Studies such as the one by Santos *et al.* (2022) demonstrate that soap production from vegetable oils is not only possible, but also efficient, providing a high-quality product with cleaning properties comparable to conventional soaps.

The manufacture of soap using wood ash and residual frying oil is a process that has been rediscovered and valued in different contexts, especially in solidarity economy and environmental sustainability initiatives. According to Silva *et al.* (2022), the implementation of school factories that use this methodology has enabled the integration between teaching, research, and extension, allowing students to learn in practice about the benefits and challenges of sustainable soap production. This practice not only promotes environmental education, but also empowers communities to develop their own solutions for waste treatment.

Calanca and Grossi (2019) emphasize the importance of popular awareness in the cooking oil recycling process, especially for the homemade manufacture of bar soap. Through educational campaigns and community workshops, the population is informed about the damage that improper disposal of oil can cause to the environment and is encouraged to actively participate in recycling. These initiatives have shown that education is a crucial factor for the success of recycling programs and for the adoption of sustainable practices in everyday life.

The use of wood ash as an alkaline source in the saponification process, replacing caustic soda, is a practice that has been successfully explored. Freitas and Salvalaio (2023) point out that the lye obtained from wood ash has sufficient alkaline properties to trigger the saponification reaction, resulting in a soap with good cleaning properties. In addition, this approach reduces the need for industrialized chemical inputs, promoting a more natural and less aggressive form of production to the environment.

Recent studies, such as that of Martins *et al.* (2022), investigate the potential of different types of vegetable oils, such as andiroba oil, combined with aqueous ash extracts for soap production. These studies expand the range of options for the manufacture of ecological soaps, exploring the specific properties of different oils and their interaction with bleach. Research has shown that the use of oils such as andiroba, which have emollient and medicinal properties, can add value to soap, making it not only a cleaning product but also a cosmetic with therapeutic properties.

Gaio's (2023) research on the production of biodiesel from waste oil from the food industry, pre-treated with boiler ash, offers valuable insights for the development of new recycling technologies. Although the focus of the study is on biodiesel, oil pretreatment and purification techniques can be adapted to improve soap production, ensuring a high-quality final product with a lower environmental impact. This demonstrates that technological innovation is key to advancing sustainable practices.

Almeida *et al.* (2018) present a similar approach, where cooking vegetable oils are used in the production of soaps with phytotherapeutic properties. In this context, waste oil, which is often considered a worthless waste, is transformed into a value-added product, promoting the health and well-being of users. Reusing these oils reduces waste and pollution, while generating a product that can be marketed or distributed in underserved communities, contributing to the local economy.

The efficiency in producing soap from waste oil depends on several factors, including the quality of the oil used and the saponification process. Santos *et al.* (2022) emphasize that the content of free fatty acids present in the residual oil can influence the final quality of the soap. Oils with a high content of free fatty acids are more suitable for saponification, as they react more easily with bleach, resulting in a soap with better texture and cleaning power.

In addition, Santos, Fernandes and Carvalho (2018) discuss how the by-products generated from the recycling of waste oil, such as glycerol, can be reused in different applications. Glycerol, for example, can be used in the production of cosmetic and pharmaceutical products, creating a sustainable and low-waste production cycle. This approach not only maximizes the use of waste, but also diversifies the possibilities of products derived from cooking oil recycling.

Before the discovery of "caustic soda", as Sodium Hydroxide (NaOH) is popularly called, ancient people used a solution resulting from the mixture of ashes with water to make soap. Wood ashes have a composition that switches into organic and inorganic compounds, among them, calcium, potassium and silicon oxides are mainly found. Wood ashes are not sufficient for soap production, but its aqueous extract, in addition to having a chemical composition that allows the saponification reaction to take place, is also highly alkaline (pH= 13). Studying the development of wood ashes for soap production is an alternative to the use of aggressive products, in addition to influencing conscious consumption and reducing the use of pure raw materials, such as caustic soda (Martins *et al.*, 2022).

The present method proposes to obtain the alkaline substance from the residual ash resulting exclusively from the burning of wood mixed with water. This alkaline mixture is also known as lye and replaces NaOH in the saponification reaction. The bleach used was prepared with 5L of water added to 300g of ash obtained from burning wood. For the manufacture of the soap, 500mL of lye was proportionally used for 80mL of residual oil obtained from frying. In an appropriate container, with the exception of aluminum (which reacts with the alkaline substance), the lye and vegetable oil were mixed and heated slowly for approximately 2 hours so that the saponification reaction occurred, which can be observed when the mixture reaches a pasty appearance and with a dark, almost black color. The yield of the reaction was approximately 90%.

Oliveira (2015) contributes to the discussion by proposing the design of frying oil recycling systems for the production of soap and polymeric resins. The study suggests that with proper sizing and the implementation of appropriate technologies, it is possible to scale soap production efficiently and sustainably, serving both small communities and larger markets. The integration of recycling systems can therefore be an effective solution for the management of urban and industrial waste.

FINAL CONSIDERATIONS

The production of soap from wood ash and residual vegetable oil proved to be a sustainable and effective alternative for waste management, answering the research question that sought to verify whether this practice could contribute to the reduction of environmental impact and generate economic and social benefits. The results obtained confirm that the reuse of these materials, in addition to reducing pollution, can become an important educational tool in raising awareness about responsible consumption and recycling, especially in poor communities.

From a social and academic point of view, the results of this research offer a solid basis to foster the integration of waste reuse techniques in educational programs and community initiatives. Academic research can benefit from this study by exploring new ways to apply this type of technology in practical teaching contexts, involving both students and society in sustainability projects. For society, the practice discussed can not only improve waste management, but also create opportunities for income generation and environmental awareness.


However, it is important to highlight some limitations of the research. The study was conducted in a specific context and on a reduced scale, which may limit the universal applicability of the results. Additionally, logistical issues such as access to raw materials and



community engagement can pose challenges in large-scale implementation. For future work, it is recommended to expand the study to other regions and contexts, in addition to investigating the impact of different types of ashes and oils on the final quality of soap. The inclusion of more advanced technologies and the study of economic feasibility on a larger scale are also promising avenues for future research.

REFERENCES

1. ALMEIDA, L. G. G. et al. (2018). Preparação de sabão com propriedades fitoterápicas e emolientes a partir do óleo vegetal de cozinha.
2. CALANCA, C. G., & GROSSI, S. de F. (2019). Conscientização popular a partir da reciclagem do óleo de cozinha para a fabricação caseira de sabão em barra. **Revista Interface Tecnológica**, 16(1), 417-426.
3. FREITAS, I. D., & SALVALAIO, L. H. (2023). Desenvolvimento e formulação de sabão utilizando cinzas de madeira a partir da reciclagem do óleo residual de fritura.
4. GAIO, G. R. de S. (2023). Produção de biodiesel a partir de óleo residual da indústria alimentícia pré-tratado com cinzas de caldeira.
5. MARTINS, L. de S. et al. (2022). Utilização do óleo de andiroba (*Carapa guianensis*) para a produção de sabão em combinação com extrato aquoso de cinzas.
6. OLIVEIRA, S. da C. (2015). Dimensionamento de um sistema de reciclagem de óleo de fritura para produção de sabão e resinas poliméricas.
7. SANTOS, P. V. S., FERNANDES, C. H. de A., & CARVALHO, L. F. (2018). Subprodutos alternativos gerados a partir de óleo residual: uma prática sustentável. In **IX Simpósio de Engenharia de Produção da Região Nordeste**. Bahia.
8. SANTOS, S. G. R. et al. (2022). Estudo da produção de óleo vegetal e sua reutilização para obtenção de sabão.
9. SILVA, G. D. S. et al. (2022). Fábrica escola de detergentes como forma de possibilitar a indissociabilidade entre ensino-pesquisa-extensão. **Revista Difusão**, 1(9).

TEACHER TRAINING AND INTERDISCIPLINARITY: REFLECTIONS ON A HUMANIZING PATH FOR EDUCATION <https://doi.org/10.56238/sevened2024.029-041>**Diego Alexandre Divardim de Oliveira¹ and Ana Luiza Ruschel Nunes²****ABSTRACT**

This article addresses the discrepancy between the dynamism of contemporary society and the traditional educational model, which is still fragmented, decontextualized and outdated. Although society and technology evolve rapidly, the school remains divided into subjects that often do not communicate with each other or with the lives of students. Education, to be meaningful and effective, must integrate the disciplines and connect knowledge to the students' reality. Paulo Freire and Rubem Alves point out that the traditional system limits the critical capacity and potential of students. Interdisciplinarity emerges as an alternative to overcome this fragmentation, in this sense we sought to bring to this discussion researchers who published in the Interdisciplinarity Journal, led by research professor Dr. Ivani Catarina Arantes Fazenda, between the years 2015 and 2018. This article highlights that education should be more integrated and contextualized, reflecting the complexities of the real world and promoting a more holistic and critical formation of the human being. The approaches discussed include the need to reformulate teacher training to incorporate interdisciplinary practices and the importance of dialogue between theory and practice. The lack of resources, infrastructure and resistance to the traditional model are challenges identified. The article concludes that in order to improve education, it is essential that teachers are in constant training, the need to promote continuous training for teachers and to rethink the curricular structure, seeking a more integrated and collaborative approach. Educators must take a proactive and political role in educational transformation.

Keywords: Education. School. Teacher training. Interdisciplinarity. Transformation.

¹ Doctor in Education

Affiliation institution: State University of Ponta Grossa-UEPG

Address: Ponta Grossa, Paraná, Brazil.

E-mail: dadoliveira@uepg.br

² Doctor in Education

Affiliation institution: State University of Ponta Grossa-UEPG

Address: Ponta Grossa, Paraná, Brazil.

E-mail: analuiza@uepg.br



INTRODUCTION

Contemporaneity is marked by a large communication network, in which a significant amount of information circulates, which is not static, the result of a dynamic society. Although we can perceive this dynamism present in society and its great technological development, we realize that the current school format is very old, that is, it is a school subdivided into disciplines, which, most of the time, do not dialogue with each other, much less with the lives of individuals. Alves (2012) raises a question that corroborates this idea, for the author,

The classic methods of school torture such as the paddle and the rod have already been abolished. But can there be greater suffering for a child or adolescent than to be forced to move through a forest of information that they cannot understand, and that they seem to have nothing to do with their life? (ALVES, 2012, p.18).

For Freire (1979), education needs to make sense, and the interactions between subjects are fundamental aspects for the construction of knowledge. Alves (2012, p.29), in turn, considers that the traditional, disciplinary, "sedimented" model suppresses the ability of individuals to think, thus, for him, "sedimented knowledge saves us from the risks of the adventure of thinking". We can consider that, in the context of the disciplinary school, individuals are deprived of exercising their potential, teachers and students are limited.

The traditional school model, where knowledge is subdivided into disciplines that do not dialogue, is the result of a model of society divided into classes, which does not allow teachers enough structure to make teaching more meaningful and emancipating. The State does not offer the time and material conditions necessary for the development of interdisciplinary and transdisciplinary projects in schools and Higher Education Institutions, nor do we find adequate conditions.

Therefore, in an attempt to produce an article that discusses the production of knowledge about interdisciplinarity in education and that are published in national journals, we went in search of these materials available on the internet, taking into account that in contemporary times the internet is an important means of dissemination and sharing of knowledge. In the beginning it seemed like an easy task, but during our research we realized its degree of difficulty when selecting articles published in national journals that dealt with the theme of interdisciplinarity in teacher training, and that came in line with critical theories of education.

After many hours of research, it was possible to verify that there are few publications on the subject in question and that most of them are published in the Interdisciplinarity

Journal, a journal created in 2010 by Prof. Dr. Ivani Catarina Arantes Fazenda³ with the collaboration of Prof. Dr. Herminia Prado Godoy. The Interdisciplinarity Journal aims to disseminate the research carried out by GEPI - Study and Research Group in Interdisciplinarity and partners dedicated to the theme, seeking to broaden the debates contributing to the construction of theoretical/practical knowledge in the area of education, art, culture, among others.

For the construction of this article, we chose the period between 2015 and 2018, when 8 editions of the aforementioned journal were published. Unfortunately, after 2018, there were no more publications in that journal. After reading those copies, we selected 12 articles published in that quadrennium, as we considered the discussions shared in them appropriate for this reflection.

DISCUSSION

About the conception of Interdisciplinarity, Fazenda (2015) says that there are two approaches that need to be considered when talking about interdisciplinary teacher training, the first concerns a scientific order, and the second focus concerns a social order.

Scientific knowledge would lead us to the construction of what we would call interdisciplinary knowledge. The organization of such knowledge would be based on the core of the scientific knowledge of the act of training teachers, such as the hierarchical structuring of the disciplines, their organization and dynamics, the interaction of the artifacts that compose them, their conceptual mobility, the communication of knowledge in the sequences to be organized. This proposition would lead to the search for disciplinary scientificity and with it the emergence of new epistemological motivations, of new existential frontiers. Therefore, we understand the following: each discipline needs to be analyzed not only in the place it occupies or would occupy in the grid, but in the knowledge it contemplates, in the concepts enunciated and in the movement that these knowledges engender, typical of its locus of scientificity. This scientificity, then originating from the disciplines, gains *the status* of interdiscipline at the moment when it forces the teacher to review his practices and rediscover his talents, at the moment when the movement of the discipline is incorporated from the world. (FAZENDA, 2015, p.10).

In this sense, social ordering aims at the "unfolding of interdisciplinary scientific knowledge to social, political and economic demands" (FAZENDA, 2015, p.10).

Such a conception calls into question the entire separation between the construction of the sciences and the solicitation of societies. In the limit, we would say more, that this ordering tries to capture all the complexity that constitutes the real and the need to take into account the interactions that are constitutive of it. It studies methods of analyzing the world, as a function of social purposes, emphasizes the impasses experienced by scientific disciplines in their impossibilities of facing complex problems alone (FAZENDA, 2015, p.10).

³ He began his research on interdisciplinarity in the 1970s (note by the authors).



There are demands that need to be met, which concern the socio-political-cultural factors that require new postures from the subjects (FAZENDA, 2015). The author takes into account that capitalism is one of the driving forces that end up influencing education, and that one cannot confuse school interdisciplinarity and scientific interdisciplinarity.

In school interdisciplinarity, the perspective is educational, so school knowledge comes from a different structure from that belonging to the constitutive knowledge of the sciences. In school interdisciplinarity, the notions, purposes, skills and techniques aim to favor, above all, the learning process, respecting the students' knowledge and its integration (FAZENDA, 2015, p.12).

School interdisciplinarity emphasizes processes, and in this context teacher training needs to be in accordance with this perspective. In this way,

The interdisciplinary training of teachers, in fact, should be seen from a circumdisciplinary point of view, as we have discussed with Yves Lenoir, where the science of education based on a set of principles, concepts, methods and purposes converge on a meta-scientific plane. In this case, we deal with what we could call synthesizing and dynamic engaging interaction, reaffirming the need for a dialectical, non-linear and non-hierarchical structure, where the professional act of different knowledge constructed by teachers is not reduced only to disciplinary knowledge. We begin here to deal with a new, recently researched subject called educational intervention where more important than the product is the process that begins and remains in the maintenance of Human Rights (FAZENDA, 2015, p.14).

When talking about teacher training, from an interdisciplinary perspective, it is essential to consider that the relationship between theory and practice needs to be based on critical awareness, which recognizes the incompleteness of the processes and the need to go beyond the conventional. For Martins; Tavares (2015, p.19)

Thinking about teaching practice is a constant reflective exercise of each educator committed to education. It is a very challenging moment, since it is necessary to self-analyze all the work done by the teacher, in a political conjuncture in which there is no real commitment to the student or even to the educator. However, this reality, although harsh, should not prevent the realization of such a practice that is so valid not only for the teacher, but for the educational system itself.

Thinking about interdisciplinarity implies thinking about the other and the collective, it is a humanitarian practice. In the meantime, Martins and Tavares (2015, p.26) demonstrate the

[...] need to bring to the classroom the interdisciplinary attitude of sensitive listening so that each teacher can act in an interdisciplinary way of being. There are many paths of interdisciplinarity and one of them is revealed through psychopedagogical practice, since this professional is a kind of bridge that connects the family and the school through paths that are sometimes long and tortuous.



By taking this idea into account, it is possible to reflect on the teaching practice of many teachers, who often seek to give meaning to the contents they teach, are attentive to students and their needs, collaborate for good coexistence at school, among many things, act in an interdisciplinary way even though they do not recognize that these practices are interdisciplinary.

[...] according to Ivani Fazenda, Interdisciplinarity is much more than a junction of disciplines, it is a new vision of the possibilities of relationship between them and between the fundamental issues of contemporaneity, which would allow the replacement of the truth of each discipline by the truth of man as a being in the world (FAZENDA, 2011a, p. 89) (FERNANDES, 2015, p.52).

According to Fernandez (2015), an interdisciplinary project demands dialogue and the appreciation of the human being. Lima (2016, p.70) says that "human beings learn to live" and that "the contents of the curriculum should not be presented in a disconnected way" and, for the author, it is important to take into account the complexity that exists in relationships, and this ends up impacting the production of knowledge in education and, as a result, changes in teaching methodologies arise, as stated by Mateus (2016). Like this

[...] Interdisciplinarity in the school environment has been suggested, by some scholars in education, as a methodological alternative to overcome fragmented teaching, being able to enhance a greater meaning to school contents, contributing to a more holistic education that prepares for life. According to Japiassú (1976), it is characterized by the "intensity of exchanges between specialists and the degree of real integration of the disciplines" in the same research project to interpret learning situations (OLIVEIRA et al. 2016, p.35).

According to Oliveira et al. (2016), interdisciplinarity does not reduce and does not annul the disciplines, but promotes interconnections between them, enabling greater integration between subjects (teacher, student and community), which contributes to the construction of new knowledge that is meaningful to all. Oliveira et al. (2016, p.36) state that for this to occur, it is necessary for teachers to be "open to seek the construction of a curricular proposal contextualized with the school reality in the perspective of forming citizens committed to the social transformation of their community".

Complementing the above, and recalling what has already been said before, the State does not provide the infrastructure for teachers to work with interdisciplinary, transdisciplinary and multidisciplinary projects. Today, when we talk about innovative projects, we remember the relevance of Freire's (2002) and Hernández' (1998) thinking, for the former education is a political act and, for the latter, it speaks of transgression.

I cannot perceive myself as a presence in the world, but at the same time explain it as the result of operations absolutely alien to me. In this case, what I do is renounce the ethical, historical, political and social responsibility that the promotion of support



for the world places on us. I renounce participating, fulfilling the ontological vocation of intervening in the world. The fact of perceiving myself in the world, with the world and with others puts me in a position in front of the world that does not belong to those who have nothing to do with it. After all, my presence in the world is not that of those who adapt to it, but that of those who are inserted in it. It is the position of those who struggle not only to be an object, but also a subject of History (FREIRE, 2002, p.23).

This is a very important posture that needs to be assumed by everyone, especially by all people who call themselves educators, because it is through education that the rest of the population will become more aware and critical of the contexts in which they live.

Regarding the fragmentation of the curriculum, decontextualization, and a transgressive posture, Hernández (1998, p.12) says that

[...] it seeks to transgress the vision of the school curriculum centered on the disciplines, understood as fragments packaged in closed compartments, which offer the student some forms of knowledge that have little to do with the problems of knowledge outside the School, which are far from the demands that different social sectors propose to the school institution and that have the function, above all, to maintain forms of control and union power on the part of those who conceive themselves rather as specialists than as educators.

Oliveira et al. (2016) conducted a survey with a group of teachers from the state of Espírito Santo, and verified aspects that we had already observed in loco in the state of Paraná. It was found

Another conviction that is crystallized in most teachers, and why not say in school, is the resistance to change, because the main goal is not in the integral formation of young people, but in complying with the programs of the disciplines. It was observed among the teachers the difficulty in detaching from programs and contents, which they said were mandatory because they were listed in the state curriculum. This obligation is reinforced in the statement of the supervision that assigns the collection to the superintendence and external evaluations, especially the PAEBES⁴ (OLIVEIRA et. al, 2016, p.43).

Ram; Silva (2017) conducted a research in a public high school in the municipality of Senhor do Bonfim, in the State of Bahia, and pointed out that

The main difficulties pointed out by the professors to carry out interdisciplinary activities between these disciplines⁵ were: lack of time available to plan and execute the activities; absence of theoretical references on the theme interdisciplinarity to assist in planning; lack of knowledge of practical examples of how to carry out interdisciplinary activities; scarcity of resources; deficiency in training and lack of interaction with professors from other areas. The latter being the most addressed (CARNEIRO; SILVA, 2017, p.39).

⁴ Basic Education Evaluation Program of Espírito Santo (PAEBES). (note by the authors)

⁵ Biology and Mathematics. (note by the authors)

In the two studies mentioned, we can see that there are two aspects that end up impacting education, in order to hinder possible changes in the perspectives of education, from a disciplinary education to interdisciplinary education. The first concerns the State's lack of interest in any non-traditional educational perspective, and the second concerns the teachers' lack of interest in transgression in education. We can consider that the teachers who participated in these researches need a lot of will and boldness to break with the traditional disciplinary model, which would require a lot of effort and dedication.

As a possible solution to this situation, Mello (2016, p.29) proposes a change in teacher training and corroborates our reflections by saying that

The rupture of the dichotomy between theory and practice presents itself as a possibility for formative integration. Contrary to the fragmentation of concepts, we then resort to the conception of formative integration as a result of several dimensions of education that, articulated, contribute to the full condition of the subject, first as a human, and then as a professional. We propose a break with curricular fragmentation, in order to allow, through practices, to integrate separate knowledges, contributing to the contextualization of the reality in which we live. [...] That said, the great challenge for formative integration is to overcome the fragmentation, which persists in our teacher training course curricula.

The fragmentation of knowledge causes subjects to lose the ability to perceive the whole and to contextualize (MELLO, 2016).

Thus, interdisciplinarity appears as an action, a form of analysis of the world, helping scientific knowledge, supporting disciplines and even helping in issues that disciplinarity alone cannot handle. It is interdisciplinarity seeking within the sciences an internalization to then move on to exteriorization, thus being able to try to respond to emerging social issues (REIS, 2017, p.16).

interdisciplinarity is a dialogical proposal that seeks to integrate subjects, society and knowledge (REIS, 2017). It is a way of humanizing and making the human being more critical, contributing to the recognition of himself as a historical subject who needs to act in the world, not as a passive subject, but performing all his modifying potential.

Still on teacher training, Frade et al. (2017) report experiences with the Interdisciplinary PIBID of the Federal University of Lavras, in the State of Minas Gerais, which is based on Paulo Freire's critical pedagogy, which promotes an organization of knowledge that enables the flow of generating themes, in addition to highlighting the importance of collaborative work. In this project

[...] the strategy used for the integration of the various areas of knowledge was the practice of weekly meetings for study, planning, review, construction and selection of materials for the Culture Circles. By debating the generating themes arising from the exchanges carried out in the schools, the students and supervising teachers were able to build scripts for the work, so that the integration of the areas was present. It was defined by using available technological resources, such as: documentary

videos, *online reports*, audios, photographs, among others, to introduce the generating themes of each Culture Circle. By experiencing the collaborative construction of these didactic materials, the integration of knowledge was guaranteed. Students from the various teaching degrees were given the opportunity to experience the interdisciplinary construction of didactic-pedagogical planning through dialogue and exchange of information (FRADE et al. 2017, p.47).

To find the generating themes, the researcher needs to be inserted in the reality that is being researched, in this case the school reality. In Freire (1979) we perceive that this practice is political, as it contributes to unveiling realities and, in this way, frees subjects from oppressive forces.

Men, as "beings-in-situation", are submerged in spatio-temporal conditions that influence them and in which they also influence. They will reflect on their character as situated beings, to the extent that they are challenged to act. Men are because they are situated. The more they reflect critically on their existence, and the more they act on it, the more men they will be. Education and thematic research in a critical conception of education are only different moments of the same process (FREIRE, 1979, p.24).

There are no subjects who are not situated, even in cases of anchoritism the relationship of the subjects with the environment where they live is an active relationship that needs to be critical and reflective. On this issue, we have the example of Henry David Thoreau who lived alone⁶ on the shores of Walden Lake, in the State of Massachusetts, USA, and that he was a critical observer of his reality. Thinking from this example, let us think that students often do not have enough maturity to be critical and reflective observers, so teachers need to provoke young people by inviting them to reflect and contextualize, because according to Lima; Monteiro (2018, p.21) "interdisciplinarity goes beyond the curriculum and epistemological points of convergence, it is intentional action and involves cultural and social aspects". In this sense, teachers need to be open to the new methodological outlines that emerge when the old paradigms of education are broken.

Viçosa et al. (2018) state that it is necessary to strengthen the continuing education of elementary school teachers with a view to interdisciplinarity, collaborative work, and the construction of knowledge in networks. "This construction occurs from the exchange of experiences that generate questions that allow us to understand different issues in groups constituted in the education networks" (VIÇOSA et al. 2018, p.96).

[...] We consider that it is essential to adapt or restructure the current programs of initial and continuing training of elementary school teachers that include improvements in interdisciplinary aspects. As a suggestion for overcoming the difficulties presented, regarding the approaches to the environment and interdisciplinarity, Shaw, Rocha and Folmer (2017) are cited, who highlight the role

⁶ Thoreau lived as a hermit during the years 1845 and 1847, his experience was reported in the work "Walden or Life in the Woods" first published in 1854. (note by the authors)



of university research professors as guides and stimulators of discussions. Thus, to soften the dissociation between disciplinary and pedagogical content, to reduce the distance between academia and the school reality, to invest in the constitution of work networks and training practices based on exchanges and professional dialogue, centering these trainings in schools, around projects that are, at the same time, pedagogical innovation and teacher training (VIÇOSA et al. 2018, p.96).

It is very important that teachers know the Pedagogical Political Project of the institution where they are inserted and, in an eventual restructuring, the demands of contemporaneity are considered and that this restructuring is carried out collectively (VIÇOSA et. al., p.96). According to the above, teachers need a sense of belonging. Education needs to be built collectively.

FINAL CONSIDERATIONS

As much as the world is in continuous scientific and technological development, and it is also possible to verify changes occurring in the cultural aspect through acculturation and endoculturation, many of these changes occur due to globalization. Even in a dynamic world, the current school format is outdated.

We need to reflect on the initial and continuing education of teachers from an interdisciplinary perspective, in order to promote the understanding of the world in a global, contextualized and critical way, valuing all subjects and stimulating them to build knowledge in a collaborative way.

Valuing education as a means of transforming society is essential when it comes to the quality of teaching, therefore, educators should not wait for the initiative of the State for the necessary changes to occur. In the meantime, Ribeiro (1979, p.14) demonstrates the relevance of his thought when he states that "the educational crisis in Brazil that is so much talked about is not a crisis, it is a program. An ongoing program, whose fruits, tomorrow, will speak for themselves."



REFERENCES

1. CARNEIRO, R. R. S., & SILVA, L. M. (2017). Prática interdisciplinar no ensino da hereditariedade em escolas estaduais de Senhor do Bonfim, BA. **Interdisciplinaridade**, 1(10), 31-40.
2. FAZENDA, I. C. A. (2015). Interdisciplinaridade: didática e prática de ensino. **Interdisciplinaridade**, 1(6), 9-17.
3. FERNANDES, P. J. C. (2015). Desafios para a efetivação de um projeto interdisciplinar na contemporaneidade: um diálogo com Jürgen Habermas e Ivani Fazenda. **Interdisciplinaridade**, 1(6), 44-55.
4. FRADE, E. et al. (2017). Os pilares da interdisciplinaridade no subprojeto do PIBID Interdisciplinar na Universidade Federal de Lavras, MG. **Interdisciplinaridade**, 1(10), 41-58.
5. FREIRE, P. (1979). **Conscientização: teoria e prática da libertação**. São Paulo: Cortes e Moraes.
6. FREIRE, P. (2002). **Pedagogia da autonomia**. São Paulo: Paz e Terra.
7. HERNÁNDES, F. (1998). **Transgressão e mudança na educação: os projetos de trabalho**. Porto Alegre: Artmed.
8. LIMA, K. O. (2016). A teoria e a prática interdisciplinar no cotidiano profissional do pedagogo. **Interdisciplinaridade**, 1(9), 69-80.
9. LIMA, K. O., & MONTEIRO, G. V. (2018). Epistemologia ecossistêmica e interdisciplinaridade: uma parceria necessária ao ensino escolar do século XXI. **Interdisciplinaridade**, 1(12), 9-31.
10. MARTINS, E. C., & TAVARES, D. C. (2015). A escuta sensível: prática do docente interdisciplinar no ensino médio. **Interdisciplinaridade**, 1(6), 18-27.
11. MATEUS, L. (2016). A percepção interdisciplinar do aluno do curso técnico em enfermagem sobre cidadania. **Interdisciplinaridade**, 1(9), 47-57.
12. MELLO, M. P. R. A. (2016). Currículo e integração formativa nos cursos de formação de professores. **Interdisciplinaridade**, 1(9), 24-40.
13. OLIVEIRA, E. B. et al. (2016). Os desafios da interdisciplinaridade no currículo da área das ciências da natureza de uma escola estadual. **Interdisciplinaridade**, 1(9), 31-47.
14. REIS, R. A. (2017). O contexto escolar em análise: as práticas interdisciplinares e as mudanças no cotidiano escolar. **Interdisciplinaridade**, 1(10), 9-30.
15. RIBEIRO, D. (2018). Sobre o óbvio. Disponível em: <<http://www.sociologiaonline.com/wp-content/uploads/2015/08/sobre-o-obvio.pdf>>. Acesso em: 30 mai. 2018.



16. VIÇOSA, C. S. C. L. et al. (2018). Desafio da formação continuada em abordagens acerca do meio ambiente em uma perspectiva interdisciplinar. **Interdisciplinaridade**, 1(12), 83-102.

BALANCE AND FLEXIBILITY IN CURRICULUM PLANNING: ANALYSIS OF PAULO TOMAZINHO'S MODEL AND ITS IMPLICATIONS FOR THE QUALITY OF EDUCATION

<https://doi.org/10.56238/sevened2024.029-042>

Luciana Carvalho dos Reis Fim¹, Mayons Pessin Zagoto², Márcia Schiavo³, Wagner Barbosa de Oliveira⁴ and Mara Rúbia Gusson Vittorazzi⁵

ABSTRACT

This article investigates the impact of curriculum planning on the quality of education, with a special focus on the model proposed by Paulo Tomazinho. The model emphasizes the need for an integrated and flexible approach in the process of curriculum construction, highlighting the relevance of planning, designing, developing, and evaluating pedagogical practices in a cohesive way. Tomazinho's proposal advocates close coordination between these phases, promoting an integration that allows the curriculum not only to meet the immediate demands of society, but also to form critical citizens who are prepared to face the challenges of the contemporary world. The main objective of this study is to analyze the applicability of the principles defended by Tomazinho in the current educational scenario, taking into account the importance of three fundamental elements: neutrality, flexibility and curricular autonomy. The research is in line with the principles established by the Law of Guidelines and Bases of Education (LDB), which seeks to ensure an education that promotes inclusion, respects diversity and fosters critical and autonomous thinking. In this sense, the reflection on curricular neutrality appears as a highlight point, since the curriculum can be influenced by ideological and social forces that directly impact the teaching-learning process. The methodology used in this article is based on a documentary analysis, associated with a critical review of the existing literature on Tomazinho's model and Brazilian educational legislation. Through this approach, the main theoretical and practical contributions of the curriculum planning model were examined, as well as its limitations and challenges. The results of the research indicate that curricular flexibility, although essential to meet the diversity of educational demands, must always be accompanied by a critical reflection on the external influences that shape the curriculum. It is thus concluded that the balance between structure and flexibility is fundamental to promote quality education, capable of forming critical individuals, aware of their role in society and prepared to act in an autonomous and transformative way.

Keywords: Curriculum Planning. Flexibility. Quality of Education. Teacher Autonomy. Curricular Neutrality. Law of Guidelines and Bases.

¹ Doctoral student in Educational Sciences at the Facultad Interamericana de Ciencias Sociales (FICS)
E-mail Luciana.prof94@gmail.com

² Doctoral student in Educational Sciences at the Facultad Interamericana de Ciencias Sociales (FICS)
E-mail m.zagoto28@gmail.com

³ Doctoral student in Educational Sciences at the Inter-American Faculty of Sciences (FICS)
E-mail marcia_schia@hotmail.com

⁴ Doctoral student in Educational Sciences at the Facultad Interamericana de Ciencias Sociales (FICS)
E-mail wagnercastelo3@gmail.com

⁵ Doctoral student in Educational Sciences at the Inter-American Faculty of Sciences (FICS)
E-mail mararubia_vettorazzi@hotmail.com



INTRODUCTION

Curriculum planning is an essential component in defining the quality and effectiveness of the educational process. It serves as the foundation on which teaching practices are built, directly influencing student learning and the achievement of educational objectives. Without proper planning, the teaching process can become fragmented and ineffective, compromising the development of competencies and skills necessary for students' academic and personal success.

In this context, curriculum planning acquires strategic importance, as it directs and organizes the contents, methods and assessments that make up the educational experience.

Paulo Tomazinho's proposal on curriculum planning represents an innovative approach that seeks to harmonize structure and flexibility, responding to the dynamic demands of the contemporary educational scenario. The innovation in Tomazinho's approach lies in the way he proposes a balance between the need for a solid structure — which ensures the continuity and cohesion of teaching — and the flexibility necessary for the curriculum to adapt to social and technological transformations. In this way, his proposal meets a fundamental principle of modern education: the formation of critical, creative individuals prepared to deal with a world in constant change.

Tomazinho argues that a well-planned curriculum must integrate in a coordinated manner the aspects of planning, design, development and evaluation. He argues that to be truly effective, the curriculum must be designed not only to meet current needs, but also to adapt to future changes. This view broadens the traditional perspective of curriculum planning, which is often limited to an exclusive focus on immediate demands. On the contrary, Tomazinho suggests that the curriculum should be a living instrument, in constant review and adaptation, reflecting both contemporary needs and forecasts for the future.

The current educational landscape is immersed in rapid and profound changes, driven by globalization and the accelerated advancement of digital technologies. These factors have reshaped not only what is taught, but also how teaching is carried out. Demands for new competencies, such as digital skills and critical thinking, become increasingly urgent. In this sense, rigid and inflexible curricula can quickly become obsolete, unable to prepare students for the challenges of the twenty-first century.

Thus, the need for flexible and adaptable curricula becomes more evident. However, curricular flexibility must be carefully balanced with the need to maintain a cohesive and consistent structure, which ensures the integrity and continuity of educational training. The



lack of a solid structure can result in a dispersed educational experience, harming the education of students.

The curriculum planning model proposed by Tomazinho seeks precisely this balance. He suggests a curriculum that not only adapts to external changes, but also maintains a solid structure that guides and organizes the teaching-learning process. Tomazinho believes that by integrating flexibility with structure, it is possible to create a curriculum that is both responsive and consistent, ensuring that students receive a high-quality education that prepares them for the future.

In addition, he argues that this integration must be continuous, that is, the curriculum must be reviewed and updated regularly to keep up with the evolution of society and the needs of students.

The Law of Guidelines and Bases of Education (LDB), established by Law No. 9,394/1996, offers an essential legal framework for the preparation and execution of curricula in Brazilian educational institutions. The LDB emphasizes the importance of the autonomy of schools and educators in the construction of pedagogical proposals, allowing adaptations that reflect local realities and the needs of students. This aspect of LDB is critical to ensuring that curricula are relevant and meaningful, since they can be adjusted to meet the specific demands of different social, economic, and cultural contexts.

However, the practical application of these principles faces significant challenges. Schools and educators often struggle to balance pedagogical autonomy with normative demands and pressures to maintain curricular cohesion. Lack of resources and pressure for immediate results can also make it difficult to implement flexible and innovative curricula, leading to the perpetuation of traditional models that may not meet the contemporary needs of students.

In this context, Tomazinho's proposal offers a valuable perspective on how to overcome these challenges. Its model provides guidelines for implementing curriculum planning that is both flexible and structured, aligning with LDB guidelines and promoting quality education. Tomazinho's approach can serve as a guide for educational institutions in adapting their curricula, helping them to face contemporary demands effectively.

This study aims to evaluate the application of Paulo Tomazinho's curriculum planning model in the current educational context, investigating how its guidelines can be implemented in a practical and effective way. The analysis will seek to understand how Tomazinho's model aligns with the LDB guidelines and how it can contribute to the improvement of educational quality. Through this evaluation, the article aims to offer insights



into the feasibility and effectiveness of Tomazinho's model, as well as its implications for pedagogical practice and educational policymaking.

DEVELOPMENT

POSITIONING

The curriculum planning model proposed by Paulo Tomazinho emphasizes the importance of a flexible and integrated approach, which covers all phases of curriculum development: planning, design, development and evaluation. Tomazinho argues that the curriculum should be designed to respond not only to dynamic changes in society, but also to the emerging needs of students, recognizing the importance of maintaining the relevance and constant updating of educational content.

This flexible approach allows the curriculum to adapt to the specificities of local contexts and technological innovations. Tomazinho argues that curricular flexibility should be a central component of the curriculum, allowing adjustments that consider local characteristics, changes in social conditions, and technological advances. This entails constantly reviewing and updating the curriculum to ensure that it remains aligned with the needs and expectations of students and society.

The Law of Guidelines and Bases of Education (LDB), in its article 12, provides the legal basis for educational institutions to adapt their pedagogical proposals to the needs of students and the community. This article is fundamental for the implementation of Tomazinho's vision, as it ensures that schools have the necessary autonomy to elaborate and execute their pedagogical proposals according to their specific realities. The LDB establishes that:

Article 12. Educational establishments, respecting the common norms and those of their education system, shall be responsible for: I - preparing and executing their pedagogical proposal; II - to manage its personnel and its material and financial resources; III - to ensure compliance with the established school days and class hours; IV - to ensure compliance with the work plan of each teacher; V - to provide means for the recovery of students with lower performance; (BRAZIL, 1996)

This excerpt reinforces the autonomy of institutions and educators in the elaboration of curricula, which is in line with Tomazinho's vision. However, autonomy must be exercised responsibly, to ensure that curricular flexibility does not compromise educational cohesion and quality. It is essential that when adapting the curriculum, institutions maintain high standards and ensure that all changes contribute to quality education. However, there are challenges to curricular flexibility.



CHALLENGES OF CURRICULAR FLEXIBILITY

While curricular flexibility is an essential concept for adapting the curriculum to contemporary needs, it faces significant challenges. Silva (1999) describes the curriculum as a "territory of power", where legitimate knowledge is defined and often excludes important knowledge. The conception of curriculum as a space for disputes and negotiations reveals that what is considered legitimate knowledge is not a neutral choice, but a reflection of social hierarchies and dominant interests.

Silva argues that the curriculum should not be seen only as a neutral selection of content, but as an arena where identities and differences are constructed, validated, or excluded. The curriculum, therefore, is a territory of power that reflects and reproduces social hierarchies, legitimizing certain knowledge and marginalizing others. This implies that when implementing curricular flexibility, it is critical to consider which knowledges are included and which are excluded, and to understand the interests that shape these decisions.

"The curriculum cannot be understood simply as a neutral selection of content, but as an arena of disputes, a space where identities and differences are constructed, validated, or excluded. It is a territory of power, in which certain knowledges are legitimized and others marginalized, reflecting and reproducing social hierarchies." (SILVA, 1999, p. 15)

For Silva, curricular flexibility must be implemented with a critical analysis of the knowledge and ideologies that influence the curriculum. This requires educators to be attentive to the issues of inclusion and exclusion of knowledge, ensuring that the adaptation of the curriculum does not perpetuate existing inequalities.

Michael Apple (1979) contributes to this discussion by highlighting that the curriculum often reflects the interests of dominant social groups, functioning as a means of reinforcing established ideologies and perpetuating social inequalities. Apple argues that the curriculum shapes the knowledge imparted and the forms of teaching in a way that maintains existing power structures and legitimizes social inequalities:

The curriculum often reflects the interests of dominant social groups, functioning as a means of reinforcing established ideologies and perpetuating inequalities. By shaping the knowledge transmitted and the forms of teaching, the curriculum contributes to the maintenance of existing power structures and to the legitimization of social inequalities. (APPLE, 1979, p. 36)

In this sense, José Augusto Pacheco (2001) also emphasizes the need for a curriculum that responds to contemporary challenges, allowing different contexts and social realities to be taken into account in the educational process.



Therefore, curricular flexibility should not be used to promote ideological views that do not contribute to equitable education. The LDB, with its emphasis on pluralism of ideas and respect for diversity, offers a guide to ensure that the curriculum reflects a wide range of perspectives and expertise. The implementation of curricular flexibility must be done with a commitment to social justice and educational equity, always weaving curricular neutrality and aware of dominant ideologies.

CURRICULAR NEUTRALITY AND IDEOLOGY

The issue of curricular neutrality is central to the discussion on flexibility. Tomazinho argues that the curriculum should be a space where different perspectives can be explored critically, without ideological impositions.

Maurice Tardif (2000), when dealing with teaching knowledge, reinforces that teachers need to be aware of the ideological influences present in the curriculum so that they can adapt it to the real needs of students, without perpetuating inequalities. Teacher autonomy, highlighted by both Tomazinho and the LDB, allows teachers to be the main mediators between the planned curriculum and the reality of the classroom.

The issue of curricular neutrality is at the heart of the discussion on flexibility. Paulo Freire (2011) argues that education should be a space for dialogue and critical reflection, where different perspectives can be explored without ideological impositions.

However, Terry Eagleton (2006) criticizes the idea of neutrality, arguing that it often hides the reproduction of dominant values. Neutrality, therefore, should be understood as a space for dialogue and critical reflection, rather than an imposition of a single vision:

"The claim of cultural neutrality, however, often serves to mask the imposition of certain dominant values. Far from being an absence of values, neutrality, on several occasions, acts as a disguise for the continuity of hegemonic ideologies. It is precisely this alleged impartiality that allows the perpetuation of power structures."
(EAGLETON, 2006, p. 46)

Eagleton's (2006) considerations emphasize that to ensure that the curriculum is truly neutral and inclusive, it is necessary to represent and discuss different perspectives. This requires constant vigilance over ideological influences and a critical approach when selecting curriculum content. The autonomy of educators, as highlighted by the LDB, is essential for them to be able to adapt the curriculum according to the needs of the students, maintaining the integrity and equity of the educational process.

The autonomy of educators is a fundamental principle in the LDB and is fundamental for the implementation of the curriculum proposed by Tomazinho. The LDB recognizes the importance of pedagogical autonomy, allowing schools to develop their curricular proposals



in collaboration with teachers, respecting national guidelines. Tomazinho states that the teacher is the main mediator between the planned curriculum and the reality of the classroom, and his autonomy is vital to adapt teaching to the needs of students:

"The teacher is the main mediator between the planned curriculum and the reality of the classroom. Their autonomy is vital to adapt teaching to the needs of students."
(TOMAZINHO, 2024, p. 29)

The autonomy of educators must be exercised with a critical understanding of the challenges and ideological pressures that can influence education. Saviani (1983) argues that the school plays a contradictory role in reproducing and transforming social inequalities:

"The school, at the same time that it reproduces social inequalities, is also the space where these inequalities can be transformed. It thus performs a contradictory function: it perpetuates the conditions of domination by reproducing existing social relations, but it also contains the potential to overcome these same conditions, opening up possibilities for social emancipation." (SAVIANI, 1983, p. 82)

The author confirms that the autonomy of educators allows them to adapt the curriculum to promote an inclusive and emancipatory education, but it must be balanced with a critical analysis of the external influences that can affect the educational process.

Denise Leite (2003) also warns of the importance of recognizing the political and ideological implications of curricular decisions. Neutrality, if understood as the absence of values, can perpetuate invisible power structures, while a critical approach to neutrality can promote a more just and equitable education.

Educators must be aware of the complexities and challenges involved in implementing the curriculum to ensure that it contributes to social justice and equity in education, so it is relevant to implement critical and reflective practices in this context.

PRACTICAL AND REFLECTIVE IMPLEMENTATION

To implement Tomazinho's model effectively, educators and managers must take a reflective and critical approach. This involves continually analyzing the ideological and social influences that may impact the curriculum and ensuring that adaptations are made in a way that promotes equity and inclusion. The LDB guides the democratic management of public education, including the valorization of teacher autonomy, which must be integrated into pedagogical practice to ensure quality education.

The practical implementation of the curriculum must consider local and contextual needs, allowing the contents to be adapted according to the realities of the students. As



established by the LDB (Law of Guidelines and Bases of National Education) addresses the issue of curricular flexibility and adaptation in article 12:

The educational establishments, respecting the common norms and those of their education system, will be responsible for preparing and executing their pedagogical proposal; manage its personnel and its material and financial resources; ensure compliance with the established school days and class hours; ensure compliance with the work plan of each teacher; to provide means for the recovery of students with lower performance; and articulate with families and the community, creating processes of integration of society with the school (Brasil, 1996).

This requires effective collaboration between educators, administrators, and the school community to ensure that the curriculum is relevant and meaningful to everyone involved. Implementation should involve an ongoing process of review and adjustment, ensuring that the curriculum remains up-to-date and tailored to the needs of students.

In addition, it is important for educators to actively participate in the construction and adaptation of the curriculum, ensuring that their voices and experiences are heard. Collaboration between different stakeholders can enrich the curriculum development process and ensure that the curriculum reflects the diversity of perspectives and needs of the school community. However, there are still questions to be answered.

QUESTIONING

The question of how to ensure that a flexible curriculum maintains its neutrality and promotes critical education is fundamental. To answer this question, a continuous examination of the role of the curriculum in society and the ideological pressures that can influence teaching is necessary.

The contributions of Tomás Tadeu Silva and Michael Apple highlight the importance of constant vigilance over the influences that shape the curriculum and the need to promote an education that values the diversity of thought and knowledge.

Morin (2000) suggests that the balance between structure and flexibility should be achieved through complex thinking, which allows the integration of diverse knowledge and the contextualization of knowledge in the curriculum:

The balance between structure and flexibility in the curriculum must be achieved through complex thinking, which enables the integration of diverse knowledge and the contextualization of knowledge. Such an approach not only allows for a more holistic understanding of educational realities, but also promotes an education that reflects the complexity and interconnectedness of social and cultural phenomena. (MORIN, 2000, p. 43)

This approach is in line with the LDB guidelines for the formation of a critical and reflective citizen, capable of understanding and responding to the complexities of the



contemporary world. The implementation of the curriculum should therefore be done with a critical and reflective approach, ensuring that teaching is relevant, inclusive, and able to promote a deep and comprehensive understanding of the social and cultural issues faced by students.

This complex thinking is necessary for the curriculum to remain dynamic and adaptable, without losing sight of the fundamental principles of an inclusive and emancipatory education. Ivor Goodson (2007) emphasizes that the curriculum must be constantly reviewed and adjusted to reflect social and technological changes, without distancing itself from its pedagogical objectives.

Ultimately, curricular flexibility must be implemented with a commitment to social justice and equity, ensuring that curriculum adaptations promote education that meets the needs of students, without immolating the quality and cohesion of the educational process.

CONCLUSION

The analysis of the curriculum planning model proposed by Paulo Tomazinho reveals the complexity and importance of balancing structure and flexibility to ensure a high-quality education. Tomazinho's model offers an approach that values both the organization and continuity of the curriculum and the ability to adapt to social and technological changes. This duality is categorical in an ever-evolving educational context, where the need for innovation and adaptation must be harmonized with the maintenance of a solid and coherent foundation.

The concept of flexibility in the curriculum allows it to adjust to different social realities and demands, without losing sight of the essential objectives of education. This progressive view recognizes that while knowledge and skills are universal in many ways, the way they are imparted must take into account the regional and cultural specificities of students. However, this flexibility must always be managed with caution so as not to weaken the coherence and consistency of the educational process. Tomazinho argues that the key to successful implementation is the balance between innovation and tradition, allowing the curriculum to evolve without losing its essence.

The Law of Guidelines and Bases of Education (LDB) offers the necessary legal support for the curriculum to be molded to the specific needs of students, without abandoning the fundamental principles of education. It guarantees educators the autonomy to adapt the curriculum to the needs of the school community, while promoting guidelines that ensure the quality and equity of teaching. However, the implementation of this flexibility faces practical challenges, especially with regard to curricular neutrality, resistance to



change, and ideological pressures that can influence both educational processes and curriculum formulation itself. Therefore, constant care is needed to prevent flexibility from becoming synonymous with incoherence or loss of quality in education.

The results obtained in this research offer significant contributions to both society and academia. For society, the investigation reinforces the importance of curricula that, in addition to keeping up with the pace of contemporary changes, promote a critical, inclusive education that prepares students for the complexity of today's world. In an ever-changing global landscape, education needs to train citizens who have not only knowledge, but also skills to think critically, solve problems, and adapt to new realities. This type of training not only enriches the individual, but also strengthens society as a whole, preparing active citizens committed to the common good.

For academia, this study provides important reflections on the application of Tomazinho's model in curriculum planning, reinforcing the need for an approach that balances tradition and innovation. The research contributes to the development of curricular theories that are both pragmatic and reflective, capable of dealing with technological and social changes, without losing sight of the essential educational objectives. The implementation of curricula that are both flexible and consistent with educational principles is one of the biggest challenges faced by educational institutions, and Tomazinho's model stands as an important reference in this process.

However, it is important to note that research has its limitations. The analysis was mainly focused on Tomazinho's model and, although it offers valuable guidelines, it may not fully reflect the different educational realities present in different regions and education systems. The diversity of cultural and educational contexts demands that the model be adapted and reconfigured according to local needs, which was not always explored in sufficient depth in this study. In addition, the study did not delve sufficiently into external influences, such as power dynamics and ideological pressures that can compromise the neutrality and equity of the curriculum. These external, often invisible forces play a crucial role in how the curriculum is interpreted and implemented in schools and need to be considered in future investigations.

Therefore, future research can explore in more detail how Tomazinho's model can be adjusted and applied to different educational realities, taking into account regional and cultural specificities. In addition, it would be of great value to investigate more deeply the external influences acting on the curriculum, especially with regard to ideological pressures and power dynamics, in order to ensure that curricular flexibility does not compromise its



quality and equity. Understanding how these forces shape curricular practice can contribute to building a more robust and equitable education system.

In short, Tomazinho's model offers an innovative and valuable approach to curriculum planning, suggesting a path for curricula that can effectively balance structure and flexibility. By aligning theory and practice, the model opens up possibilities for educational institutions to not only adapt to contemporary transformations, but also promote critical, inclusive, and transformative education. This balance between innovation and tradition is crucial to prepare students who are not only recipients of knowledge, but also active, critical citizens prepared for the challenges of a constantly evolving world.

Finally, it is essential to recognize that the success of the educational process depends on the ability to continuously review and update curricula, while maintaining a critical and inclusive approach. The commitment to the quality and relevance of education must be permanent, in order to form citizens capable of facing the changes of the modern world. Future works that deepen these discussions will certainly contribute to an education that is increasingly aligned with the needs of contemporary society.

Therefore, the key to achieving quality education lies in the ability to adapt the curriculum in a reflective and informed way, ensuring that it remains relevant and effective in the current educational context. The constant review and updating of curricula, combined with a critical and inclusive approach, is essential for the formation of citizens capable of facing the challenges and taking advantage of the opportunities of the modern world.

ACKNOWLEDGMENTS

This work is the result of a collective effort that would not have been possible without the support and dedication of several people. First, we express our deep gratitude to our family members, who offered us unconditional support during the research and writing process. The patience and understanding of each of them were essential for us to be able to dedicate the necessary time to the preparation of this article, and without their encouragement, this journey would have been even more challenging.

We especially thank our educational institution FICS and our doctoral classmates, who provided us with an environment conducive to debate and the maturation of the ideas presented. The discussions held in our academic meetings were decisive for us to refine our critical thinking and explore in more depth the curriculum planning model proposed by Paulo Tomazinho.

In addition, we want to express our sincere recognition to Professor Dr. Paulo Tomazinho himself, whose work was the central inspiration of this study. His contributions to the field of



education, particularly with regard to flexibility and balance in curriculum planning, were extremely important for the development of this article. The analysis of his model allowed us to reflect on the practical implications of his ideas on the quality of education and to expand our understanding of the topic.


We are also grateful to the reviewers and editors of this publication, who, with their thoughtful observations and constructive suggestions, helped to enhance this work and ensure that the content was presented clearly and accurately. Your contributions were valuable in raising the academic level of this article.

Finally, we want to register our gratitude to all those who, directly or indirectly, collaborated in the realization of this study. Whether through conversations, critical readings or technical support, each contribution was essential for us to be able to complete this research with the desired depth and quality.



REFERENCES

1. APPLE, M. W. (1979). *Ideology and curriculum*. São Paulo: Brasiliense.
2. BRAZIL. (1996). Law No. 9,394, of December 20, 1996. It establishes the guidelines and bases of national education. *Diário Oficial da União*, Brasília, DF, 23 Dec.
3. BRAZIL. (2000). *Curricular parameters of high school*. Brasília: MEC.
4. BRAZIL. (2006). *National curriculum parameters: High school*. Ministry of Education, Secretariat of Medium Education and Technology. MEC; SEMTEC.
5. EAGLETON, T. (2006). *Theory of literature: An introduction* (W. Dutra, Trans.; 2nd ed.). São Paulo: Martins Fontes.
6. GOODSON, I. (2007). *Curriculum: Theory and history* (3rd ed.). Petrópolis: Vozes.
7. LEITE, D. (2003). *Curriculum: Policy and practices*. Porto Alegre: EDIPUCRS.
8. LÜDKE, M., & ANDRÉ, M. E. D. A. (1986). *Research in education: Qualitative approaches* (2nd ed.). São Paulo: EPU.
9. MORIN, E. (2000). *The seven knowledges necessary for the education of the future*. São Paulo: Cortez.
10. PACHECO, J. A. (2001). *Curricular studies*. Porto: Porto Editora.
11. SAVIANI, D. (1983). *School and democracy*. Campinas: Associated Authors.
12. SILVA, T. T. da. (1999). *Identity documents: Introduction to curriculum theories*. Belo Horizonte: Autêntica.
13. TARDIF, M. (2000). *Teaching knowledge and professional training*. Petrópolis: Vozes.
14. TOMAZINHO, P. (2024). *Curriculum: Planning, design, development and curriculum evaluation*. São Paulo: Educators.
15. TOMAZINHO, P. (2010). *Curriculum planning: Fundamentals and practice*. Curitiba: Ibpex.

STRATEGIES TO COPE WITH REPETITIVE WORK IN THE TEXTILE INDUSTRY <https://doi.org/10.56238/sevened2024.029-043>**Alana Pires Dale¹ and Daisy Moreira Cunha²****ABSTRACT**

This is an ongoing doctoral research, which aims to identify the coping strategies used by workers in the textile industry in the face of repetitive work, we carried out a case study, based on the Ergonomics of the Activity and Ergological Approach to Work. With the participation of workers from a textile industry in the interior of Brazil. Observations, document collections, and semi-structured individual interviews were carried out. As strategies, we identified the reduction of the work pace, the use of knowledge related to machines and operations (constituted and invested), ingestion of medications, stretching before and during activities and the choice of the best way to transport materials. Even in the face of standardized procedures, it is clear how workers make *use of themselves*, through individual and collective constructions, in the search for the preservation and maintenance of health. In the search for the preservation of health, individual and collective actions and constructions stand out, even in the face of strict prescriptions.

Keywords: Repetitive movement. Coping strategies. Textile industry. Occupational risks.

¹ Doctor in Education
Federal University of Minas Gerais

² Doctor in Philosophy
Federal University of Minas Gerais



INTRODUCTION

Similar to what happened in many countries, in Brazil the textile sector was one of the pioneers among the industries and still has great importance for the national market and economy. In our territory, in 2017 there were 29 thousand formal industries operating in this field of activity, being the 4th largest clothing production park and the 5th largest textile producer in the world. In that same year, the revenue of this production chain reached US\$ 45 billion, with annual production of 5.9 billion pieces. The sector directly employed 1.479 million workers, reaching 8 million, including indirect hiring, of which 75% are women. It was the 2nd largest employer in the manufacturing industry, behind only the food and beverage sector (ABIT, 2017). In the period from January to September 2019, the textile and clothing sector generated 14,504 formal jobs in the country, in addition to 137,269 in the transformation sector (ABIT, 2020).

Even with so much strength within the national market, the textile industries suffered a great impact in the face of international competition, which forced national companies to seek ways to remain among the largest producers in the world. Its efforts consisted mainly of investments in the modernization of production and machinery. Recent data provided by the Brazilian Textile Industry Association (ABIT) show that in 2018 the country invested a total of 1.92 billion reais, increasing in 2019 to 2.02 billion (ABIT, 2020). The main threat to the Brazilian market comes from Asian countries, especially China, India, Pakistan, South Korea, Taiwan, Indonesia, Malaysia, Thailand and Bangladesh, responsible for 73% of world production. It was from the entry of foreign products that many small and medium-sized industries closed their doors in Brazil, due to the difficulties encountered in competing with the low prices offered by competing companies. So, its bet was on the production of superior quality items, taking advantage of the fact that it is one of the few owners of the entire production chain and a major producer of its main raw material, cotton.

The choice of the field for this study came from the expressive prestige and value that the textile industry has in the region where one of the researchers lives. This sector is a great generator of jobs and income for the municipality. Currently, in the company that is the focus of our research, the number of direct workers is around 750 people. Operating 24 hours a day, seven days a week, consisting of three eight-hour shifts. Not unlike most industries in the country, it is also going through a process of modernization of machinery, which occurs at a slow pace, due to lack of capital for investments. The purchase of new equipment has been happening gradually, and this process, which clearly benefits the quality and speed of production, is also responsible for the dismissal of workers, who make a living from this work.

Marx (1975/1890) already brought the importance of machines in industrial production, especially in the textile industry, but placed as the main function of the worker that of serving the machine, thus following its rhythm, mostly constant and uniform. What the author does not discuss in this passage are the singularities of the subjects, revealed in the real of the work.

In a study carried out by Saraiva & Provinciali (2002), in a textile industry organized based on Taylorist principles, it was found that 74.6% of the workers do not have any type of autonomy in relation to the operations carried out within the company, however a contradictory discourse is perceived, which I believe is related to what the Ergological Approach to Work and the Ergonomics of the Activity recommend, the distance between prescribed work and real work, as at least half of the workers heard in the survey highlight the importance of initiative and personal judgment in the performance of work activities. In other words, the machine demands, but the worker manages even if infinitesimally to put a little of himself into the activity, adapting in subtle ways to his personality.

Santos & Marques (2006), in a study with *call center workers*, witnessed 46% of the subjects reporting the lack of autonomy to reorganize their work activities, considering that the Taylorist model is predominant in relation to the organization of work in that place.

Taylor ignored man as a unit, valuing only the mechanical aspect of the workers (Friedmann, 1956). It aimed at work in standard time, with simple execution movements, inducing the worker to automatism, which were mere executions of predetermined tasks (Oddone, Re & Briante, 2008).

The operative type of work constantly seen in the activities guided by this Taylorist model is characterized by explicit and embarrassing prescription (Schwartz, 2004). Through it, there is a rationalization of the work and the actions performed by the workers, treating them in the same way as the local machinery, resulting in a clash with the vital resistance of the subject who works, possessing strong singular interests, which stand out from the constant attempt at control. Taylor's knowledge in the field of engineering provided him with a superficial thinking in relation to human subjectivities, believing that he could prevent workers from thinking during their work and the consequences of their actions. It was aimed only at subjects performing tasks (Canguilhem, 2001).

But from the need to modernize spaces and equipment, in view of the growing entry of competition in the domestic market, we observe the gradual increase in the use of the Japanese model in industrial production processes, according to Trindade (2016), the implementation of Toyotism in Brazilian industries does not occur in the same way as it is done in its country of origin, Japan. The socio-historical development of each nation marks

the level at which such a process will take place. In Brazil, we still witness the use of different production models, in certain sectors of the textile industry, there is the coexistence of the Taylorist-Fordist pattern (control of time and mode of production), as well as the presence of the Toyotist pattern (organization of workers in cells, production on demand, flexibility in production, at work and with workers, kanban, diversity of products, intensification of work).

In contrast to what we say about Taylorism and the transmission of knowledge among workers, in the Japanese model, this process is no longer so simple, as working in cells makes it difficult to contact and exchange information between colleagues (Trindade, 2016). Thus harming the transmission of knowledge, arising from collective constructions and passed on among workers.

In Toyotism there is also the alteration of machinery and the industrial plant (with an environment previously full of workers, allocated side by side), for spaces occupied by modern machines and flexible production, which requires a reduced number of subjects to carry out the operations or simply supervise the machines (Heloani, 2003). A new profile of worker emerges, previously unobserved, they are polyvalent, qualified individuals, with freedom to express their creativity and autonomous (Jinkings, 2002).

Much is said about the growth of the Japanese model in industries, a true fact, but which does not cancel out the still prevalence of Taylorist principles in these sectors, they coexist. Trindade (2016) brings in his article this aspect, the advance of the Toyotist system in the textile industry, however, he reiterates the non-rupture with the previous processes (Taylorism/Fordism), this mixture, according to the author, is observed in production as a whole, in different sectors, it is possible to identify the adoption of different modes of work organization.

Santos and Marques (2006), on the other hand, bring this coexistence of two models separated at the macro level with the adoption of Toyotism and micro of Taylorism. This is how they describe the activities of *call center workers*, in which they have characteristics of "a flexible production that satisfies a globally segmented and networked production organization" (2006, p. 81). But together with a standardized arrangement, with routine, equal activities, with no room for maneuver, imposed and not very complex.

Even in an emerging context of flexible work and technological modernization, in the company addressed in our study, Taylor's production model stands out as a managerial and administrative culture, whether in the organization of tasks, space, or the way workers are monitored. In a few items there is the intention of making the tasks more flexible, which are

minimal. The lack of resources for the total replacement of machinery is one of the reasons for the still domination of the Scientific Administration of Labor in this place.

This is then an important point in our study, the indisputable presence of real work in the work activities developed, even in the most rigid and controlled environments, with a small margin of autonomy in the choices of their actions, a point witnessed in the observations of the work and in the speech of the subjects, making clear the diversity of knowledge built from needs confronted in daily life, and competent especially in situations that make people sick.

But one thing is certain, regardless of the model adopted by the company, the characteristics of capitalism in general are determined in: owners of the means of production aiming at the multiplication of their income and, in capitalism, this process occurs through surplus value, also called surplus labor, which corresponds to the value produced by the worker minus the exchange value of labor power (wage) (MARX, 1971/1890). It is the surplus value that the capitalist appropriates, his source of profit. It represents, in a way, the rate of exploitation of the worker's labor (Netto & Braz, 2006), Marx (1971/1890) brings this situation as unpaid work, and explains,

The capitalist pays the value of the labour-power, or its price, which does or does not coincide with the value, and receives in return the right to dispose directly of the living labour-power. He enjoys the force of work in two periods. In a period, the labourer produces only a value which is equal to the value of his labour-power, and therefore an equivalent. The capitalist thus receives a product of a price equal to that which he paid for labour-power. [...] But in the period of surplus labour, the labour-power which the capitalist uses produces for him a value which costs him no return. It exploits the labor force free of charge. In this sense, surplus labor can be called unpaid labor (1970/1890, p. 612, 613).

Silva, Silva & Mendes (2017) reinforce this idea by bringing the constant search of companies to multiply the gains on the use of working labor, thus leaving fundamental aspects for working with health in the background. Including an adequate organization of work, in addition to material and structural aspects based on the local reality and the subjects there.

The lack of appreciation of the good working conditions and life of workers is a determining factor for the multiplication of agents harmful to health, which generate suffering and illness. In a study carried out by Santos, Paula & Pereira (2009), in a textile industry, several risks were identified, among them: physical (noise and heat), chemical (dust), psychological (stress), ergonomic (inadequate posture, repetition of movement) and mechanical (accidents with machinery).

In view of these realities experienced at work, composed of sickening situations, and devoid of individual adjustments, the subjects use strategies to face the existing adversities on a daily basis, which are their tools for permanence at work. Bring

These strategies they use are in a way a mechanism used by everyone within the work, in particular ways, motivated by the needs of each one and guided by knowledge and values.

Work routines with repetitive characteristics are in fact distinct in their details, and they require and allow, even if timidly, the worker's private intervention. The protection maneuvers are created and improved throughout a life history, inside and outside the work environment, it is from the awareness of the actions performed and their consequences on the body and the psyche that the subjects are able to make their choices/arbitrations, carrying out a necessary debate between their personal norms, the norms preceding it and the concrete situations they find before them, the main point covered by ergology, the reactions of workers in the face of the infidelities of the environment.

From these situations of debate, which require daily struggles to maintain health, personal and family sustenance, we want to understand how it occurs and what are the forms of protection against the risks present in repetitive work. How do workers build strategies?

With this process, we seek to immerse ourselves not only in what is verbalized by the workers, but also in the actions performed unconsciously, with ingrained attitudes, built and used throughout a working life.

Seeing the context of how the strategies are used, their characteristics and particularities, we can then think of them as an activity, as it encompasses the intimacy of each worker, their actions and arbitrations.

Thus, we aimed to identify the coping strategies used by workers in a textile industry when performing repetitive work.

This article is part of an ongoing doctoral research, bringing data measured up to the time of submission of the text.

THEORETICAL PATHS IN SEARCH OF THE USES OF THE SELF

Strategies are actions or behaviors used when subjects must deal with a danger or enemy, situations that present problems or threats, as in the case of an unhealthy work environment, representing a part of the real work activity. According to Dias, Santos & Aranha (2015, p.221) "it is in the nature of human beings to reconstruct the environment in which they live in order to guarantee their singular existence". According to Canguilhem

(2001, 2009), for the subject to maintain his health, he needs to establish his own norms, in front of external norms.

Guérin, Laville, Daniellou, Duraffourg & Kerguelen (2001) point out that, when subjects perceive the body's signals that something is wrong, through pain, discomfort, limitations, they immediately seek new ways to perform activities, their operative modes, within the margin of available freedom. They also add that the work activity is "a strategy of adaptation to the real work situation, object of the prescription" (2001, p. 15). In other words, it is always this confrontation between organizational protocols and the individual reality of work, divergent from a mechanical scenario, but expressing singularities in the doing.

Strategies for adapting to situations represent real activity. This encompasses a set composed of body, thought, desire, representations and history, which are developed in the personal (here are the coping strategies) and social dimensions of the subjects (Guérin et al., 2001).

The Ergological Approach to Work deals with several issues with regard to this search for strategies, not using this term exactly, but making discussions that lead us to such a discussion. In the approach brought by Schwartz & Durrive (2015), reconfiguration, that is, renormalization of imposed norms, is a universal act in human activity. And why do the subjects do this? The answer is the search for a healthy life. According to the authors, living in health is not accepting the impositions of the environment, without first questioning them, hierarchizing them, trying to adapt, create and renormalize them.

When a worker is deprived of making deviations, choices in his actions, necessary for the maintenance of his well-being at work, he gets sick. The deprivation of freedom of choices in doing is pathological (Canguilhem, 2009). But the ability to create your own rules and put them into practice is a process that requires time, experience, and knowledge exchanges. Canguilhem (2009) reiterates that health is "a balance achieved at the cost of incoactive ruptures" (2009, p.131), where the subject, when faced with threats, creates new constitutive elements to maintain it, that is, to be healthy is to be able to be normative in the face of the risks of the environment, in different situations, to have the possibility of tolerating infractions in relation to the usual norm and to create new norms. Life is made up of debates, explanations, escapes and dodges, and not, as some imagine it, monotonous and rectilinear. Daily interventions and creations are required, and at every moment, because one day-to-day work is never the same as another.

The creation of strategies is a consequence of learning and experiences acquired at work, and time is paramount in this process. The know-how, the competencies and

subjectivities of the subjects are fundamental when defining these mechanisms, providing the subject with the ability to dominate the production and infidelities of the environment. In most cases, what defines these individual choices are the criteria of values attributed by each one (Assunção & Lima, 2009, Guérin et al., 2001).

Schwartz & Durrive (2007) bring strategies as doing things in a *different way*, that is, workers are constantly using *themselves* in activities. These changes have to do with the distance between the prescribed work and the real one, which refers to the activity performed by *the body itself*, they are acts that most of the time occur unconsciously, without the need to think about each gesture to be performed. And I reinforce by stating that this distance is explained according to the values present in that environment, which guide and define each activity. Still on the *body itself*, the authors continue, it is the "arbiter in the most intimate of the activity, it is not a delimited, defined "subject", but an enigmatic entity that resists attempts to be objectified (2007, p. 198)".

The subject who acts, chooses, arbitrates in the face of work situations, performs uses of *himself in the activity*. It is composed of values, knowledge and skills. Attributes that give room for them to reinvent their ways of living, of being, of surviving with themselves, with the world and with others (Schwartz & Durrive, 2015). The individual then carries out debates between his own norms and the antecedent, organizational norms, dare now, he renormalizes.

Renormalizations, which are multiple managements of variability, of holes in norms, of weaving of human networks, are actions that are difficult to anticipate how they will be done, as they come from singular beings in work situations, allowing for micro-decision variables that concisely define the result of the activity (Schwartz, 2011; Schwartz & Mencacci, 2008). In addition to providing our highlight of this study, the creation of unique strategies to face the challenges of the environment (Schwartz, 2000).

According to Schwartz & Durrive (2015), renormalizing is a universal factor among workers, as strictly complying with external standards is *impossible*, a fact that has already been highlighted, in which each worker, based on needs, makes individual options for actions in the activity. And it is also *unliveable*, that is, harmful to health, because it tries to treat different beings in a similar way.

In the work environment, these renormalizations are used so that the worker is healthy to keep working, in order to meet his subsistence needs. "Health begins with the attempt to partially redesign the environment in which one lives, according to its own norms elaborated by its history" (Schwartz & Durrive, 2015, p. 334), and this work on norms is guided and hierarchized based on a set of values.

But for adequate renormalization to occur, the worker's global and organizational knowledge must fit into the specific knowledge for each situation (Schwartz, 2014). That is why it is important to highlight the importance of knowledge at work, as it is a contributing factor to coping.

Based on the general objective of this study, we can consider the *use of oneself by itself* as our main point, as this term designates the ability to reinvent a certain way of being at work individually and collectively. In other words, it is the alchemy of a *body-itself* that considers the pre-constructed (the prescribed) and gives it its singular form (Schwartz & Durrive, 2015), thus enabling the construction of coping strategies.

The *use of the self* means, then, to put into action memory, body, gestures, sensibility and intelligence, coming from the experience of the subject himself and his history, in the face of the infidelities of the environment (Schwartz & Echternacht, 2007; Schwartz & Durrive, 2007). In the activity, the subject is summoned in his singularity, equipped with capacities much more complex than those required by the task (prescribed work) (Durrive & Schwartz, 2008). Uses impose on subjects the continuous realization of permanent micro-choices (Schwartz, 2014), considering that no day is the same as another.

By making *use of themselves* over the impositions, the workers manage to renormalize, keeping them at work, healthy, confirming the idea of Schwartz and Canguilhem.

In the company, the focus of this study, these variations during the day are easily observed, even though their main characteristic is repetitive activities. Among these deviations are: lack of material, or of some operator, defect in the machinery, change in the quality of the material (cotton), defect in the product.

METHODOLOGY

This is a case study, supported by the Ergological Approach to Work, which is the main support for understanding the relations of the use of labor within the textile industry in question. In addition, it helped to understand how norms and prescriptions try and often succeed in neglecting the uniqueness of workers, causing damage to their health (Schwartz & Echternacht, 2007). We also use the Ergonomics of the Activity, with the important contribution to the understanding of the relationship between the prescribed work and the real work, and above all in the constant negotiation and distance between them, when it reveals the true density of the activity, that is, showing that the activity is never the pure chain of rules and procedures designed by the organization for the worker.

Such bases support us in the understanding of human activity, focusing on "its actions, its functioning, its intentions, its values and competences, knowledge and meanings that it attributes to its work and the tasks that are assigned to it" (Cunha, 2009, p. 228). In order to understand the work activity, we must give voice to the subjects who experience the process that occurs in that environment, and not to a model of study of prescriptions and manuals for performing certain tasks (Moraes & Pinto, 2011).

The research was carried out in a textile industry in the interior of Brazil, and had as main participants of the study, workers who perform repetitive movements. But we highlight that foremen, inspectors, managers, laboratory technicians, occupational safety technicians, those responsible for the human resources department, operators from other sectors, at different times were essential for a better understanding of the company's activities and the construction of the research

The investigation was divided into two parts, an exploratory phase, which refers to the approximation of the research problem with the place, population studied and production process. It is a phase of deepening that aims to emerge with detail in the individual strategies of each worker.

In the exploration phase, the global recognition of the industry was initially made, with exploratory studies with observations to understand the production process, with regard to the arrival of cotton, until the departure of the fabric already printed, which enabled the elaboration of a complete flowchart of the industry. Cursive observations – without dialogue with the subjects – and participatory observations – with some dialogues, but without intervention in the progress of the activities – of the chosen segments. To complement the observations and ergonomic analysis, we also collected the Operating Procedures (O.P.) adopted by the industry, which are written documents that contain the operations that each function must perform during its activities. It is a standardized document, without adaptations to the individual characteristics of workers, that is, common to all workers.

After some visits to the company and conversations with foremen, three functions were chosen to participate in the research, all in the spinning sector: spinning mill lowerer, autoconer winder operator and 2nd pass dowel operator. For this selection, we used the main inclusion criterion of the project, which is the performance of repetitive movement (of different durations).

During the observation phase, all workers in these three sectors were monitored. They were invited to the interviews, but only nine agreed to participate.

Focusing on the immersion of the coping strategies used by the workers, we conducted semi-structured individual interviews, guided by generating themes and confrontation with the content captured in the observations (the reasons why they perform the activities in certain ways), at this moment when we sought to identify the reason for adopting each action, in each situation.

Topics such as working time, turnover, professional training, age, gender, feeling of discomfort at work, autonomy at work, illnesses, cooperation among workers, among others, were addressed.

But throughout the process, whether in observation or in interviews, it is evident the difficulty in capturing aspects as small as knowledge, values, *uses of oneself*. Issues that are often unknown to them, but which in reality are the true protection strategies. The construction of protective means against occupational risks are actions that we can perceive when we compare individuals, activities in relation to operational procedures, or after questioning during interviews. Protection is for them, a doing in another way, different from what is prescribed, but better for him.

RESULTS

In this first moment, we present characteristics of the field of study and the population in focus, as well as general data from the deepening phase (still in the process of content analysis).

Even though we do not have the final results of the study, it is already possible to visualize characteristics of the activities performed, risks present in the tasks and some coping strategies.

In the observations, 15 workers from three functions were followed: spinning mill lowerers (three men and one woman), 2nd pass passer operators (three men and one woman) and winder operators (seven women).

We noticed that there are characteristics common to the different functions, such as the performance of repetitive movements, however each one requires movements particular to its function and distinct among each worker, thus representing the singular activities.

Below we bring general data regarding the three functions covered, focusing mainly on the characteristics of the tasks.

- Ring spinning: they are responsible for harnessing, unloading and loading the spinning machines. Its characteristics are the performance of repetitive movement; standing all the time; carrying weight; ergonomically inadequate posture, risk of accidents, agility requirement, high temperature of the

environment; intense noise. The most compromised body parts in this sector are legs; column; Shoulders; Fingers; neck; Elbows; Fists.

- 2nd pass passer: Its main function is to duplicate, standardize and parallel the cotton fibers. Their activities are characterized as repetitive in many moments; with permanence in the standing position; high ambient temperature; intense noise; excess cotton powder in the air and in machines; constant attention; handling of large materials; risk of accidents; excessive tasks, machines ergonomically inadequate for workers. The most compromised body parts in this sector are legs; Shoulders; Arms; Elbows; column; Fingers.
- Autoconer winder: Its main assignment is to transform the bobbins of the spinning machines into coils (packaging change). We observed as typical of this function, the performance of repetitive movements; standing at all times; displacement of heavy objects; risks of accidents; ergonomically inadequate posture; need for constant attention and agility; charging for product quality; multiple tasks. Due to this character, the parts of the body of workers that are most affected in this sector are, legs; column; Shoulders; Elbows; neck; Fingers; Fists.

Among the functions observed, that of spinning harness is the one with the lowest number of tasks, forcing workers to remain for a long time concentrated on the same activity, which basically consists of the movement of removing bobs and putting shins on the spindles. But I reiterate that the repetition of movements is present in the 3 functions observed, since this is the mandatory characteristic for the choice of groups.

Repeated actions can be presented with different cycle durations, that is, short, medium and long. In addition to movements that are also distinct on certain occasions, what we must take into account mainly is the totality of repeated movements made throughout the workday, resulting in a sum of loads on the subject who worked there (Brasil, 2018).

The movements, in addition to being repetitive, must also be agile, as it is the responsibility of the workers to maintain control and full operation of the machines on which they work. The non-cessation of the machines is fundamental, whether due to lack of material, lack of lowering or cotton. In the midst of the tasks to which workers are submitted, constant attention to the operation, movement of machines and what happens around them is paramount, both for the activity to occur harmoniously and for accidents to be avoided.

The causes of accidents or occupational illnesses can be related to some factors present in this environment, among them we can mention as health risks, carrying heavy boxes without proper care, handling large materials, standing up throughout the working

day (in the three sectors there are times when there are no activities to be carried out, even so, they must remain in a standing position, which can reach three hours in a row).

Regarding the postures adopted at the time of work, many variations were observed, according to employees of the company's Human Resources (HR) they seek to allocate workers with an anthropometric profile consistent with the machine in which they will work, such as in the winder, which is a short machine, they only have women working, they report that they are better suited because they have a smaller stature than men. However, it was possible to perceive in the three functions, the adoption of inappropriate postures and excessive effort to reach materials and handle the machines.

In addition, there are other characteristics such as high temperature, intense noise and excess cotton dust as factors that can be harmful to the health of workers in the long term, causing respiratory tract diseases, hearing problems, among others.

When asked about quantitative production targets, they said there were none, but mentioned the demand for the quality of the products (bobbins, bobbins), resulting in fear about possible failures and defects in the final material.

We have observed above that there are several risks present in this environment. But even with so many factors that would be key to serious illnesses and absences from work, we realize that many there have been working in the activities for years, and this question that worries us, what coping strategies do these workers use to, even performing activities with so many risks, be able to stay working?

The strategies are unique among the workers, but built from a collective, which in the face of obstacles, always seek the "best way", and are then, subsequently, appropriated and renormalized by the individuals, based on their constituted and invested knowledge, their values, internal norms and experiences.

The group of subjects who participated in the deepening phase is very diverse, in terms of age, time in the job and education.

Chart 2 – Profile of the workers interviewed

Name	Age	Time in the role (years)	Industry	Schooling
Raquel	25	4	Colander	Complete high school
John	42	10	Arriador	Complete Fundamental
Thulium	44	7	Colander	Fourth grade of elementary school
Sofia	49	8	Winder	Fourth grade of elementary school
Peter	50	8	Arriador	Fifth grade of elementary school
Fernanda	53	30	Winder	Complete high school
David	53	19	Arriador	Fourth grade of elementary school
Erica	56	4	Winder	Seventh grade of elementary school
Mary	60	10	Winder	Complete high school

Source: Author's archive (2019)

Taking into account all the risks presented above, which were identified in the observations and dialogues with the participating workers, we then sought to identify the individual and collective strategies used by the subjects in order to maintain health and work.

We present this data with separation by functions, thus facilitating the explanation of the data and descriptions.

SPINNING HARNESS

Among the functions assigned to the lowering agents is the transport of material from the spinning mill to the winding sector. What we must analyze in this task is the way each operator transports the boxes between the carts and why they choose such actions.

According to Schwartz & Durriue (2007), the study of "doings" at work is the best way to assess the personal values of workers. For, as Friedmann (1956) states, behind all work there are workers, and behind these subjects there are social and moral relations that integrate them.

In this activity, David and Pedro choose to carry two or three boxes at once, claiming that even though it is heavier, they prefer the greater agility of the process. João, on the other hand, unlike the others, chooses to handle only one box at a time, reporting that this is the least harmful way to health, in addition to the fact that there is no need to perform such an activity at a higher speed.

These choices are renormalizations made from the *uses of the self* always aim to find the best way, the best way to carry out the activity, each in their own way, with a constant search for well-being at work, these interventions can come in the form of: implementing their creative capacities, creating defense mechanisms against the risks of work and placing themselves as unique beings in the midst of a collective (Silva, Silva & Mendes, 2017).

This activity, even though it is not included in the P.O., is the function of all spinning mills, as it is one of the processes that make up the task as a whole. Because they are not included in the manuals, workers have freedom of choice in relation to the way of doing things, each one chooses the way they believe is most appropriate, as reported above.

Sometimes, you wanted to do it one way, but you see, "oh, guys, what nonsense", sometimes you do it just as quickly, you save time for the same thing, to pick it up, the same way you pass it, put it quickly there, the same thing as you take two, three boxes, there's no need, you have to look at your body (João).

The intelligence of workers arises from routine constructions, and even illness can be a driver for learning, resulting in knowledge that will help in future activities.

This was the case with Pedro, after an elbow injury, caused by the repetitive movement of removing heels. After becoming ill, the worker created his own way of performing this action, thus avoiding the aggravation of the damage already installed, in addition to other pathologies related to this activity.

This ability to change, create, renormalize, do differently, make *use of oneself* has a direct connection with the experiences lived at work and time in the function, allowing the subjects to expand their knowledge and their abilities to deal with adversity (Oliveira & Brito, 2011).

It is this placement of knowledge in the action of working, personalizing activities, rewriting history in the form of renormalizations (Schwartz, 2003), that characterizes these changes in the way of "doing", filling the void of norms existing in labor relations (Schwartz & Durrive, 2007), thus placing their own norms, always seeking their own benefit.

Pedro, still starting from his history in the spinning mill and knowing the times and rhythms of production in the spinning mill, proposed to the other tillers (from the other shifts) the separation of two or three machines per pair, to carry out the cleaning of the spindles, thus reducing the number of tasks and consequently the intensity of work for all. But the lack of commitment of some resulted in the failure of the strategy, resulting in the obligation of all workers to carry out the total cleaning of the machines. This is an example that demonstrates a loophole in the rules in relation to the tasks to be performed in the sector, giving workers the opportunity to define certain actions, but without the union and collaboration of all, it is not effective.

The organization that opens up to the knowledge of workers, giving them even minimally the opportunity to change ways of working, significantly reduces the suffering caused by rigidity in the conduct of activities. In addition to maintaining health, workers can also contribute to production, as they are great connoisseurs of the real work (material used, operation of machines, common failures). Activity Ergonomics defends the autonomy of subjects within the work, whether in relation to the organization, environment and/or components for carrying out activities. Making it clear that this should be a reciprocal relationship, in which the two parties should come to an agreement, thus resulting in mutual gain (Wachowicz, 2013).

This passage also reiterates the importance of work and collective constructions, thus benefiting the entire working group. But as identified in this study, without everyone's collaboration, changes do not occur effectively.

These collectives of workers can also create their own norms, based on the problems faced in the activity (Schwartz & Durrive, 2015), as in this case, the cleaning of the spindles, a high-intensity and fast-paced activity.

Davi, who has been in the textile business for 19 years, mentions that at certain times during the unloading or cleaning of the machine, he feels muscle pain in the neck and legs, so, to alleviate such discomfort, he chooses to reduce the pace of work or do brief stretches, right there, in the middle of the machines, actions that have never been encouraged or taught by the company's organization, but rather a choice of the worker based on his need.

[...] It goes slower, it cleans cleaner. Then the person in charge arrives and shows him that it's too dirty. "There's no way to get it out quickly, look at the dirt" (Davi).

This is the way found by the operator to face some of the consequences of performing repetitive motion, a way that provides him with a reduction in discomfort, permanence in the activity, without harming production.

It is known that remaining in the same position for a long time, whether standing or sitting, performing activities that require a lot of strength, intensity or repetitiveness of movements are major causes of damage to the health of workers. And that most of the observable ergonomic risks can be mitigated or avoided through a change in posture after a certain time, adequacy of furniture and equipment (Trindade et al., 2012, Trindade, Schuh, Krein, Ferraz & Amestoy, 2012).

The sickening character of work situations makes the activity propose, convene and impose choices and arbitrations, thus producing solutions to the problems posed by the environment (Schwartz, 2004), these resources used are directly related to the workers' knowledge.

The know-how, the competencies and subjectivities of the subjects are fundamental when it comes to defining maneuvers, providing the domination of production and its negative deviations. On most occasions, what defines individual choices are the criteria of values attributed by each one (Assunção & Lima, 2009, Guérin et al., 2001). Schwartz & Echernacht (2009) state that the environment is transformed according to each subject and their values, which constitute the reference systems for the needs of life throughout history. They are then experiences built throughout life, inside and outside work.

SECOND-PASS DOWEL OPERATOR

Using the knowledge about the machines, their operation and the dynamics of activities in the sector are important strategies adopted by the operators of the dowel.

According to Túlio and Raquel, this knowledge, which is acquired mainly in daily situations at the factory, contributes significantly to a good conduct of activities, thus facing their infidelities, providing independence in actions, within the margin allowed by the organization.

According to Daniellou, Simanrd & Boissières (2013), knowledge is fundamental in work activities, in coping with the variabilities and infidelities of work, requiring actions that are different from those existing in pre-existing manuals and procedures. Thus providing autonomy and security in the face of work situations.

The time and experiences in the function contribute directly to the construction of knowledge, which provides a broader repertoire for the performance of professional activities (Tardif & Raymond, 2000).

An important point in the question of workers' knowledge is, in the work environment, it must be transformed into actions, renormalizations, debates, thus building their real activity. This knowledge must always be renewed, transformed, improved, aiming at the benefit of the subjects at work (Schwartz, 2003). But I emphasize that it is not the main responsibility of the worker to circumvent the risks of work, but of the organization to prevent them from existing. This reality, which requires the adoption of means of protection, is experienced by everyone on a daily basis, with routine constructions and adjustments.

Still on knowledge, it was observed constant use of the so-called "can fold" or as they say, the act of "unequalizing the machines", a strategy that consists of passing cotton ribbons from one can to another, so that they do not run out at the same time, an act that results in a decrease in the pace of work, while each can must be replaced at different times.

It's calmer, then you can work more calmly, because if you just splice, splice, even for you drag cans, give a job, because six passers, 3.5 finishing the cans, because it's eight cans, eight cans, right? For each sieve, imagine the can for three equal strainers there, we work like this to give him an unequal to make it easier for the worker (Túlio).

For this task, each operator defines the moment to perform the can folding. The way of doing it is described in the P.O. of the function, but what really happens are different actions between each operator and not consistent with the prescriptions. Thus, a certain degree of mobility is perceived in relation to the ways of doing things in the sector. Túlio justifies the reason for these actions.

[...] But sometimes we do this to make it easier for us, because at meal time there are only two people, then so it doesn't run out, then sometimes there is a machine that runs out of cans, then if you did that, then you go one, fix it, then when you come back it's calm, right? But it does more because of that, but actually they forbade it to do that [...] (Túlio).

It's calmer, then you can work more calmly, because if you just splice, splice, even for you drag cans, give a job, because six passers, 3.5 finishing the cans, because it's eight cans, eight cans, right? For each sieve, imagine the can for three equal strainers there, we work like this to give him an unequal to make it easier for the worker (Túlio).

Schwartz (2015) states that external norms serve as guides for carrying out activities, but do not have the capacity to produce real work. According to Guérin et al (2001), the task, even if it is mostly limiting, is also essential, because from the moment it determines the activity, it also authorizes it (Guérin et al., 2001).

Regarding the construction of strategies, Raquel draws attention to some points. When asked about the use of these means of protection, the operator reports that working in the sector is indeed sickening, but that, with the passage of time and the acquisition of experiences, you acquire skills and learn to work with health.

Unequal, for example, you arrive, take the eight cans, everything is the same, then everything ends up being the same. The first thing you have to do when you take a shift is to unequal the cans, you have to work with your head (Raquel).

In the conception of Oddone et al. (2008), it is experience that provides workers with the ability to create health defense mechanisms, and they call such competence "smartness", that is, they are procedures created in order to improve working conditions. Guérin et al (2001) also defends experience as an ally of health at work, as it helps subjects when protecting themselves from occupational risks.

The worker, as well as other operators in the industry, tells about the difficulties she faced at the beginning of her career in the factory. One of the problems that hit him was pain resulting from the physical effort necessary to carry out the activities. Faced with this problem, they often opted for the ingestion of medications that would alleviate such discomforts, using them during and/or after work. He says this is the way he found to stay at work.

In the beginning, I felt a lot of pain in my legs, in my knee, from going up and down stairs a lot, I even felt pain in my shoulder too, I think the issue of cages being high, but, as you say, as time goes by we get used to it (Raquel).
Until we get used to it, we take medicine, medicine for pain (Raquel).

Neves & Nunes (2010) also identified in their study the search for ways to "silence" pain at work, in order to preserve employment, their source of income. Self-medication was the main strategy used by the workers studied. This is often the last alternative found by subjects who do not have the autonomy to change the ways of doing the work.

During the interview, Raquel highlighted that she learned a lot from her co-workers, observing them and questioning them. The reproduction of what he saw provided him with gains in relation to easier performance of tasks, reduction of energy expenditure, increase in performance.

In this regard, Clot (2010) points out that the collective is in the individual as an instrument for action, created from the external exchanges that occur between the groups. The knowledge existing in a work environment, resulting from the creations of the collective acting there, no longer belongs to each of its creators, but rather as a tool available to those who need it, incorporating it and putting it into practice based on the needs faced.

But one point deserves to be highlighted, the appropriate knowledge of the collective is, by the reworked worker (Clot, 2010), as Schwartz calls it, renormalized, there is a debate.

And this is a constant situation in this environment, the exchange of knowledge among the subjects, especially the novices learning from the more experienced operators, appropriating the knowledge, internalizing it and applying it in their own way.

WINDER OPERATOR

As already mentioned in the other functions, winding machine operators also highlight the importance of knowing the machine and its rhythms, in order to facilitate and result in more harmonious and less physically and mentally exhausting activities.

The increase in tasks in the winding industry, as a result of the dismissal of operators who worked there, was a point of great relevance in the statements of the operators interviewed (Fernanda, Sofia, Érica and Maria). In this sector, the tasks were divided, two operators worked on each machine consecutively, one at the front of the machine (where the workers studied work) and at the back (where there were other operators, the packers), but a few years ago, there was a reduction in the company's staff, resulting in a 50% drop in workers in this function. The consequence of this outcome was the increase in tasks, rhythms and intensities, because the work that was previously performed by two operators is now the duty of only one.

Because the day that there is no shortage of material, you don't have time to drink water, go to the bathroom, then if you have the packer, you are fine to say just filling up, if you can make an appointment, you schedule. Because you stay there on the

side where I stand, you can mark, even with my height, you can mark with that chalk [...] Now it's even tighter because we put the plastic, we didn't put it, and form all those pallets, everything just right [...] then you leave it on, because we've been there for a while, so we don't stop the cart, we go there to pack it, with it running, when you look back like this, you run because it's already empty, the box is full of spurs, so you have to run (Sofia).

This passage from Sofia's speech demonstrates how the departure of the packers influenced the increase in the workload. Reporting even lack of time to drink water and go to the bathroom. That is, a change made by the company's organization, in order to reduce expenses, but which considerably intensified the work routine of the operators, bringing discomfort and complaints to everyone in relation to such a change.

Faced with this problem, the workers saw the need to reorganize. This transformation has to do with the strategies to protect against the risks that have been added there, in view of the structural and organizational changes in the required procedures.

According to Marx (1975/1890), working with machines requires a learning process from the subject, so the author indicates an early initiation of this relationship (man/machine), so he will be able to more successfully "adapt" his body, his movements, to the continuous uniform movement of machines.

With the changes in the sector, the workers had to relearn how to work, adapting to the new routine, rhythms and tasks.

According to the workers, the knowledge they have in relation to the times to carry out each operation on the machines (filling magazine, packing and marking bobbins, removing bobbins, placing cylinders) are essential to create synchronicity of movements and avoid unnecessary energy expenditures. And these actions are learned by each worker when they start working in the company and rebuilt individually, but not discarding exchanges of information and knowledge transfers, especially between experienced and novice operators.

Birth & Messiah (2018) confirm what we have been saying above. They highlight that knowing when to perform each activity and knowing the characteristics and particularities of each material worked, provides the operator with time savings, reduced work pace and less chance of execution errors.

According to Dejours (2004), work is composed of "gestures, *know-how*, an engagement of the body, the mobilization of intelligence, the ability to reflect, interpret and react to situations; it is the power to feel, to think and to invent" (2004, p. 28).

The subjects, in the face of the reality of work, make *use of themselves*, as this is the ability to reinvent a certain way of being, of living, of surviving (Schwartz & Durrieu, 2015). It

is this *use* that represents the strategies used by operators in the face of the difficulties encountered, from the reduction of the number of employees and the consequent work overload.

These work situations with an illening character make the activity propose, summon and impose choices and arbitrations in *the drama of the use of oneself*, thus producing solutions to the problems posed by the environment (Schwartz, 2004).

Reducing the pace of work in moments of discomfort is a strategy used by Sofia, the worker mentions feeling pain in the neck region for some time, caused by the repetitive movements of stocking the magazines. When they become more intense, it reduces the speed of movement. This was a way found by the operator to stay in business, otherwise, her only option would be to move away from work at the factory.

I myself chose, I saw the way it is, it's better for me to do it this way, than for me to really stop working (Sofia).

This attitude of Sofia goes against the ideas of Canguilhem (2009), for the maintenance of health, which are these strategies created at work, and which should be routinely debated, in order to deal with the infidelities of the environment. These actions, called renormalizations by the Ergological Approach to Work, are rereadings of the tasks, performed by the workers based on their individualities, using the gaps in the prescriptions (Baião, 2012). The reinterpretations characterize the subjects as singular and alive (Durrive & Schwartz, 2008), who will naturally opt for acts that are less harmful to health.

Workers always look for the best way to perform tasks, adapting them to their particularities. To do this, they use their own operative mode, that is, a way to perform the activity satisfactorily and at low human cost (Daniellou, Simard & Boissières, 2013).

Schwartz & Durrive (2015) point out that the *uses of the self* justify these deviations used by workers in the face of risks, often going against the prescriptions established by the organization of work. Thus, each subject, led by the manuals, added to the knowledge (individual and collective) and lived experiences, seeks the best for himself every day.

Like workers in other sectors, winding machine workers also seek in medicines a means to mitigate or even disguise the consequences of intense work, however this is only a palliative measure, as it does not focus on solving the real problem, which can lead to unexpected results, the aggravation of diseases and injuries. Even so, this is a measure adopted by Fernanda, Maria and Sofia.

In the study by Zavarizzi & Alencar (2018) with workers affected by RSI/WMSD, they identified that these subjects constantly use anti-inflammatory drugs and muscle relaxants, aiming to reduce pain caused by work.

Self-medication, in addition to the non-notification to the company in relation to illnesses and discomforts, are frequent actions among workers, justifying a fact commonly observed in the world of work, the fear of losing their job (Alencar & Nobre, 2017). This fact leads to underreporting of health problems caused by the work carried out at the site, in addition to the worsening of the workers' illnesses. In other words, medication is only a palliative means of solving the problem, and not a definitive way.

FINAL CONSIDERATIONS

When we proposed to carry out a study in an industry, with tasks dictated by operational procedures, machines determining work rhythms and inspections, we expected to find "trained" workers, who would perform standardized and plastered actions, very characteristic of the Taylorist model of production.

And this was a point that drew a lot of attention in this study, the great relevance, and still strong presence of the then model based on a scientific management of work, going against the idea that it would have been replaced by a flexible work pattern. In the industry studied, it is also possible to observe a Taylorized organization and human labor as fundamental in the operation of machines and material handling, in view of the inability, mainly financial, to modernize the entire mechanical apparatus of the site.

Supported mainly by the Ergonomics of the Activity and the Ergological Approach to Work, we realized that, even surrounded by different forms of control, the activities are never the same between different subjects. In a close and continuous approach, we identify a variety of gestures, actions, choices and particular ways of acting in each work situation. Thus bringing a wealth of detail, to something that seen from afar seemed monotonous and the same.

But these changes are not options by chance, but strategies to cope with the risks, in this case, arising from the performance of repetitive work, gestures that can last for a short, medium or long period of time, but that are performed for many hours daily, are a driving factor for different pathologies. That is, they are defensive mechanisms of a conscious or unconscious nature, individual and/or collective, but motivated by the maintenance of health.



It is then through *the use of self* and renormalization that workers are able to use these defense mechanisms, which are based on knowledge and experiences built inside and outside work.

Starting from what has been concluded so far, we seek to understand this entire process of maintaining life as a work activity, as it escapes from always positive results in relation to the transformations of situations, and possible singular actions arise in the place, in the organization and by the subjects present there. These constructions are renewed every day, thus drawing a definitive conclusion about the strategies, which are variable, and adapt to the reality of each organization.

REFERENCES


1. Associação Brasileira da Indústria Têxtil e de Confecção (ABIT). (2020). *Monitor: Superintendência de Políticas Industriais e Econômicas*. <https://www.abit.org.br/uploads/arquivos/monitor%20julho%20.pdf>
2. Alencar, M. C. B., & Nobre, T. L. (2017, julho/dezembro). Adoecimento e o sofrimento de trabalhadores acometidos por LER/DORT. *Revista de Psicologia*, 8(2), 8–18. <http://www.periodicos.ufc.br/psicologiaufc/article/view/5861>
3. Assunção, A. A., & Lima, F. P. A. (2009). Aproximações da ergonomia ao estudo das exigências afetivas das tarefas. In D. M. R. Glina & L. E. Rocha (Eds.), *Saúde mental e trabalho: da teoria e prática* (pp. 1–20). São Paulo: ROCA.
4. Baião, F. R. (2012). *Dramática do uso de si na atividade do trabalho* (Dissertação de Mestrado). Centro Universitário UNA, Belo Horizonte. http://www.redemebox.com.br/index.php?option=com_content&view=article&id=27052:a-dramatica-do-uso-de-si-na-atividade-do-trabalho&catid=325:305&Itemid=21
5. Brasil. (2018). Ministério da Saúde. Lesões por esforços repetitivos (LER) distúrbios osteomusculares relacionados ao trabalho (DORT). Secretaria de Políticas de Saúde Departamento de Ações Programáticas e Estratégicas Área Técnica de Saúde do Trabalhador.
6. Canguilhem, G. (2001, julho/novembro). Meio e normas do homem no trabalho. *Proposições*, 12(2-3), 109–121. <https://periodicos.sbu.unicamp.br/ojs/index.php/proposic/article/view/8643999>
7. Canguilhem, G. (2009). *O normal e o patológico*. Rio de Janeiro: Forense Universitária.
8. Clot, Y. (2010). *Trabalho e poder de agir*. Belo Horizonte: Fabrefactum.
9. Cunha, D. M. (2009, setembro/dezembro). Lições de pedra: das minas de saberes e valores. *Educação Unisinos*, 3(3), 228–235. <http://revistas.unisinos.br/index.php/educacao/article/view/4950>
10. Daniellou, F., Simard, M., & Boissières, I. (2013). Fatores humanos e organizacionais da segurança industrial: um estudo da arte. FONCSI. <https://ergonomiadaatividade.com/2017/06/30/caderno-fatores-humanos-e-organizacionais-da-seguranca-industrial/>
11. Dias, D. S., Santos, E. H., & Aranha, A. V. S. (2015). Contribuições da ergologia para a análise da atividade de trabalho docente. *Revista Eletrônica de Educação*, 9(1), 211–227. <http://www.reveduc.ufscar.br/index.php/reveduc/article/view/1202/389>
12. Durrive, L., & Schwartz, Y. (2008). Revisões temáticas: glossário da ergologia. *Laboreal*, 4(1), 23–28. http://laboreal.up.pt/files/articles/2008_07/pt/23-28pt.pdf
13. Friedmann, G. (1956). *Problemas humanos del maquinismo industrial*. Buenos Aires: Editorial Sudamericana.

14. Guérin, F., Laville, A., Daniellou, F., Duraffourg, J., & Kerguelen, A. (2001). **Compreender o trabalho para transformá-lo: a prática da ergonomia** (1ª ed.). São Paulo: Blucher: Fundação Vanzolini.
15. Heloani, R. (2003). **Gestão e organização no capitalismo globalizado: história da manipulação psicológica no mundo do trabalho**. São Paulo: Atlas.
16. Jinkings, I. (2002). **Reestruturação produtiva e emprego na indústria têxtil catarinense** (Dissertação de Mestrado). Universidade Federal de Santa Catarina, Florianópolis. <https://repositorio.ufsc.br/xmlui/handle/123456789/82868>
17. Marx, K. (1975/1890). **O capital: crítica da economia política** (3ª ed.). Rio de Janeiro: Editora Civilização Brasileira.
18. Marx, K. (1971/1890). **O capital: crítica da economia política** (2ª ed.). Rio de Janeiro: Editora Civilização Brasileira.
19. Moraes, T. D., & Pinto, F. M. (2011). O corpo nas atividades em trânsito: condutores profissionais e mobilização do corpo-si. **Cadernos de Psicologia Social do Trabalho**, 14(2), 279–294. <http://pepsic.bvsalud.org/pdf/cpst/v14n2/v14n2a09.pdf>
20. Nascimento, A., & Messias, I. A. (2018). Rodízio de postos em abate de bovinos: para além das dimensões físicas do trabalho. **Cadernos de Saúde Pública**, 34(10), 1–11. https://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-311X2018001005008
21. Netto, J. P., & Braz, M. (2006). **Economia política: uma introdução crítica**. São Paulo: Cortez.
22. Neves, R. F., & Nunes, M. O. (2010). Da legitimação à (res)significação: o itinerário terapêutico de trabalhadores com LER/DORT. **Ciência & Saúde Coletiva**, 15(1), 211–220. <https://www.scielo.br/pdf/csc/v15n1/a26v15n1.pdf>
23. Oddone, I., Re, A., & Briante, G. (2008). **Esperienza operaia, coscienza di classe e psicologia del lavoro**. Torino: OTTO Editore.
24. Oliveira, S. S., & Brito, J. C. (2011). A dimensão gestonária do trabalho e o debate de normas e valores no teleatendimento. **Trabalho, Educação e Saúde**, 9(1), 265–284. https://www.scielo.br/scielo.php?script=sci_arttext&pid=S1981-77462011000400013
25. Santos, M. J., & Marques, A. P. (2006). O caso dos call centers: organização do trabalho e atitudes face ao trabalho e emprego. **Sociologia, Problemas e Práticas**, 52, 67–86. <https://repositorio.iscte-iul.pt/handle/10071/597>
26. Santos, A. F. E., Paula, J. A., & Pereira, O. A. V. (2009, julho/agosto). Percepção de trabalhadores de uma indústria têxtil sobre os riscos de seu ambiente de trabalho. **Revista Enfermagem Integrada**, 2(1), 188–199. https://www.unilestemg.br/enfermagemintegrada/artigo/v2/Orcione_pereira_Aline_espirito_santo_e_Janine_de_paula.pdf
27. Saraiva, L. A. S., & Provinciali, V. L. N. (2002, janeiro/março). Desdobramentos do taylorismo no setor têxtil – um caso, várias reflexões. **Caderno de Pesquisa em Administração**, 9(1), 19–33.

https://www.academia.edu/4127535/Desdobramentos_do_taylorismo_no_setor_t%C3%A0xtil_um_caso_v%C3%A1rias_reflex%C3%B5es

28. Schwartz, Y. (2000, julho). Trabalho e uso de si. **Pró-Posições**, 1(5), 34–50. <https://periodicos.sbu.unicamp.br/ojs/index.php/proposic/article/view/8644041/11485>
29. Schwartz, Y. (2003, janeiro/junho). Trabalho e Saber. **Trabalho & Educação**, 12(1), 21–34. <https://seer.ufmg.br/index.php/trabedu/article/view/7361/5716>
30. Schwartz, Y. (2004). Ergonomia, filosofia e exterritorialidade. In F. Daniellou (Org.), **A ergonomia em busca de seus princípios: debates epistemológicos**. São Paulo: Edgar Blücher.
31. Schwartz, Y. (2011). Conceituando o trabalho, o visível e o invisível. **Trabalho Educação e Saúde**, 9(1), 19–45. <http://www.scielo.br/pdf/tes/v9s1/02.pdf>
32. Schwartz, Y. (2014, julho/setembro). Motivações do conceito de corpo si: corpo si, atividade, experiência. **Letras de Hoje**, 49(3), 259–274. <http://revistaseletronicas.pucrs.br/ojs/index.php/fale/article/view/19102>
33. Schwartz, Y. (2015, setembro/dezembro). Conhecer e estudar o trabalho. **Trabalho & Educação**, 24(3), 83–89. <https://periodicos.ufmg.br/index.php/trabedu/article/view/9452>
34. Schwartz, Y., & Durrive, L. (Orgs.) (2007). **Trabalho e Ergologia: conversas sobre a atividade humana**. Niterói: EdUFF.
35. Schwartz, Y., & Durrive, L. (2015). **Trabalho e Ergologia II: diálogos sobre a atividade humana**. Belo Horizonte: Ed. Fabregactum.
36. Schwartz, Y., & Echternacht, E. H. (2007, julho/dezembro). O trabalho e a abordagem ergológica: “usos dramáticos de si” no contexto de uma central de tele-atendimento ao cliente. **Teoria & Prática**, 10(2), 9–24. <http://www.seer.ufrgs.br/InfEducTeoriaPratica/article/view/6029>
37. Schwartz, Y., & Echternacht, E. (2009). Le corp-soi dans les milieux de travail: comment se spécifie sa compétence à vivre? **Cairn. Info**, 6, 31–37. <https://www.cairn.info/revue-corps-dilecta-2009-1-page-31.html>
38. Schwartz, Y., & Mencacci, N. (2008, janeiro/junho). Trajectoire ergologique et genèse du concept d’usage de soi. **Informática na Educação: teoria & prática**, 11(1), 9–13. http://www.scielo.br/scielo.php?script=sci_nlinks&ref=000156&pid=S1414-9893201000040000300021&lng=pt
39. Silva, L. A., Silva, L. F., & Mendes, D. P. (2017, setembro/dezembro). Os usos de si e o debate de normas dos trabalhadores de uma indústria metal-mecânica. **Trabalho & Educação**, 26(3), 167–178. <https://periodicos.ufmg.br/index.php/trabedu/article/view/9590>
40. Tardif, M., & Raymond, D. (2000). Saberes, tempo e aprendizagem do trabalho no magistério. **Educação & Sociedade**, 21(73), 209–244. <https://www.scielo.br/pdf/es/v21n73/4214.pdf>

41. Trindade, L. L., Schuh, M. C. C., Krein, C., Ferraz, L., & Amestoy, S. C. (2012). Trabalhadores da indústria têxtil: o labor e suas dores osteomusculares. *J Nurs Health*, 2(2), 377–387. <https://periodicos.ufpel.edu.br/ojs2/index.php/enfermagem/article/view/3466>
42. Trindade, L. L., Schuh, M. C. C., Krein, C., Ferraz, L., & Amestoy, S. C. (2012, janeiro/abril). Dor osteomusculares em trabalhadores da indústria têxtil e sua relação com o turno de trabalho. *Revista de Enfermagem UFSM*, 2(1), 108–115. <https://periodicos.ufsm.br/reufsm/article/view/3886>
43. Trindade, H. (2016). Precarização do trabalho na indústria têxtil: sobre vidas esfarrapadas... *Em Pauta*, 12(38), 169–187. <http://www.e-publicacoes.uerj.br/index.php/revistaempauta/article/view/27842>
44. Wachowicz, M. C. (2013). *Ergonomia*. Curitiba: E-tec.
45. Zavarizzi, C. P., & Alencar, M. C. B. (2018, janeiro/março). Afastamento do trabalho e os percursos terapêuticos de trabalhadores acometidos por LER/Dort. *Saúde em Debate*, 42(116), 113–124. https://www.researchgate.net/publication/325409664_Afastamento_do_trabalho_e_os_percursos_terapeuticos_de_trabalhadores_acometidos_por_LERDort

EVALUATION, IN A SENSORY PANEL, OF A CEREAL BAR ENRICHED WITH
ATTA SEXDENS (LINNAEUS, 1758) <https://doi.org/10.56238/sevened2024.029-044>

Ana Beatriz Conti¹, Ana Carolina Siqueroli², Ana Lídia Pires Teixeira³, Cristiellen Elisa Silva Batista⁴, Daiane de Oliveira Teixeira⁵, Eduarda Moro Alexandre⁶, Gabrielly Quito Campos⁷, Giana Maria Silva Aveiro⁸, Isabela Pereira Roque⁹, Juliana Cassaro Vieira¹⁰, Lara Quintiliano de Carvalho¹¹, Maria Carolina de Souza Minholi¹², Pedro Machado Pelli¹³, Ramon Marques Macedo¹⁴, Stefany Letícia Coutinho Lima¹⁵, Tainá Ribeiro Silva¹⁶, Thiago Humberto da Silva Pires¹⁷, Wanessa Eduarda Ribeiro de Jesus¹⁸ and Afonso Pelli¹⁹

ABSTRACT

Insects represent the most species-rich group of living beings. They participate in the functioning of ecosystems, providing essential services to our well-being, such as pollination, production of products such as silk and honey, and being a direct source of food. Entomophagy is the term used to describe the use of insects in the human diet. This resource is fully realized because insect farming requires few resources, generates few impacts, and has a low cost/benefit ratio, thus contributing to food security. Cereal bars containing or not containing insects were used to evaluate the possibility of including this item in the menu. The species used in cereal bars was the leafcutter ant *Atta sexdens* (Linnaeus, 1758). The experiments involved 120 participants. Evaluations were made in five categories: Aroma, Flavor, Texture, Overall Impression, and Purchase Intention. The three sensory panels included recipes A and B. Sometimes, discrepancies were observed between the two recipes, particularly regarding "Purchase Intention," even though the recipes were the same. Recipe 3B was the only one with the presence of parts of insects of the species *Atta sexdens* (Linnaeus, 1758). Apparently, the participants noticed the presence of insects, since parts of them were added in a significant proportion. The chi-square test was performed to analyze the data between the parameters in each experiment. Despite the differences observed, they were not significant for experiments 1

¹ Undergraduate in Biomedicine, Federal University of Triângulo Mineiro

² Undergraduate in Biomedicine, Federal University of Triângulo Mineiro

³ Undergraduate in Biomedicine, Federal University of Triângulo Mineiro

⁴ Undergraduate in Biomedicine, Federal University of Triângulo Mineiro

⁵ Master's student in Environmental Sciences, Federal University of Triângulo Mineiro

⁶ Undergraduate in Biomedicine, Federal University of Triângulo Mineiro

⁷ Undergraduate in Biomedicine, Federal University of Triângulo Mineiro

⁸ Undergraduate in Biomedicine, Federal University of Triângulo Mineiro

⁹ Undergraduate in Biomedicine, Federal University of Triângulo Mineiro

¹⁰ Undergraduate in Biomedicine, Federal University of Triângulo Mineiro

¹¹ Undergraduate in Biomedicine, Federal University of Triângulo Mineiro

¹² Undergraduate in Biomedicine, Federal University of Triângulo Mineiro

¹³ Undergraduate in Medicine, University of Ribeirão Preto

¹⁴ Master in Ecology, Federal University of Uberlândia

¹⁵ Undergraduate in Biomedicine, Federal University of Triângulo Mineiro

¹⁶ Undergraduate in Biomedicine, Federal University of Triângulo Mineiro

¹⁷ Master's student in Environmental Sciences, Federal University of Triângulo Mineiro

¹⁸ Undergraduate in Biomedicine, Federal University of Triângulo Mineiro

¹⁹ Postdoctoral Fellow in Sciences - Materials Physics, Federal University of Triângulo Mineiro



and 2. For experiment 3, the only one in which insects were actually added, the test was statistically significant at the 5% level, for “Taste”; “Texture”; “Overall Impression” and “Purchase Intention”. The results provide valuable insights into how cultural factors affect the evaluation of new foods and highlight important methodological considerations in conducting experiments of this type. The central finding was the strong influence of the suggestion on the sensory acceptance of the participants. This highlights the importance of cultural beliefs and expectations in the formation of food preferences. In contrast, those who were open to the idea of consuming insects were more receptive and, in some cases, reported positive acceptance, suggesting that familiarity and a favorable predisposition can lessen the negative impact of psychological suggestion. However, society has evolved, demands have increased, and new values can be instilled in people, such as healthier or more environmentally friendly food. A few decades ago, in Brazil, there were few restaurants that sold oriental food, which contains raw fish. Today, this practice is deeply rooted in our culture. A relevant fact that should be highlighted is the lack of reports of diseases transmitted by insects used in human food, unlike what happens with vertebrate meat, which often, when prepared without cooking, can transmit etiological agents of various diseases.

Keywords: Entomophagy. Biodiversity. Sustainability.

INTRODUCTION

Insects represent a taxon with a wide variety of organisms¹. These animals have very diverse ecological relationships, occupying strategic positions in food webs. They are found on land and in water, with varying degrees of sociability; developed as a response to evolutionary pressures, allowing them to live in diverse environmental conditions². They are essential for various ecological functions and ecosystem services: nutrient recycling, pollination and dispersal of seeds and plants. They transfer matter and associated energy, as they are a source of food for fish, amphibians, reptiles, birds and mammals. They also bring indispensable benefits to the survival of the human species, through pollination, production of products such as silk and honey, being a direct source of food, in addition to contributing directly to agribusiness². Entomophagy is the term that characterizes the use of insects in the human diet. This resource is satisfactory insofar as insect cultivation requires few financial resources, generates less environmental impacts, in addition to being easier to produce; in contrast to the great value in mass and nutrients that these animals offer; thus contributing to ensuring food security³.

Around 1,509 species of edible insects have already been catalogued and are distributed in more than 120 countries. The classes that concentrate the largest number of edible species are Coleoptera, Hymenoptera, Orthoptera and Lepidoptera. The practice of entomophagy is very old and is described in the Bible, in Leviticus 11:20-23, probably between 300 and 500 BC. However, with the cultural colonization of Europeans, the diet based on these animals became commonplace. Similarly, today there is a certain stigma regarding the ingestion of some arthropods⁴. Eating marine shrimp is somewhat elegant, but their ecological equivalents, or similar terrestrial detritivores, are not so much. The aversion to insects can be explained by the view that insects are dangerous, dirty, disease-carrying and, therefore, inedible. At the same time, the interpretation of what constitutes food influences individuals' decisions about whether or not to accept food, and social, cultural and economic factors give rise to this perspective. For example, there are religions in which the gods do not allow insects to be eaten by their followers, or even when these animals are represented as totems and, therefore, prohibited from being consumed⁴.

The negative view of these animals is concentrated in Western culture, while in Eastern culture they are seen in a more pleasant way and are included more routinely in the diet⁵. Naturally, these choices are influenced by environmental factors, which also shape cultures. In this sense, it is clear that the dietary individuality of each social group culturally determines the consumption habits of a given source of supply, thus, what is seen as banal for one group may be censored for another³.

Secondly, it is worth noting that taste, which is a sociocultural characteristic, is a preponderant factor in choosing to practice entomophagy. From this perspective, there are several flavors related to insects, for example: when Marco Polo visited China he found that grasshoppers acquired the taste of the seasoning that was used; in a region of Africa, when a fly is crushed it resembles the taste of caviar; it was also observed that insects that live in water have a flavor similar to marine animals; a caterpillar, in northeastern Brazil, resembles the taste of roasted pig intestines. Therefore, depending on the social context, there may be variations in people's willingness to practice entomophagy⁴.

One of the variables that influences the aversion to insects lies in their aesthetics. This fact is proven by analyzing a survey of university entomology students, which found that the more disguised the dish in which the insect was found, the more readily the students were interested in trying it⁴. However, this aversion has recently been deconstructed. At the XXIX Brazilian Congress of Entomology and XIII Latin American Congress, which took place in September 2024 in Uberlândia, the subject was addressed and discussed (Figures 1 and 2).

Fig. 1. Products sold on a large scale, with insects added to their composition.



Fig. 2. Master chef, with a high level of entomophagy skills, presenting dishes and menus during a scientific event of international repercussion; the XXIX Brazilian Congress of Entomology and XIII Latin American Congress, which took place in September 2024 in Uberlândia/MG.





Although academia presents the benefits of entomophagy, and the practice is rooted in traditional cultures in Brazil, there is a strong aversion to insects as food. A study was carried out in a municipal elementary school in Rio Grande do Sul, with two classes of eighth graders. In this analysis, a questionnaire was presented that required, as one of its components, that students select the adjectives that characterize this group of animals and, after a lecture on insects, this questionnaire was redone with the aim of verifying possible changes. Before the lecture, the majority of students saw insects in a negative light. However, after teaching about the diversity and importance of insects, the students' perspective made them opt more for adjectives such as: beautiful and useful, increasing the positive aspect¹. It is seen, therefore, that the construction of the image regarding animals occurs from the beginning of the individual's formation⁴. However, the nutritional combination of using insects in human food is favorable for consumption due to their nutritional properties, which vary depending on the specimen, as many contain high levels of vitamins, proteins and minerals, with a predominance of unsaturated fats, which are healthier⁶.

Insects have a generous dose of nutrients, containing the same substances that are found in vertebrates common to human food, such as cattle, fish and chicken. However, there is a marked difference in the concentration of these compounds between these animals, since in insects the presence of proteins is more expressive, manifesting up to 43% of this component, in contrast to 20% in chicken and 20 to 30% in beef. In addition to proteins, a variety of minerals essential to the human body are also found, such as: lipids and vitamins that are capable of promoting healthy development⁴.

From this perspective, it is possible to see that insects are an advantageous source of nutrients for animals, such as cattle and chicken, when in the form of feed. Likewise, it is possible that it could also be a viable alternative for humans, since its production would affect landscapes much less than livestock farming, for example. ⁷ Thus, the study on the quantification of proteins in insects is of economic, social and environmental interest given the benefits in production. ⁶ Even so, it is clear that entomophagy presents itself as an excellent habit to include in daily meals, even helping to guarantee food security. ⁴ Thus, entomophagy shows, with its studies, the potential advancement of food sources in a world where hunger is still one of the main problems, even though access to food is a right for everyone. Finally, the viability of including this group in our diet is possible.

It is estimated that in the near future, the practice of entomophagy will increase due to population growth and the need to obtain more food sources, especially protein sources, where current agriculture alone will not be able to meet the needs of feeding the entire

population⁹. This scenario will require other sources to obtain nutrients for everyone, and thus entomophagy will expand in the future, with more foods based on various insects that have a higher nutritional and protein value than other sources of animal protein being sold in markets and restaurants, and people's repulsion towards this habit will decrease, and it will become something more present in the culture of several countries¹⁰.

Among the options of insects used in human food is the Order Hymenoptera. This order is highly diverse and includes insects such as bees, wasps and ants. This taxon is of extreme ecological importance, as they participate in plant pollination, pest control, are prominent in beekeeping and agriculture, and also participate in human nutrition. This order has mouthparts ranging from sucking to chewing, and they are projected either ventrally or forward. The antennae are large and articulated and are folded anteriorly or dorsally. The Apocrita, a suborder of the Hymenoptera, have the propodeum to constitute the mesosome. Another characteristic of the Apocrita is due to a constriction or petiole, found in the second abdominal segment².

In this sense, cereal bars containing insects were used to evaluate the possibility of including insects in the human diet. The species used in the cereal bars was the leafcutter ant *Atta sexdens* (Linnaeus, 1758), belonging to the Order Hymenoptera. The leafcutter ant is present in the diet of indigenous groups and also in some urban areas of Brazil¹¹. This species is normally a substitute for meat and is served whole or only in the abdominal region⁴. A certain group of individuals in the Northeast region claim that they consume the mesosoma and gaster, the rest is discarded and served fried¹². The nutritional value of *Atta* spp. consists of a low protein content (~13%) and medium lipid content (34.5%), however, it presents an adequate nutritional quality, since the amino acids provided have a high nutritional value¹³.

The objective of this article was to test the perception and acceptance of cereal bars, which could have insects of the species *Atta sexdens* as one of their ingredients, among students, teachers and employees of the Federal University of Triângulo Mineiro.

MATERIALS AND METHODS

The research was conducted in the age group of 18 to 60 years. Approval was obtained through documentation signed by the participants (TCLE - Informed Consent Form).

In this experiment, cereal bars were developed with minor changes. The ingredients were homogenized in a Mondial mixer, model Power Mixer500®, and then transferred to a

Mallory cereal bar machine, model Nutritive Cereal Maker 280w®. Recipe 1A was baked for 15 minutes and 1B for 22 minutes (Table 1).

In recipe 2, there was a change in the proportions and baking time, with 30 minutes being used (Table 2). For recipe 3, 38g of the abdomen of the ant *Atta sexdens* (Linnaeus, 1758) was added to cereal bars “B” (Table 3). These were baked for 30 minutes, using the same preparation method as the previous ones.

Table 1. Recipes 1A and 1B, with ingredients and their respective proportions.

INGREDIENTS		1A	1B
Wheat bran		14 g	14 g
Brown sugar		25 g	25 g
Crystal sugar		20 g	20 g
Cocoa		10 g	10 g
Oat mix		30 g	30 g
Silver banana		80 g	80 g
Margarine		20 g	20 g

Source: organized by the authors.

Table 2. Recipes 2A and 2B, with ingredients and their respective proportions.

INGREDIENTS		2A	2B
Wheat bran		7 g	7 g
Brown sugar		25 g	25 g
Crystal sugar		20 g	20 g
Cocoa		10 g	10 g
Oat mix		30 g	30 g
Silver banana		80 g	80 g
Margarine		20 g	20 g
Raisins		20 g	20 g

Source: organized by the authors.

The base ingredients were whole wheat bran, enriched with iron and folic acid; oat mix; barley flour; enriched with B1, B2 and B6; ascorbic acid; salt and sodium bicarbonate; dehydrated cocoa fruit and silver banana.

Tabela 3. Receitas 3A e 3B, com ingredientes e suas respectivas proporções.

INGREDIENTS		3A	3B
Wheat bran		7 g	7 g
Brown sugar		25 g	25 g
Crystal sugar		20 g	20 g
Cocoa		10 g	10 g
Oat mix		30 g	30 g
Silver banana		80 g	80 g
Margarine		20 g	20 g
Raisins		20 g	20 g
<i>Atta sexdens</i>		0 g	38 g

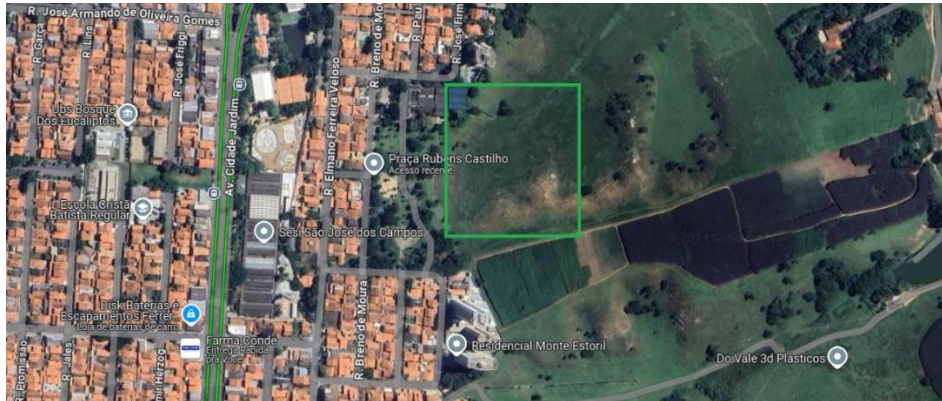
Source: organized by the authors.

The tanajuras, known as "içá" in the region where they were collected (Fig. 3), are a very popular food among the elderly. Fried, seasoned and served with flour, it is a very

popular dish in the months of October and November, despite the culture of not collecting ants after November 2nd (All Souls' Day). The içãs were collected manually and frozen until the recipe was prepared.

The land in question is part of the cerrado biome and serves as pasture for cattle, popularly called "fazendão", located in the Estoril neighborhood, in the city of São José dos Campos/SP.

Figure 3. Location where the tanajuras used in the experiment were collected. Approximate geodetic location: 23.2509141, -45.882297



Source: Google Maps.

Only the abdomen of the ants was used to produce the cereal bars (Fig. 4).

Figure 4. *Atta sexdens* (Linnaeus, 1758) used in the production of Cereal Bars.



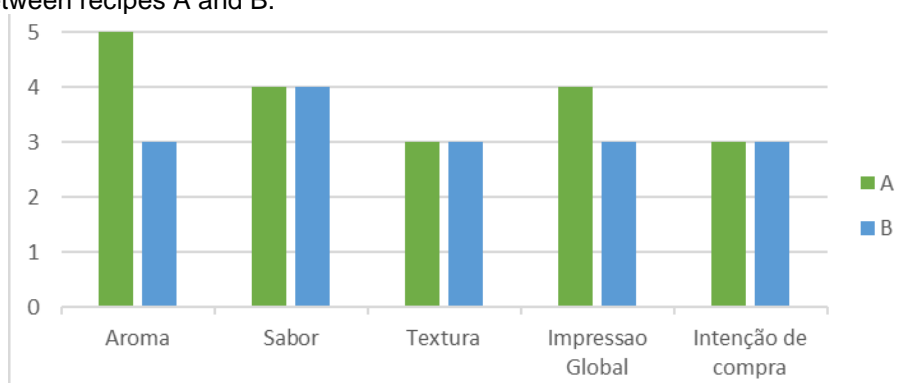
Source: the authors.

RESULTS AND DISCUSSION

The experiments involved 120 participants, divided into 19 for recipe 1, 51 for recipe 2 and 50 for recipe 3. Evaluations were made in five categories: Aroma, Flavor, Texture, Overall Impression and Purchase Intention. The three sensory panels included recipes A

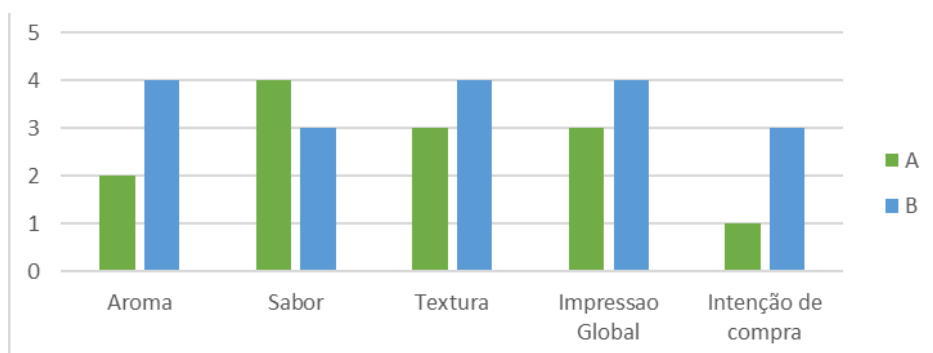
and B, and experiment 3B was the only one with the presence of insects. However, there was no indication of which recipe contained insects or not. The results can be seen in Figures 5 to 7. From Experiment 1, it can be seen that recipe 1A was the one that received the highest approval. The “Taste”, “Texture” and “Purchase Intention” between bars A and B were the same, which was expected, since both did not contain insects and were exactly the same, except for the cooking time. According to the differences between “Aroma” and “Overall Impression”, cereal bar A presented greater satisfaction among the participants, which may have been influenced by the difference in cooking time.

Figure 5. Results of the Sensory Panel, carried out in Experiment 1, with cereal bars, in which insects of the species *Atta sexdens* (Linnaeus, 1758) were not included and the difference between the bars was only the cooking time between recipes A and B.



Source: Data collected through a questionnaire answered by volunteers in a common area of the Federal University of Triângulo Mineiro.

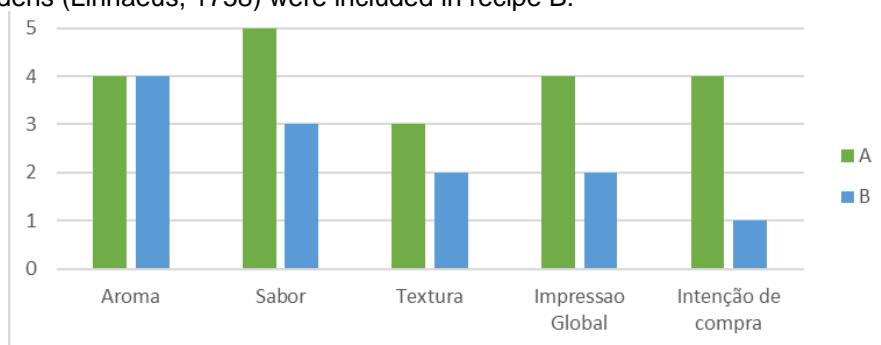
Figure 6. Results of the Sensory Panel, carried out in Experiment 2, with cereal bars, in which insects of the species *Atta sexdens* (Linnaeus, 1758) were not included and there was no difference between cereal bars A and B.



Source: Data collected through a questionnaire answered by volunteers in a common area of the Federal University of Triângulo Mineiro.

In experiment two, both recipes (2A and 2B) were identical and did not contain insects. However, large discrepancies were observed between the two recipes, particularly regarding “Purchase Intention”.

Figure 7. Results of the Sensory Panel, carried out in Experiment 3, with cereal bars, in which insects of the species *Atta sexdens* (Linnaeus, 1758) were included in recipe B.



Source: Data collected through a questionnaire answered by volunteers in a common area of the Federal University of Triângulo Mineiro.

Recipe 3B was the only one with the presence of parts of insects of the species *Atta sexdens* (Linnaeus, 1758); however, there were no changes in the other ingredients between cereal bars 3A and 3B. In this sense, this fact was not exposed at the time of testing. Apparently, the participants noticed the presence of insects, since parts of them were added in a significant proportion. Recipe 3B was the one with the lowest approval in four of the five categories. The aroma between the two recipes was identical. The chi-square test was performed to analyze the data between the parameters in each experiment. Despite the differences observed, they were not significant for experiments 1 and 2. For experiment 3, the only one in which insects were actually added, the test was statistically significant at the 5% level for “Taste”; “Texture”; “Overall Impression” and “Purchase Intention”.

CONCLUSION

The results of the experiments demonstrated a variation in the sensory responses of the volunteers in relation to bars A and B. In Experiment 1, bar A received a higher evaluation in almost all sensory attributes, with emphasis on aroma, which received the highest score. This preference for aroma may have positively influenced the overall impression and purchase intention. However, bar B received a lower evaluation in aroma and overall impression, suggesting that these factors negatively impact product acceptance. In Experiment 2, a reversal in the results was observed, since bar B performed better in aroma, texture and overall impression. This higher performance resulted in a higher purchase intention for bar B compared to bar A, which received a lower sensory evaluation in aroma and a lower purchase intention. Since the recipes were identical, it can be concluded that the participants were induced to believe that there were insects in one of the two recipes. It is also likely that one participant could influence others. This is why the level of evaluations was different between them. These data corroborate the literature, as

they indicate that cultural aspects can interfere with the acceptance of insect-based products⁴.

Experiment 3 reflects a preference for the sensory attributes of bar A, especially in terms of taste and overall impression, resulting in a higher purchase intention compared to bar B, which, despite presenting a competitive aroma, obtained a low evaluation in terms of overall impression and purchase intention.

The results provide valuable insights into how cultural factors affect the evaluation of new foods and highlight important ethical and methodological considerations when conducting experiments of this type.

The central finding was the strong influence of psychological suggestion on the sensory acceptance of participants. Even though they were identical to the control bars (without insects), those who believed they were consuming leafcutter ants reported different perceptions regarding taste, texture and appearance.

The acceptance or rejection of foods is shaped by cultural and psychological factors. In this study, participants who already had an aversion to the idea of consuming insects tended to describe a less pleasant sensory experience, even though the bars did not contain leafcutter ants. This highlights the importance of cultural beliefs and expectations in the formation of food preferences. In contrast, those who were open to the idea of consuming insects were more receptive and, in some cases, reported positive acceptance, suggesting that familiarity and a favorable predisposition may lessen the negative impact of psychological suggestion^{14,15}.

The main limiting factor of this study is related to acceptance and rejection by participants, as many people approached to taste the cereal bars refused to participate in the research. This refusal is largely due to cultural factors that are already deeply rooted in the population, which directly influence individuals' willingness to try new products. These cultural aspects, which shape consumers' preferences and resistance, therefore prove to be a significant obstacle in collecting data and obtaining more comprehensive and representative results in the context of this study. In addition, aspects related to the production of the cereal bar must be taken into account when looking at acceptance or rejection^{14,15}. In the recipe containing the abdomen of the ant, *Atta sexdens* (Linnaeus, 1758), due to the quantity of insects present, the presence of parts of these was perceived. This caused the participants to feel strange, causing them to not try the sample or to eat only part of it and throw the rest away. They also reported the peculiar flavor present, leading them to believe that the sample contained insects. The possibility of a consumer market for a cereal bar made with insects is linked to factors such as cultural acceptance,



the search for innovative foods, and interest in sustainable practices. In Brazil, although still uncommon, the consumption of insects in food has been gaining ground, especially among those seeking protein alternatives and more ecological diets^{14,15}. In addition, there is an increase in interest in exotic and differentiated products. Thus, there may be an audience interested in this type of product, especially if it is well positioned and accompanied by a campaign that highlights its nutritional, social, economic, and environmental benefits¹⁵.


It is concluded that the acceptance of insect-based foods, such as cereal bars, is influenced by cultural and psychological factors of the individual. The simple suggestion that the cereal bar could contain the insect already caused a change in the sensory perception of the participants, reflecting a deep-rooted cultural aversion. On the other hand, improved sensory aspects, such as flavor and texture, can mitigate this initial repulsion, suggesting that the acceptance of these foods can be improved over time and with appropriate sensory and educational approaches. Market acceptance may change if the population comes to accept entomophagy in their diet, but based on the experiment carried out, it can be observed that in experiment 3, bar B, the only recipe that contained ants, received a purchase intention score of 1. This analysis suggests that most people would not buy the bar if it were introduced to the market, which would not result in immediate profit from the sale of bars containing insects. However, society has evolved, demands have increased, and new values can be instilled in people, such as healthier or more environmentally friendly food. ¹⁶ A few decades ago, in Brazil, there were few restaurants that sold oriental food, which contains raw fish. Today, this practice is deeply rooted in our culture. A relevant fact that should be pointed out is the lack of reports of diseases transmitted by insects used in human food, unlike what happens with vertebrate meat, which often, when prepared without cooking, can transmit etiological agents of various diseases.

REFERENCES

1. Lopes, L. A., Valduga, M., Athaydes, Y., & Dal-Farra, R. A. (2014). As concepções sobre insetos no ensino fundamental em escola pública de Sapucaia do Sul, RS. **Revista de Ensino de Ciências e Matemática**, 16(4). <http://www.periodicos.ulbra.br/index.php/acta/article/view/1276/1028>
2. Gullan, P. J., & Cranston, P. S. (2023). **Insetos. Fundamentos da entomologia** (5th ed.). Rio de Janeiro: Roca.
3. Cheung, T. L., & Moraes, M. S. (2016). Inovação no setor de alimentos: insetos para o consumo humano. **Interações (Campo Grande)**, 17(3). <https://www.scielo.br/j/inter/a/nCXbbgXydfNrRBDxY57DjzJ/#>
4. Costa-Neto, E. M. (2003). Insetos como fontes de alimentos para o homem: valoração de recursos considerados repugnantes. **INCI**, 28(3). https://ve.scielo.org/scielo.php?script=sci_arttext&pid=S0378-18442003000300004
5. Amaral, K. O. D., & Medeiros, M. D. A. (2015). Análise das concepções de estudantes do ensino fundamental sobre insetos, por meio da metodologia do Discurso do Sujeito Coletivo. **BG Journal**, 6(1). <https://seer.ufu.br/index.php/braziangeojournal/article/view/28068>
6. Bisconsin-Junior, A., Januario, L. A., Netto, F. M., & Mariutti, L. R. B. (2018). Composição de insetos comestíveis. O uso consciente da biodiversidade: perspectiva para o avanço da ciência e tecnologia de alimentos. https://www.researchgate.net/publication/327118458_Composicao_de_insetos_comestiveis/citation/download
7. Khalifah, A., Abdalla, S., Rageb, M., Maruccio, L., Ciani, F., & El-Sabrou, K. (2023). Could insect products provide a safe and sustainable feed alternative for the poultry industry? A comprehensive review. **Animals**, 13(9). <https://pubmed.ncbi.nlm.nih.gov/37174571/>
8. Luke, S. H., Roy, H. E., Thomas, C. D., Tilley, L. A. N., Ward, S., Watt, A., et al. (2023). Grand challenges in entomology: Priorities for action in the coming decades. **Insect Conservation and Diversity**, 16(2). <https://pubmed.ncbi.nlm.nih.gov/38505358/>
9. Elaine, E. O. (2019). Entomofagia: alimentação à base de insetos. I Congresso Brasileiro de Insetos Alimentícios e Tecnologias Associadas II Simpósio de Antropoentomofagia. <https://pt.scribd.com/document/437709778/Anais-Insetec-2019>
10. Gonçalves, C., Chavez, K., & Jorge, R. (2022). Entomofagia - consumo atual e potencial do futuro. **Associação Portuguesa de Nutrição**, 29. https://www.researchgate.net/publication/363694304_ENTOMOFAGIA_-_CONSUMO_ATUAL_E_POTENCIAL_DE_FUTURO
11. Neto, E. M. C., & Ramos-Elorduy, J. (2006). Los insectos comestibles de Brasil: etnicidad, diversidad e importancia en la alimentación. **Etnoentomologia**, 1(38). <http://sea-entomologia.org/PDF/GeneralInsectorum/GE-0062.pdf>
12. Salgado, G. A. T., Salgado, A. G. A. T., Pinheiro, Y. V. F., & Martins, C. (2024). Você come formigas? Um estudo de caso de entomofagia na serra da Ibiapaba, Ceará,

13. Fontes, V., Santos, C. M. M., & Henrique, V. S. M. (2018). Composição e aplicação da formiga Içá na culinária brasileira. *2018 Brazilian Technology Symposium*, 1. <https://pt.scribd.com/document/541157097/083>
14. Macedo, R. M., Neves, N. M., Sabino, R. M., & Pelli, A. (2022). Insetos na alimentação humana: avaliação sensorial de barras de cereais com *Tenebrio molitor* Linnaeus, 1758. *Acta Biologica Brasiliensia*, 5(1), 75–86. <https://doi.org/10.18554/acbiobras.v5i1.7202>
15. Peixoto, P. G., Oliveira, R. V., Miranda, V. S., Paulino, T. P., de Andrade, R. M., & Pelli, A. (2016). Avaliação proteica e parâmetros populacionais de *Cynaenus angustus* Le Conte (Coleoptera: Tenebrionidae). *EntomoBrasilis*, 9(2), 108–113. <https://doi.org/10.12741/ebrasilis.v9i2.561>
16. Macedo, R. M., Ribeiro, R. L., Souza, F., & Pelli, A. (2020). Adição do Coleoptera *Cynaenus angustus* LeConte, 1851 em barras proteicas para consumo humano. *Revista SODEBRAS*, 15(179), 44–51. <https://doi.org/10.29367/issn.1809-3957.15.2020.179.44>

SELF-PERCEPTION OF AGING AND OLD AGE OF URUGUAYAN ELDERLY LIVING IN HOUSING PROJECTS

 <https://doi.org/10.56238/sevened2024.029-045>

María Virginia Aquino Santiago¹, Celmira Lange², Marcos Aurélio Matos Lemões³, Carolina Gabriela Ocampo Aguiar⁴ and Enrique Agnese⁵

ABSTRACT

Self-perception influences the way you face challenges related to health, aging, and your physical and mental well-being. Objective: To know the self-perception of elderly people living in housing complexes provided by the Social Security Bank, regarding aging and old age, their social relationships and the economy. Methodology: Qualitative study, with a narrative approach. Intentional selection of participants. Study population 27 people over 65 years of age, with more than one year living in one of the three housing complexes. Techniques for obtaining information: semi-structured and individual interviews. Field period September to December 2022. Results: Of the participants, 20 were women and 7 were men. All have comorbidities and some functional limitations. Regarding self-perception, the results varied in relation to aging and old age. Relations with neighbors expressed that they were weak or absent ties. Final thoughts: Your economic situation is limited and the social support network is insufficient or non-existent. The diversity found in the self-perception of ageing and old age may be due to past and present circumstances, their social environment, economic resources and health.

Keywords: Self-perception. Aging. Oldness. Old. Qualitative research.

¹ Highest degree of education: Prof. PhD in Health Sciences and Nursing
Academic institution: Universidad de la República - Faculty of Nursing UA Salud Adulto y Anciano - Uruguay.

² Education: Doctor Professor in Nursing at the Ribeirão Preto College of Nursing
Academic Institution: University of São Paulo (USP) – Brazil

³ Education: Doctor in Sciences, Federal University of Pelotas (UFPeI)-Brazil
Academic Institute: University of São Paulo (USP) – Brazil

⁴ Highest degree of training: Prof. Adj. Esp. in Health Services Management - Master's Degree.
Academic Institute: University of the Republic - Faculty of Nursing UA Adult and Elderly Health - Uruguay.

⁵ Highest degree of education: Bachelor of Nursing, Dr. Aydte.
Academic institution: Universidad de la República - Faculty of Nursing UA Salud Adulto y Anciano - Uruguay.



INTRODUCTION

The world is ageing, the proportion of people aged 60 and over continues to rise, with people over 80 being the fastest growing demographic sector. The increase in life expectancy can be considered a triumph, but it must be accompanied by a change in the perception of old age. Aging and old age are a natural part of the life cycle, with biological, psycho-affective, social and cultural changes, it is an individual process and is not synonymous with disease. ¹

The concept of old age that each individual has is a cultural construction, where forms of kinship, health, economy, functional capacity, education, religion, among other things, interfere.²

In other words, the self-perception of aging and old age will be different for each person, varying according to their individual and cultural experiences, although there are common issues at this stage. There are people who can self-perceive this process as natural and part of life, having a positive attitude, and in others this self-perception can become negative for various reasons, being accompanied by feelings of sadness, loneliness, abandonment, devaluation, changes in health, physical fragility, mental deterioration, fragility in social relationships, poverty, generating concern and/or fear, thinking or living this last stage of life.³

Trying to understand the elderly, their feelings, their needs and desires, would help to recognize and respect the heterogeneity of these people who do not lose their rights just because they are elderly. It would be avoided to continue classifying these people into rigid and derogatory categories any longer, understanding that each person has their own life story, that there is no single way to live it, and that it is subject to personal circumstances and decisions.⁴

In Uruguay, there is a sustained increase in the number of seniors aged 65 and over, compared to other age groups, making it considered one of the oldest countries in Latin America and the Caribbean.⁵ The State assumes the responsibility of facing this reality, generating public policies on the issues of old age and aging, in order to promote the rights of the elderly to achieve a dignified and quality old age.⁶

To this end, there are institutions that have centralised policy action on old age; Within the Ministry of Social Development, the National Institute for the Elderly⁷ is created, responsible for designing, coordinating and evaluating social policies on the issues of old age and ageing.⁷

One of the State's responses is linked to housing for the elderly population, through the Housing Solutions Program of the Social Security Bank (BPS), in agreement with the

Ministry of Housing and Spatial Planning. The right to housing is recognized, seeking to respond to a sector of this elderly population that receives the lowest pensions or pensions, adding other elements of social vulnerability in which it is, providing different types of solutions such as: Housing located in Housing Complexes, rent subsidies and "sleeping space".

Housing is provided, often leaving behind issues that were important in their life and that are part of their identity, their sense of belonging, such as having to get rid of the neighborhood, the affective ties, to guarantee a place to live.⁸

Although there are many methods to assess the health status of the elderly population, self-perception has been widely used, because despite its subjectivity, its practicality and reliability have been demonstrated, being able to predict morbidity, mortality and functional deterioration. The individual's perception of aging and their life contributes significantly to this process.⁹

Knowing the self-perception of older adults living in BPS housing complexes about their old age is essential to improve their quality of life, guide new policies and programs, promote social participation, and understand their needs and concerns. This would help to address challenges more effectively and promote healthy and positive ageing.

In Uruguay, no studies were found on self-perception in elderly people living in housing projects of the Social Security Bank.

This article allows us to know the self-perception of the elderly people who live in these housing complexes made available by the Social Security Bank, about old age and aging, and their social and economic relationships.

METHODOLOGY

The study carried out had a qualitative approach because it allows, as Minayao says: to work with the universe of meanings, motives, aspirations, beliefs, values and attitudes that cannot be reduced to an operationalization of variables.¹⁰ People's lives are important, focusing on feelings and perspectives, on the physical, social and cultural context in which they occur.

Three housing projects for BPS retirees and pensioners in the city of Montevideo were selected for the investigation. The criteria that were established for the selection of the complexes were as follows: Complexes that were selected by the Faculty of Nursing to carry out practical teaching for students of the Bachelor of Nursing, in the care of the elderly at different times (Continues in 3 years, 1 year and less than 6 months); the geographical location of the complexes in terms of accessibility to health services. The study received

authorization from the BPS and data collection was carried out between September and December 2022.

The invitation was made in each of the complexes through posters in the elevator and in the spaces for common use by residents, ensuring that everyone had the same possibility of participation. However, people had to be 65 years old or older and have lived in the BPS housing complex for more than a year.

The study population consisted of 27 elderly people living in housing complexes for retirees and pensioners. To define the number of participants, the saturation point methodology was used, so that, after a certain quantity, new cases are repeated or come to saturate the content of previous knowledge.¹¹

To obtain information, individual semi-structured interviews were conducted. There were eight interviews in Complex 1, Complex-2 ten interviews and Complex-3 nine interviews. The day and time were agreed upon before the interviews were conducted. These were recorded for later transcription.

25 interviews were conducted at the person's home by decision of each participant, 2 were conducted in the meeting room of the corresponding complex. During the data collection process, the people who were part of the sample signed the Informed Consent Form after receiving the necessary clarifications. In this, the objectives of the research were explained and clarified that their participation is voluntary, anonymous, confidential and that the information collected would be used for exclusively scientific purposes, in accordance with Decree 158/019 on the full protection of human beings. object of investigation, considering his dignity and integrity. To maintain the anonymity of the participants, we changed the names to CH, B, C, which indicates the Housing Complex in which they live, and the number of the order of the interview. The study was approved by the ethics committee, and the request for registration of the project was made to the General Directorate of Health of the Ministry of Public Health - Health Evaluation Division No. 5218709.

RESULTS

CHARACTERIZATION OF HOUSING COMPLEXES

CH Complex. It is located in a central neighborhood with a large concentration of services, public and private offices, educational centers of various levels, theaters, cinemas, important access to public transport, commerce. The streets are concrete, illuminated, there are traffic lights, there are no unevenness. The Complex is a 10-story apartment tower, with

a total of 29 houses spread over 9 floors, the top floor has a lounge that can be used by residents for social activities.

As for the distance to access health services, the closest is 6 blocks (600 meters) and the farthest is 35 blocks.

Regarding services, Pharmacy 1 to 4 blocks, Supermarkets 2 to 3 blocks. The green spaces are between 5 and 10 blocks long. In this complex, the Faculty of Nursing has been working with the elderly for 1 year, after the beginning of fieldwork.

Complex B It is located in one of the most vulnerable areas of Montevideo. According to the boundaries of the neighborhood, it is in the same area as complex 3, but the latter is to the southeast. It is an area that presents several housing problems, unemployment, labor informality, difficulty in accessing basic services. The government of the capital has sought to revitalize the area to improve the quality of life with regard to the neighborhood's infrastructure, social integration, security, health, housing, employment and education. It is a building with 28 apartments, located on a street that has a slope. It is a building that has 3 floors and in the center was left a green space with trees and plants and a meeting room.

It is located in the eastern center of the city of Montevideo, near the summit of a small hill. It is an area with a significant population density, compact, endowed with infrastructures and social services, with signs of impoverishment. Several of its streets are built on these slopes. It is an area that has heritage and historical values, with several social and cultural educational organizations and institutions. In this complex, the Faculty of Nursing has been working with the elderly for 3 months, since the beginning of the fieldwork. It is located on a block that leads to three streets. It is a 3-storey building, with no main entrance ramp. The different floors are accessed by stairs or elevator, it has 47 apartments occupied out of a total of 50. All the houses have natural lighting and face the common courtyard and others face one of the three streets that surround the building. On the ground floor there is a common room, with bathroom, kitchen, is spacious with natural light that overlooks a patio with barbecue and green areas.

With regard to the participants, a characterization table was prepared taking into account age, gender, level of education, the number of people living in the household and the length of residence in the Complex (Table No. 1).

Table 1- Characterization of older adults living in the Montevideo/Uruguay complexes, 2022.

Interviewee	Genre	Age (years)	Level of education	Number of people per Dwelling / presence of pet	Time living in Complejo
Ch1	F	92	Primary Complete	1	20 years
Ch2	F	67	E.Superior Incomplete	1	5 years
Ch3	F	82	Utu Secretariat	1 Pet	7 years
Ch4	F	79	Incomplete Secondary School	2 (husband)	4 years
Ch5	M	86	Incomplete primary	2 (wife)	4 years
Ch6	F	80	Incomplete primary	1	1 year
Ch7	M	76	Complete Primary	2(couple) Mascot	1 year and a half
Ch8	F	72	Incomplete Secondary School	2 (couple)	1 year and a half
B1	M	75	Incomplete primary	1	5 years
B2	F	68	Incomplete Secondary School	1	3 years
B3	F	70	Incomplete primary	1	5 years
B4	F	84	Incomplete primary	1	7 years
B5	F	72	Complete Primary	1	12 years
B6	F	86	Complete Primary	1	17 years old
B7	F	87	Complete Secondary	1	3 years
B8	F	70	Incomplete Secondary School	1	1 year
B9	M	77	Complete Primary	1	18 years old
B10	M	78	Incomplete primary	1	6 years
C1	F	74	Complete Primary	1 pet	12
C2	F	76	Illiterate	1	6
C3	F	76	Incomplete primary	2	12
C4	F	79	Complete Primary	2	10
C5	M	78	Incomplete primary	1	3
C6	M	84	Complete Primary	2	8 years
C7	F	71	Complete Primary	1	4 years
C8	F	82	Incomplete primary	1	4 years
C9	F	70	Complete Secondary School	2	8 years

Of the 27 interviewees, the age group was 92 years old and the youngest was 67 years old. In our interviews, 9 of the people are over 80 years old. There is a higher proportion of women living in the complexes, of the interviews, 20 were women and 6 of them were over 80 years old. According to the stories, 19 elderly people live alone. As for the level of education, most do not have a high level, 18 people completed the primary level, but half only managed to complete it. Several of the interviewees expressed that the reason

they could not continue their studies was because they had to leave for work. There were 8 people who reached high school, but only three managed to complete it.

The time of residence in complexes, according to the stories, was 20 years and the minimum was 1 year. Of the total number of interviewees, 9 people live between 5 and 10 years.

Regarding the health of the interviewees, all have comorbidities. The same person has more than one non-communicable disease, which implies health checks, pharmacological treatments, among others. Several of them have some type of functional limitation. Everyone has a healthcare provider that can be public or private.

In the analysis of the interviews, three categories were identified: Self-perception of aging and Old Age; relationship with the neighbors of the complex; socio-economic situation.

"I'm not the same" Self-perception of aging and old age

There are positive aspects that can make this stage of life an enriching experience. One of them is the development of greater wisdom and experience accumulated over the years. As the participants explain below:

"I'm a person who has to thank God every day, because at my age there are people who are already crazy. However, it will be because I exercised my mind in my work,... I'm still mentally well. Well, for me, aging is a part of the human being that has to be respected" (C6).

"Always young, for me the age never came... I hope everyone reaches my age like me... I proudly say that I am 72 years old" (CH8).

"I'm going to enjoy it until the last moment" (B5).

In the stories they express in a positive way their self-perception about their aging process and old age, both in men and women. Where they express a natural phase that is part of life, joy, the feeling of pride. Some attribute what they did in other stages of life as a contribution to them being able to express themselves positively about their aging process today. These are people who have some chronic non-communicable diseases, but that does not invalidate them.

Each individual lives and experiences aging and old age in a unique and different way from others. This self-perception can be conditioned by health problems, decreased functional capacity, loneliness, and social isolation.

"At this age, for example, I would like to be younger, to be able to do more things, which I can't do now,... because of the tiredness of the body... it's like getting old, the fan is shutting down, it's shutting down" (CH2).

"I'm forgetting things. Don't put me in a residence because I don't want to. I'll stop there unfortunately..." (B8)

"I'm not the same anymore, I don't have the same strength anymore,..., it seems like I'm going to break alone" (B10).
 "I wouldn't like it, but you. I think about my children. There are days that I lie down and cry like crazy... But it hurts terribly. I mean, I wouldn't want to have a disease. I saw my mother suffer a lot" (C3).
 "Getting older is, it's like saying: Well, I'm just sitting here, I'm old,... it is like sitting and waiting for death" (B5).

The elderly express a self-perception with negative aspects. These are people who suffer from chronic health problems, so it is living with them every day and to this is added the need to comply with medications and dietary treatments on an ongoing basis. They associate this phase with physical and cognitive losses, a phase that causes pain, no more plans, passivity, loneliness, sadness, fragility, tiredness, loss of autonomy, dependence.

Other participants have a different self-perception than those mentioned above. To resist lifestyle adaptation or to refuse to recognize the physical and cognitive changes of age, expressing a refusal to have to live old age as expressed below:

"For me, I don't age. I like to be tidy and not get old" (C3).
 "I didn't want to reach old age" (C2).
 "Yes, yes, I can't answer because I don't know, I haven't thought about what it's like to grow old" (B2).

In the stories, it is impressive that this stage was not thought of, perhaps it was not considered part of the cycle of life. In some, it conveys the idea that he could not stop this process and now he had to live it. Even relating aging to sloppiness, a phase of carelessness, of carelessness in self-care.

RELATIONSHIP WITH THE NEIGHBORS OF THE COMPLEX

Relationships with neighbors can play a significant role in the lives of seniors. For many, neighbors become close companions, providing emotional, social, and practical support, for others they do not. To continue the relationship with the neighbors, they express:

"Moving to the complex..., I lost all the friendships I had there" (CH3).
 "Strange to be able to make friends... And here it does not exist, no, it does not exist here" (CH7).
 "Relationship with neighbors, honestly I have felt more discriminated against here, here in this complex than outside" (B3).
 "There are people here who are scary and there are people who are not. There are people who are difficult to understand" (C6).
 "It's complicated. Things are complicated here. You get along with one person and then you can't get along with anyone. Because it's every man for himself" (B4).
 "Because there are people who believe that they will never need anyone... And logically,... here the fundamental thing is to help the other" (B9).

The research addresses men and women from different groups, where participants express the fragility or absence of bonds between neighbors. They are people who live the same stage of life, who may have some elements in common such as the fact of living alone, having health problems, difficulty accessing certain services, living in the same condominium, having the same needs. However, the stories I relate between neighbors in the different complexes reflect, it is difficult, there is a lack of empathy, understanding, the impossibility of generating new bonds of friendship, of strengthening the support network, it is mentioned by some neighbors, having felt discriminated against. These are expressions that demonstrate the difficulty of living in housing projects, where it affects well-being, which can increase people's loneliness and isolation.

SOCIOECONOMIC SITUATION

Socioeconomic conditions can have a significant impact on people's self-perception of old age. The relationship between low socioeconomic status and negative self-perception of old age can be explained by several factors. Following the self-perception of the interviewees, they point out that:

"... The elderly in general are poorly cared for, the government has to take care of the elderly. We are a country of the elderly... They give us housing, so what? We are alone as if we were nothing... the pension they pay us... because we earn a pittance" (CH3).

"The government works to improve the quality of life for some. But who cares about the poor? (C9).

"No, the income I have is not enough for me at all... If I don't have money, I have a son who is a sun. He doesn't let me lose anything" (C1).

"No, but retirement doesn't give me... I wish I had more... not worrying about paying the bills and not running out of money" (B1).

"Yes, because when I'm so, really lacking, I take out a loan" (B10).

Important issues felt by older people are collected in the stories. Understand that in the country we are faced with a reality that is the proportion of elderly people, a group that continues to grow and that needs greater support from the State. From what was expressed "Who cares for the poor?", perhaps we want to convey the idea of the importance and value of dedicating time and effort to taking care of these people, of ensuring respect for their rights, of ensuring that they have support for those who are in situations of poverty and vulnerability. They receive pensions that they express are not enough to cover their expenses and are considered a "misery"

DISCUSSION

Particular attention is needed to the situation of older people and in a national context that demonstrates the growth of an ageing society. Old age, a phase that can be prolonged because life expectancy has increased, resulting as much as adulthood, reaching 60 years and adding to these on average another 20. The increase in life years has been accompanied by pathologies and dependence in old age (CIEN 2020).¹² This is demonstrated in the population of people living in housing projects in the city of Montevideo, Uruguay.

Projections indicate that by 2050, women aged 65 and over will account for 54% of the world's population (United Nations, 2019).¹³ The elderly who are unable to stay with their families or in single-cell homes have Social Policies that provide housing complexes.

The results of this research demonstrate a feminization of aging in residents of housing complexes, a phenomenon in which there is a higher proportion of women than men, especially at older ages. Feminization in the elderly population is also noted in a study conducted in Brazil.¹⁴

The fact that aging is more prolonged among women, since they survive longer.

Of those interviewed, most refer to what their history was like since childhood, with health, economic and educational deprivations, and certainly this had an impact on their old age. Many of them were part of disadvantaged socio-economic backgrounds, where they had to drop out early because they had to start working. There are authors who mention that people who have been educated are more likely to make better decisions or have more information about their health than those who have not. These investigations showed how the level of education is considered in the quality of life of the individual. Older adults with no academic education or primary education perceived the dimensions of quality of life as low, compared to older adults with higher levels of education.¹⁵

When analyzing schooling and occupation, it was found that there is a large number of elderly people with little schooling, which may be a reflection of the difficulties in accessing school when they were children and, even due to the precarious socioeconomic conditions, therefore, low income.

Similar data were also found in a study carried out in a Long-Term Care Institution for the Elderly in Rio Grande do Sul/Brazil: low education, low professional qualification and income, in addition to chronic health conditions.¹⁶

The way we see and understand old age, our own and that of others, will be conditioned by various factors such as health, the economic situation and the context in which we age, giving it a meaning according to our own experiences. To have a successful

old age as a goal is not to want to extend the limits of life span, but rather to seek to ensure that she is in good health, in activity and social interaction, independence and autonomy.¹

Self-perception is diversified in the interviewees, and may or may not influence society's view of old age and aging. In the case of Uruguayan society, old age continues to be linked to passivity, deterioration, spending, illness, and the absence of the capacity to act, rarely wisely (CIEN, 2020).¹²

This view is not shared by all the elderly and this makes them heterogeneous, showing that there is no single path and that it is different from what society has of them. There are those who perceive themselves as positive, recognizing it as part of the cycle of life, even nostalgic for some, youth as years of well-being and old age with its losses, but also with gains. The real understanding of the elderly about the changes in their own bodies and in the environment in which they live has a significant impact on active aging and on the good perception of old age.¹⁷

Those who express having difficulties in recognizing themselves in this process, express it as if it did not correspond to their own experience, stating that having the years of life that link it to old age does not mean an element that makes them feel identified as such. The results are similar to a study on Conception and social attributes of old age according to the self-perception of the elderly in the twenty-first century, which shows the imprecision of the concept of old age and the negative connotations associated with it.

The refusal to identify oneself as elderly demonstrates the need to update the meaning that still exists of old age.¹⁸

The lack of acceptance or recognition of old age and aging can cause the person to lose the opportunity to take care of their health and well-being, have difficulties adapting to new circumstances and limit their access to resources that could help in their quality of life. Of the interviewees, their self-perception is linked to issues that accompany them in this phase and affect them in their activities of daily living because they have health problems or live with physical pain. Others have had the experience of seeing a loved one in old age, as is the case of their sick and dependent parents having to be institutionalized.

Another category of the study concerns the social relationships of the elderly, in these situations, the relationship between neighbors of housing complexes. It is an informal network where it can be formed by family and friends as well as neighbors. The elderly interviewed in the complexes live mostly alone, so a component of their informal social relationships should be neighbors.



A study mentions that there is support in care, household chores, monitoring and the money comes mainly from family members, but those who live alone do not receive this support, being followed by those who live alone with their partner.¹⁹

In the investigation, the stories indicate that some people have little connection, very few people mention the existence of friends. A study conducted in Mexico showed that seniors in single-person homes have a smaller support network compared to other types of family arrangements. For those with few economic resources and limited social protection, the informal network is expected to be what helps to cover people's needs, with the family generally being considered as a protective factor.

The study also refers to the need for the elderly to strengthen their social relationships throughout life to generate reciprocity.²⁰

The next category of research is socioeconomic status. People living in the complexes have formal social support in terms of material transactions, as they receive a pension or contributory pension from the BPS that should not exceed 12 Adjustable Units. Generally, at this stage of life, the financial situation is worrying, and you may have money to cover expenses with medicines, health exams, food, services, among other things, and not depend on others to live. This is also an important issue that contributes to the self-perception of how they see themselves at this stage of life.

In the story they say that the money they receive monthly "is not enough for anything", which is a "misery".

One study refers to the role of the family as an important resource for the elderly, responsible for providing direct help, especially for those with health problems, and this support is highly valued.²⁰

Those who do not have the support of their social network resort to monetary loans and enter a recurring circle to obtain money to cover their expenses, exposing themselves to other difficulties that arise in these situations.

A study on older people relates a precarious economic situation with greater frailty, associating that being a woman, widowed and having a low level of education were risk factors for a higher rate of frailty and level of satisfaction. Suggesting that before old age, socioeconomic health conditions should be improved to avoid the presence of financial fragility.²⁰

Undoubtedly, financial fragility is an indicator of health in older people, schooling is an element of protection in both men and women. In the study by Zimmer: where he addresses the prevalence of frailty, he mentions that the most favorable socioeconomic characteristics



and those who live in countries with stronger economic indices, the elderly have life expectancy without disability.¹²

FINAL CONSIDERATIONS

The stories show that self-perception is positive, for others negative or both, perhaps conditioned by life circumstances in the past, personal and cultural experiences, but also in the present, by factors such as their social environment, their economic resources, their health status and emotional support.

In this study, all people live with chronic non-communicable diseases, others with functional limitations, which weakens them to a certain extent. Most are women who live in these complexes, demonstrating that they also survive longer, but not in better health.

The participants' stories allowed them to learn about the social relationships with the neighbors. Human beings are part of the community and need the support of other people in various situations throughout life. In old age it is important to have this support, considered as an element of protection that helps to reduce isolation and the feeling of disconnection from the community, avoids feelings of loneliness and promotes a feeling of permanence and support. The results of the study show that these social relationships are scarce, perhaps ineffective or non-existent, for the interviewees of the different housing complexes, who express difficulties in the bonds between neighbors.

They are people of low socioeconomic status, with a significant impact on their lives, their health, their emotional well-being and their ability to access services and resources. The level of health shows that they have chronic diseases, with certain limitations that affect their daily lives.

Knowing the self-perception of the elderly about their aging and old age brings several benefits, such as knowing the physical and mental health of the elderly, and helping them to adapt and be resilient to the changes associated with old age to face new challenges. It would favour the development of interventions and policies aimed at this population that would promote equality for the elderly, recognizing their rights.

Create programs and services that meet physical, emotional and social needs to promote healthy and satisfying aging, with a positive outlook, which helps to shift to a new paradigm of active and healthy aging, to a more just society, providing opportunities to the elderly. Society must collaborate with the older generations, so that they take an active role in their interaction with the health and citizen security sectors, managing to uproot negative images about this group of people and even about those who are already living old age.



This would help to provide adequate support, opportunities for social participation, access to health services, and promotion of inclusion in society.

REFERENCES

1. Vázquez-Palacios, F. (2022). Hacia una cultura de la ancianidad y de la muerte en México. **Papeles De Población**, 5(19), 65-75. Recuperado de <https://rppoblacion.uaemex.mx/article/view/18139>
2. Cardona Arango, D., & Peláez, E. (2012). Envejecimiento poblacional en el siglo XXI: oportunidades, retos y preocupaciones. **Salud Uninorte**, 28(2), 335-348. Recuperado de <http://www.scielo.org.co/pdf/sun/v28n2/v28n2a15.pdf>
3. Navarro, R., Salazar-Fernández, C., Schnettler, B., & Denegri, M. (2020). Autopercepción de salud en adultos mayores: moderación por género de la situación financiera, el apoyo social de amigos y la edad. **Revista médica de Chile**, 148(2), 196-203. <https://dx.doi.org/10.4067/s0034-98872020000200196>
4. Murillo Ramírez, A. (2022). Autopercepción sobre el proceso de envejecimiento de los adultos mayores que frecuentan el parque principal del municipio de Villamaría (Caldas). Manizales: s.n. Recuperado de <https://repositorio.ucaldas.edu.co/handle/ucaldas/18079>
5. Uruguay. Instituto Nacional de Estadística. (2018). **Indicadores demográficos.** Montevideo: INE. Recuperado de https://www.ine.gub.uy/c/document_library/get_file?uuid=a70bf11d-a2a0-4f26-aadb-fe4df9b5fc8bygroupid=10181
6. Uruguay. Sistema De Información Sobre Envejecimiento Y Vejez. (2015). **Las personas mayores en Uruguay: un desafío impostergable para la producción de conocimiento y las políticas públicas.** Montevideo: MIDES. Recuperado de <http://dinem.mides.gub.uy/innovaportal/file/61742/1/las-personas-mayores-en-uruguay-un-desafio-impostergable-para-la-produccion-de-conocimiento-y-las-politicas-publicas.-2015.pdf>
7. Uruguay. Ministerio De Desarrollo Social. Instituto Nacional del Adulto Mayor (INMAYORES). (2019). **Ejercer el derecho a la participación política en la vejez. Reflexiones a 10 años de la Red de personas mayores.** Montevideo: MIDES. Recuperado de <https://www.gub.uy/ministerio-desarrollo-social/sites/ministerio-desarrollo-social/files/2019>
8. Nuñez, I. (2019). Soluciones Habitacionales. Contexto actual y descripción de las alternativas del Programa de Vivienda del BPS. **Comentarios de Seguridad Social**, 56(2). Recuperado de <https://www.bps.gub.uy/bps/file/12809/1/soluciones-habitacionales.-contexto-actual-ydescripcion-de-las-alternativas-del-programa-de-vivienda-del-banco-de-prevision-social.-i.nunez.pdf>
9. Leal, R. C., et al. (2020). Percepção de saúde e comorbidades do idoso: perspectivas para o cuidado de enfermagem. **Brazilian Journal of Development**, 6(7), 53994-54004. <https://doi.org/10.34117/bjdv6n7-881>
10. De Souza Minayo, C. (2016). **Investigación Social. Teoría, Método y Creatividad.** Buenos Aires: Lugar Editorial. Recuperado de https://www.trabajosocial.unlp.edu.ar/uploads/docs/de_souza_minayo__maria_cecilia__investigacion_social__teoria__metodo_y_creatividad_.pdf

11. Serna, M. (2019). ¿Cómo mejorar el muestreo en estudios de porte medio usando diseños con métodos mixtos? Aportes desde el campo de estudio de elites. *EMPIRIA. Revista de Metodología de las Ciencias Sociales*, (43), 187-210. Recuperado de <https://www.redalyc.org/journal/2971/297166564008/297166564008.pdf>
12. Paredes, M., & Perez, R. (2020). *Miradas interdisciplinarias sobre envejecimiento y vejez.* Montevideo: CIEN. Recuperado de <https://www.cien.ei.udelar.edu.uy/miradas-interdisciplinarias-sobre-envejecimiento-y-la-vejez/>
13. Naciones Unidas. (2023). Paz, dignidad e igualdad en un planeta sano. *Naciones Unidas*, 14(1), 41-50. Recuperado de <https://www.un.org/es/global-issues/ageing>
14. Sousa, N. F. da S., Lima, M. G., Cesar, C. L. G., & Barros, M. B. de A. (2019). Envelhecimento ativo: Prevalência e diferenças de gênero e idade em estudo de base populacional. *Cadernos de Saúde Pública*. <https://doi.org/10.1590/0102-311x00173317>
15. Samaniego Chalco, M. J., & Quito Calle, J. V. (2023). Calidad de vida en adultos mayores no institucionalizados de Cuenca-Ecuador, 2022. *Maskana*, 14(1), 41-50. <https://doi.org/10.18537/mskn.14.01.03>
16. Silva, R. S. D., Fedosse, E., Pascotini, F. D. S., & Riehs, E. B. (2019). Condições de saúde de idosos institucionalizados: contribuições para ação interdisciplinar e promotora de saúde. *Cadernos Brasileiros de Terapia Ocupacional*, 27, 345-356. Recuperado de <https://www.scielo.br/j/cadbto/a/9ZZBqkWW999PJbhZQcWzTvB/abstract/?lang=en>
17. Lindemann, I. L., et al. (2019). Autopercepção da saúde entre adultos e idosos usuários da Atenção Básica de Saúde. *Ciência & Saúde Coletiva*, 24(1), 45-52. <https://doi.org/10.1590/1413-81232018241.34932016>
18. Amezcua, T., & García Domingo, M. (2022). «¿Mayor, yo? ¿Dónde lo pone?» Concepción y atribuciones sociales a la vejez según la autopercepción de las personas mayores del siglo XXI: de la seneficiencia al elder pride. *RECERCA. Revista De Pensament I Anàlisi*, 27(1). <https://doi.org/10.6035/recerca.5778>
19. Villegas, S., Garay, V., & Montes de Oca, M. (2019). Redes de apoyo en los hogares con personas adultas mayores en México. *Revista Latinoamericana de Población*, 13(26), 70-88. Recuperado de <https://www.redalyc.org/journal/3238/323861646004/323861646004.pdf>
20. Ortega-Rabí, Y., et al. (2022). Evaluación del apoyo social en el adulto mayor. *Rev Ciencias Médicas*, 26(6), e5786. Recuperado de <http://revcmpinar.sld.cu/index.php/publicaciones/article/view/5786>
21. Rojas Huerta, A. V. (2022). Trayectorias de fragilidad y factores relacionados en la población de adultos mayores en México. *Población y Salud en Mesoamérica*, 19(2). Recuperado de https://www.scielo.sa.cr/scielo.php?pid=S1659-02012022000100081&script=sci_abstract&tlng=es
22. Zimmer, Z., Saito, Y., Theou, O., Haviva, C., & Rockwood, K. (2021). Education, wealth, and duration of life expected in various degrees of frailty. *European Journal of Ageing*, 18(3), 393-404. Recuperado de



https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8377115/pdf/10433_2020_Article_587.pdf

IMPLEMENTATION AND INSTRUMENTALIZATION OF THE AQUARIUM FOR EXPERIMENTS RELATED TO ICHTHYOFAUNAdoi <https://doi.org/10.56238/sevened2024.029-046>**Miguel Vieira de Melo Neto¹, Ézio Sargentini Júnior², Marcos Alexandre Bolson³,
Tania Machado da Silva⁴ and Luiz Fabrício Zara⁵****ABSTRACT**

The analysis of the behaviors of aquatic organisms in the face of environmental stressors is a way to assess environmental quality and reduce negative impacts. In this study, the use of aquariums to observe the behavior of fish exposed to behavioral barriers was proposed. For this, water circulation, oxygenation, injection and liquid sample dispersion systems were installed in a set of 3 aquariums, in addition to a remote monitoring system with image capture. Software was developed to identify the position of the fish in the aquariums and control the introduction of the sample. The results showed that this method is effective for analyzing fish behavior and can be adapted to study other stressful stimuli.

Keywords: Controlled environment. Air bubbles. Ichthyofauna. Behavioral barriers.

¹ Master in Environment and Rural Development
University of Brasilia
Brasilia, Federal District, Brazil
E-mail: miguelv17@gmail.com

² Doctor in Chemistry
São Paulo State University Júlio de Mesquita Filho
Manaus, Amazonas, Brazil
E-mail: eziosargentini@gmail.com

³ Master of Science
University of São Paulo
Manaus, Amazonas, Brazil
E-mail: mabolson@gmail.com

⁴ Doctor in Environmental Sciences
University of Brasilia
Brasilia, Federal District, Brazil
E-mail: taniams.venturo@gmail.com

⁵ Doctor in Analytical Chemistry
São Paulo State University Júlio de Mesquita Filho
Brasilia, Federal District, Brazil
E-mail: fabriciozara@gmail.com

INTRODUCTION

The growing need for clean and renewable electricity generation to supply industry, agriculture, commerce, and residence results in the construction of hydroelectric power plants (FRIGOTTO *et al.*, 2023). These plants require scheduled and untimely maintenance in order to maximize energy generation and minimize costs. However, during these stops, the reduced operational flow can facilitate the entry of fish into the suction pipes, the water intake galleries and the sewage wells (PERRY *et al.*, 2014). As a result, it is necessary to develop behavioral barrier systems suitable for different species, in order to mitigate or even prevent the entry of these fish into undue areas (DA SILVA *et al.*, 2022). Behavioral systems have demonstrated efficacy, but each species reacts differently, requiring further investigation (ZIELINSKI *et al.*, 2014; DENNIS *et al.*, 2019). This need is accentuated because they are tropical species, which live in conditions different from those found in temperate environments (MURCHY *et al.*, 2022; DE MENDONÇA MAROJA *et al.*, 2023).

The use of controlled environments in carrying out experiments is common in science, as it is used as a pilot in order to adjust the procedures in order to simulate the environmental conditions as much as possible. In addition to reducing the operational costs inherent to the implementation of the bubble system and the respective experiment in the field (Da Silva, 2010; Zielinski *et al.*, 2014; Zielinski & Sorensen, 2015). Although they are not fully effective, there is the importance of developing behavioral systems with as much effectiveness as possible, for this it is necessary to develop aquariums to be used as controlled environments in experiments (Zielinski & Sorensen, 2015). In this study, we proposed the development of aquariums instrumentalized to observe the behavior of fish exposed to behavioral barriers.

MATERIALS AND METHODS

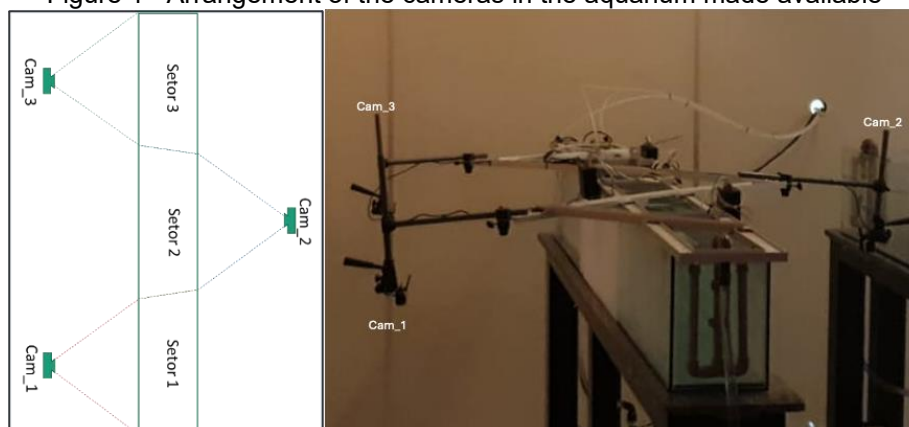
AQUARIUMS INSTRUMENTALIZED FOR ANALYSIS OF FISH BEHAVIORS

The evaluation of the effect of the bubble on the behavior of the ichthyofauna was used by 03 aquariums with a capacity of 100 L and dimensions 20x30x200 cm (W x H x D), equipped with water circulation and recirculation and oxygenation systems. Each aquarium has an approximate useful capacity of 100 liters and a water column of 26 cm. The recirculation system present in the aquariums has a 24V Aw500s pump, capable of pumping 10 liters per minute, and an FY-B7 flow sensor based on the Hall Effect (Hall *et al.*, 1879). These devices were connected to the aquarium using 3/4-inch crystal polyethylene tubing. Flow control is handled by a 350 W power supply that offers regulated voltages of 5, 12, 17 and 24 V, with flow rates of 3.5; 6,6; 8,8; and 10.6 L/min, respectively. It is essential

to highlight that the integration of the liquid sample insertion system with the circulation system is crucial. This system consists of: peristaltic flow pump from Ismatec UK Ltd., model MC-MS/CA8: equipment that has the ability to accurately control the rate of liquids and has the functionality of being operated remotely (Formato et al. 2019); interaction and management device: the gadget_TTGO T-Display, equipped with a 32 MHz chip_ESPRESSIF 240 MHz, is capable of being configured to receive guidance from a computer and transform them into electrical signals to activate the peristaltic pump.

To monitor the behavior of the fish, an image capture system was developed with 3 Full HD cameras, with a resolution of 1080p/30fps, arranged in a mobile aluminum profile in a "V" shape, with the central camera opposite the cameras at the ends, avoiding image overlap (Figure 1). Specific software detects and records the position of the specimens throughout the aquarium, as well as controls the introduction of bubbles and permanent lights. The software uses C# computational language (C Sharp) and the features of the open source computer vision library OpenCvSharp. The aquariums are located at the National Institute for Research in the Amazon - INPA.

Figure 1 - Arrangement of the cameras in the aquarium made available



Source: Prepared by the authors.

EXPERIMENTAL PROTOCOL

The species Tambaqui (*Colossoma macropomum*); Matrinxã (*Brycon*); Amazonian angelfish (*Cichlasoma amazonarum*); Dianema Tiger (*Dianema urostriatum*); Mandi (*Pimelodus blochii*) were commercially acquired and kept in an acclimatization tank (5,000 L) for 60 days at an average temperature of 26 ± 1 °C, being fed with commercial feed and exposed to the natural photoperiod of 12/12 hours. To perform the assays, 30 individuals were randomly selected and transferred from the acclimatization tank to the instrumentalized aquariums 18 hours in advance, being kept fasting. Previously, the aquariums received 50% (v/v) of the water from the acclimatization tank, minimizing

significant changes in the physical-chemical parameters of the water, and, consequently, changes in behavior and/or diseases in the fish. In the first stage of the tests, the bubble system was turned off for 15 minutes, and images of the fish's behavior were acquired. In the sequence (second stage), the bubble systems were turned on and images of the fish's behavior were acquired for 15 minutes. In the last step, the bubble systems were turned off and images of the fish's behavior were acquired for 15 minutes.

FULL BUBBLE CURTAIN SYSTEM AT THE BOTTOM IN THE AQUARIUM (20 CM)

The generation of bubble barrier by the air compressor (Vulcan Trent VC 25), working with a pressure of 2.5 bar) linked to a micro-perforated hose for gas diffusion with a bubble size of 50 to 500 μm .

To generate permanent light, in the upper part of the aquarium, at the same point where the bubble curtain system was installed, a structure with dimensions of 20 x 30 cm was adapted with a 3 mm slit to generate a light slit on the bubble dispersion axis. Inside this box there was a Taschibra light-emitting diode lamp with a power of 9 W and bivolt, which was used in yellow (warm, 3000 K).

In addition to the use of bubble curtains and permanent light, the aquariums were prepared to integrate a liquid sample insertion system. This system consists of a peristaltic flow pump from Ismatec UK Ltd., model MC-MS/CA8, equipment capable of precisely controlling the rate of liquids and which can be operated remotely (FORMATO et al. 2019). The interaction and management device used is the T-Display gadget_TTGO, equipped with a 240 MHz ESPRESSIF 32 chip, configured to receive commands from a computer and transform them into electrical signals to activate the peristaltic pump.

It is important to note that the instrumentalized aquariums are located in a laboratory at the National Institute for Research in the Amazon (INPA). This laboratory has light and temperature control, in order not to interfere with the behavior of the fish used in the experiments.

COMPUTER PROGRAM FOR ACQUISITION, CONTROL AND TREATMENT OF AQUARIUM IMAGES

The elaboration of a computer program in the C# computer language (C Sharp), which was compiled in Microsoft Visual Studio, using the tools available in the open source computer vision library OpenCvSharp. The aforementioned program has the functionality of detecting and recording the position of the fish in the aquarium, as well as controlling the bubbles.

In order to locate the fish, the software analyzes the images captured by the cameras, putting them together to create a single view of the aquarium. This process goes through six steps: (1) grayscale transformation and noise reduction using the Gaussian Blur filter. This step smooths the image and prevents false detections; (2) using a copy of the original image, a background image is created with the Gaussian Blur filter adjusted differently; (3) the difference between the two images is calculated to highlight the objects of interest; (4) the resulting image is then binarized with the Threshold filter, converting it to black and white; (5) the Dilate filter is applied to the binarized image to improve the definition and correct internal flaws in the objects; (6) In the last stage, the fish are counted and recorded in Cartesian coordinates.

The information of the detection process is stored in a document in .csv format at a frequency of ten frames per second (10 Hz), in which each line records the date, time and location of each fish identified in each frame analyzed. Simultaneously, a file in .mp4 format is generated to record all frames in a streaming video with a rate of 10 Hz, allowing the choice of whether or not to include markers for the fish.

EXPERIMENTAL PROTOCOL FOR TESTING WITH BUBBLE CURTAIN

The species Tambaqui (*Colossoma macropomum*), Matrinxã (*Brycon spp.*), Amazonian angelfish (*Cichlasoma amazonarum*), Dianema Tigre (*Dianema urostriatum*) and Mandi (*Pimelodus blochii*) were commercially acquired and kept in a 5,000 L acclimatization tank for 60 days, at an average temperature of 26 ± 1 °C. During this period, they were fed commercial feed and exposed to the natural 12/12-hour photoperiod.

To perform the trials, 30 individuals were randomly selected and transferred from the acclimatization tank to the instrumentalized aquariums 18 hours in advance, being kept fasting. Previously, the aquariums received 50% (v/v) of the water from the acclimatization tank, minimizing significant changes in the physical-chemical parameters of the water and, consequently, changes in behavior and/or diseases in the fish.

In the first stage of the trials, the bubble system was kept off for 15 minutes, and images of the fish's behavior were acquired. Then (second step), the bubble curtain system was turned on, and the images of the fish behavior were captured for 15 minutes. In the final step, the bubble curtain system was turned off again, and the images of the fish's behavior for another 15 minutes.

RESULTS

To verify the functioning of the bubble curtain system, an initial test was carried out before the behavioral tests. To this end, the compressor, operating at a pressure of 2.5 bar, was connected to the microperforated hose for gas diffusion, in order to evaluate the formation of the bubble curtain. The results were satisfactory, with the bubble curtain being formed as expected and the test recording confirming the efficacy of the system (Figure 2).

Figure 2 – Image of the curtain formation test in the bubble curtain system.



Source: Prepared by the authors.

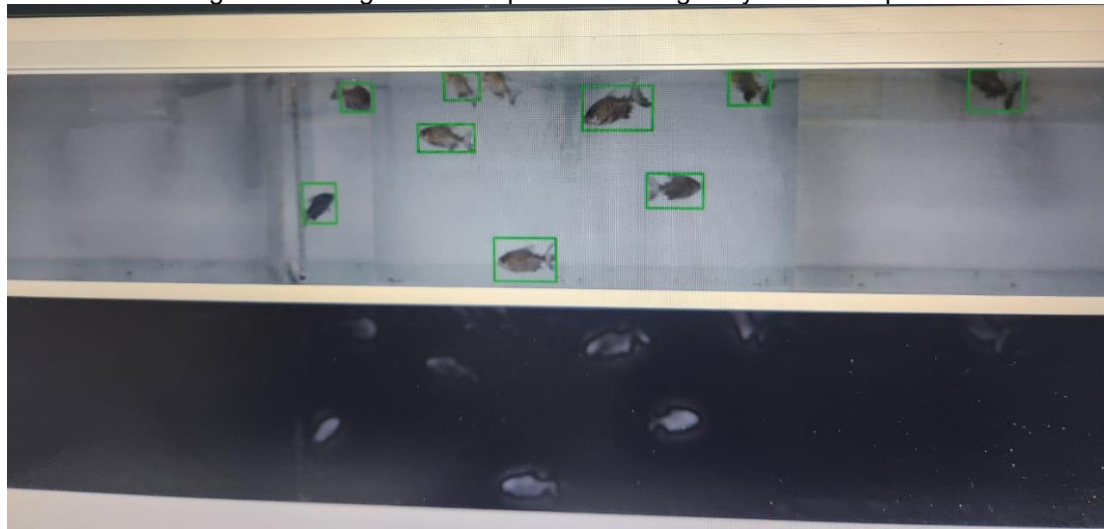
Based on the preliminary tests, the bubble curtain system and other components of the instrumentalized aquariums are confirmed to be adequate for the execution of the planned experiments. The aquariums, equipped with circulation, water recirculation and oxygenation systems, proved to be efficient in all phases of the tests, making it possible to maintain the stability of the physicochemical properties of the water and the controlled observation of the behavior of the fish. The integration of the bubble system with the remote control center and the ability to insert liquid samples allows the flexibility of the experiments, with the possibility of changing the experimental conditions without significantly interfering in the operation of the other systems.

The *software* developed for image acquisition, control, and processing played a crucial role in capturing and analyzing fish behavior. The detection and recording of fish positions throughout the aquariums occurred flawlessly, with the camera system in "V" profile ensuring complete coverage of the environment. Combining the images from the three cameras into a single view of the aquarium allowed for continuous and accurate monitoring of fish movement, avoiding overlaps and maximizing the clarity of observations.

During the experimental phase, the fish were monitored in three stages: with the bubble curtain system turned off, turned on and turned off again. The data collected by the *software*, stored in .csv format and videos in .mp4, allowed a detailed analysis of the behavioral changes induced by the activation of the bubble curtain (Figure 3). The system

detected clear changes in swimming patterns and behavior, such as fast swimming, immobility, and lethargy, which were consistently observed across all species tested.

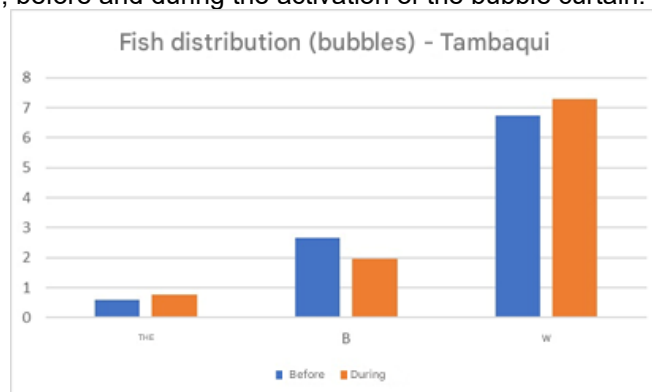
Figure 3 – Image of the acquisition of images by the developer.

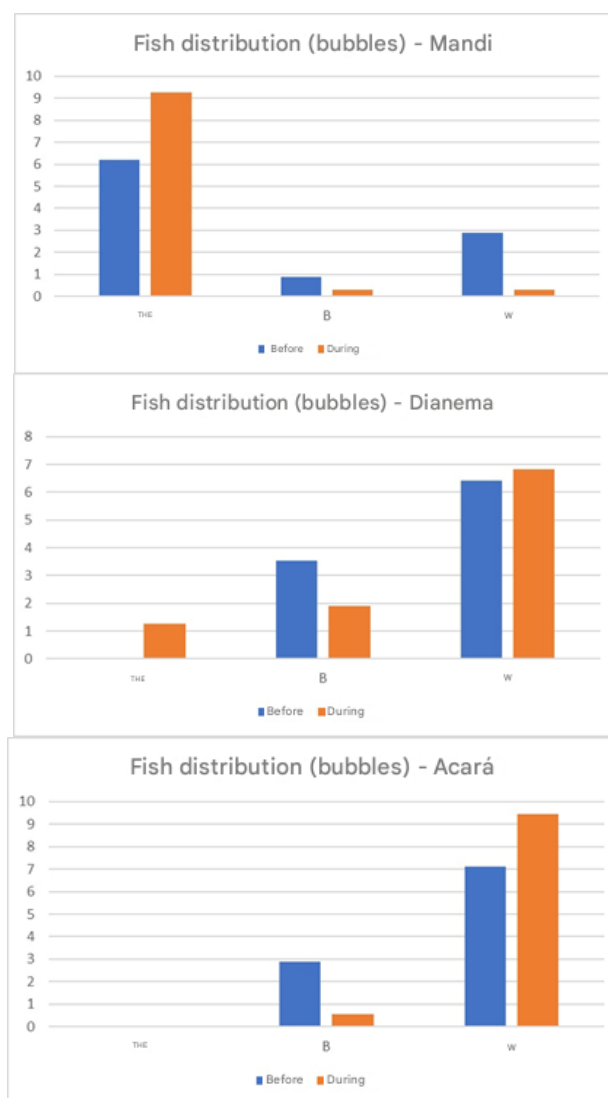


Source: Prepared by the authors.

Figure 4 shows the average distribution of the specimens of the five species participating in the experiment, in the three sectors of the instrumentalized aquarium, before and during the activation of the bubble curtain. With the exception of the mandi specimens, the other fish species showed a tendency to move away from the bubble curtain, being mostly positioned in sector 3 of the aquarium. This behavior reflects the efficiency of the bubble curtain as a physical-behavioral barrier for fish. However, the experiment is done in a closed environment. Thus, with the passage of time and without the possibility of escaping to more distant regions, some species tend to "face" the risk and, consequently, the other specimens participating in the experiment follow the "lead fish", as observed in the behavior analysis described above.

Figure 4 – Average distribution of the ichthyofauna specimens used in the study in the three sectors of the instrumentalized aquarium, before and during the activation of the bubble curtain.





Source: Prepared by the authors.

Figueiredo et al. (2023) performed experiments using the liquid sample insertion system in aquariums to introduce hypoxanthine-3-N-oxide, an alarm substance that has been shown to be effective in provoking behavioral responses in fish species of the Osteriophysan group. In the assay with the species *Matrinxã* and *Tambaqui*, the concentration of $6.0 \mu\text{g L}^{-1}$ of hypoxanthine-3-N-oxide was introduced into the aquatic environment, resulting in unusual behaviors such as lethargy, foraging for the bottom and attacks. These results confirm the efficacy of hypoxanthine-3-N-oxide as an inducer of alarm signals in fish, demonstrating the potential of its use in ichthyofauna management practices, especially in areas impacted by hydroelectric activities. The possibility of remote and precise application of the substance using the developed monitoring and control system reinforces the feasibility of future studies and practical applications with this approach.



CONCLUSION

In general, the instrumentalized aquarium, combined with the monitoring software, proved to be highly effective for conducting the planned experiments. The precision in the control of the experimental variables and the software's ability to process and analyze images in real time provided reliable results, demonstrating the feasibility and potentiality of the system for future studies on behavioral and chemical barriers in fish.


ACKNOWLEDGMENTS

We thank the Sustainable Energy R&D Program in Brazil (ANEEL/PD-06631-0009/2019).

REFERENCES

1. Da Silva, F. N. A. (2010). *Efeito de campo elétrico no comportamento de peixes brasileiros e estudo de barreira elétrica como mecanismo de controle de movimentação de peixes*.
2. Da Silva, T. M., et al. (2022). Detering fish by increasing the flow rate in bulb turbines. *The International Journal on Hydropower and Dams*, 29(4), 62-65.
3. Dennis, C. E., Zielinski, D., & Sorensen, P. W. (2019). A complex sound coupled with an air curtain blocks invasive carp passage without habituation in a laboratory flume. *Biological Invasions*, 21, 2837-2855.
4. De Mendonça Maroja, A., et al. (2023). Reação da ictiofauna da região amazônica a diferentes impulsos sonoros: Reaction of ichthyofauna in the amazon region to different sound impulses. *Brazilian Journal of Animal and Environmental Research*, 6(3), 2538-2549.
5. Figueiredo, W. S., et al. (2023). Eficácia da hipoxantina-3-N-óxido como método alternativo na proteção da ictiofauna em usinas hidrelétricas: Efficacy of hypoxanthine-3-N-oxide as an alternative method to protect ichthyofauna in hydroelectric power plants. *Brazilian Journal of Animal and Environmental Research*, 6(2), 1108-1116.
6. Formato, G., et al. (2019). Fluid–structure interaction modeling applied to peristaltic pump flow simulations. *Machines*, 7(3), 50.
7. Frigotto, S., et al. (2023). O potencial energético renovável do Brasil como vetor apto a retardar a mudança climática. *Observatório de la Economía Latinoamericana*, 21(10), 17662-17677.
8. Hall, E. H., et al. (1879). On a new action of the magnet on electric currents. *American Journal of Mathematics*, 2(3), 287-292.
9. Murchy, K. A., et al. (2022). Behavioral responses of native and invasive fishes of the Upper Mississippi River to 100 hp boat motor acoustic stimulus. *Management of Biological Invasions*, 13(4), 750-768.
10. Perry, R. W., et al. (2014). Using a non-physical behavioural barrier to alter migration routing of juvenile chinook salmon in the Sacramento–San Joaquin River delta. *River Research and Applications*, 30(2), 192-203.
11. Zielinski, D. P., et al. (2014). Laboratory experiments demonstrate that bubble curtains can effectively inhibit movement of common carp. *Ecological Engineering*, 67, 95-103.
12. Zielinski, D. P., & Sorensen, P. W. (2015). Field test of a bubble curtain deterrent system for common carp. *Fisheries Management & Ecology*, 22(2).

PUBLIC POLICIES AND THE CONFRONTATION OF INEQUALITIES IN BRAZIL – CONSTITUTIONAL TELEOLOGY VERSUS ECONOMIC AND SOCIAL RESISTANCE: THE LONG ROAD

 <https://doi.org/10.56238/sevened2024.029-047>

William Gomes Lisboa da Costa Filho¹

ABSTRACT

This study analyzes the effectiveness of public policies in addressing inequalities in Brazil, in the light of constitutional teleology, highlighting the main economic and social barriers. The central question is to understand what are the main obstacles to the effective implementation of public policies aimed at reducing inequalities in Brazil. The research adopts a qualitative and exploratory approach, based on bibliographic and documentary research. The analysis revealed that, although the 1988 Constitution provides a robust normative basis for social equality, budgetary limitations and the influence of neoliberalism, together with social and cultural resistance, compromise the realization of social rights. The results indicate that overcoming these barriers requires a reassessment of the State's economic priorities and a continuous effort to combat social resistance. Future studies should continue to explore the interactions between economic policy, social resistance, and constitutional rights, aiming at the construction of more effective and inclusive public policies.

Keywords: Inequalities. Social rights. Public policies. Economic resistance. Constitutional teleology.

¹ Master's student in Law at the University of Marília - UNIMAR. Graduated in Law from UNIC - University of Cuiabá. 2008. Specialist in Public Law from the Cândido Mendes University. Notary and Registrar at the Notary Office and Civil Registry of Poconé/Cangas – MT.



INTRODUCTION

Confronting inequalities in Brazil is a highly relevant topic, given the persistence of economic and social disparities that mark the country. The Federal Constitution of 1988 established a fundamental commitment to the promotion of equality and the guarantee of social rights, however, the implementation of these policies faces several obstacles. The study focuses on the effectiveness of public policies in the contingency of these inequalities, analyzing them under the *lumen* of constitutional teleology and encompassing the main economic and social resistances.

The central question that guides this research is: What are the main obstacles to the effective implementation of public policies aimed at reducing inequalities in Brazil? Two hypotheses are raised to answer this question: the first is that budgetary limitations and the influence of neoliberalism make significant obstacles to the effective implementation of these policies; the second is that social and cultural resistance, including prejudices and the interests of privileged groups, make it impossible to fully achieve the constitutional objectives of equality.

The general objective of the study is to analyze the effectiveness of public policies in addressing inequalities in Brazil in the light of constitutional teleology, contemplating the main economic and social barriers that hinder the implementation of these policies. The specific objectives are: to examine the constitutional principles and fundamental rights established by the Federal Constitution of 1988 in the context of public policies for the promotion of social equality; and to identify the main economic and social barriers that prevent the implementation of these public policies in the country.

The relevance of the investigation is based on the need to understand the dynamics that perpetuate inequalities in Brazil, providing subsidies for the formulation of more effective public policies. In the academic field, it contributes to the debate on the interface between constitutional law and public policies, promoting a critical analysis of the interpositions to the integral development of these policies.

The methodology adopted is qualitative and exploratory, based on bibliographic and documentary research. Legal texts, decrees and official publications were analyzed, as well as relevant academic literature. The documentary analysis allowed an in-depth understanding of the legal construct that guides public policies in Brazil, as well as the practical difficulties faced in its implementation.

The theoretical framework is composed of two main sections. The first, entitled "Constitutional Teleology and the Promotion of Social Equality", addresses constitutional principles and fundamental rights, as well as the role of the State in reducing inequalities.



The second, "Economic and Social Resistances to the Implementation of Public Policies", discusses economic obstacles, such as budget limitations and influences of neoliberalism, and social resistances, including structural inequality and cultural challenges.

It is hoped that the results of this study will provide critical and amplified biases about public policies to address inequalities in Brazil, identifying the barriers that limit their effectiveness and proposing ways to overcome them.

CONSTITUTIONAL TELEOLOGY IN THE PROMOTION OF SOCIAL EQUALITY

This section addresses the constitutional principles that underlie public policies in Brazil, with an emphasis on the promotion of social equality. An analysis of the articles of the Federal Constitution of 1988 that guarantee the fundamental rights and dignity of the human person is made, highlighting how these provisions guide the formulation of policies aimed at reducing inequalities.

In the segment, the most relevant public policies implemented by the Brazilian State since the promulgation of the 1988 Constitution are discussed, aimed at reducing social and economic inequalities, envisioning policies in the areas of education, health, social assistance, and income redistribution and the advances and obstacles interposed in the realization of these rights.

CONSTITUTIONAL PRINCIPLES AND FUNDAMENTAL RIGHTS

The principles of law are the foundations that guide the construction and application of the legal system. Bandeira de Mello (2016, p. 54) conceptualizes a legal principle as a "fundamental provision that radiates over different norms, composing their spirit and serving as a criterion for exact understanding and intelligence".

According to Norberto Bobbio (1992), fundamental rights guarantee the individual a sphere of freedom "in relation to" the State, and, in the case of political rights, offer freedom "within" the State, allowing an effective participation of the members of society in the exercise of power. This includes, as first-generation fundamental rights, the rights to life, liberty (including demonstration, movement and association), the right to equal treatment (isonomy) and the right to exercise political power.

The Federal Constitution of 1988, known as the Citizen Constitution, establishes a list of fundamental principles and rights that establish the legal basis for the formulation of public policies aimed at promoting social equality in Brazil. Kim (2015) points out that article 5, paragraph 1, of the Federal Constitution, determines the self-applicability of the norms defining fundamental rights and guarantees, including social rights.



Among these principles, the dignity of the human person, equality, social justice, and the commitment to the eradication of poverty and marginalization stand out. Article 1 of the Federal Constitution, in its item III, establishes the dignity of the human person as one of the pillars of the Federative Republic of Brazil.

Article 1 The Federative Republic of Brazil, formed by the indissoluble union of the States and Municipalities and the Federal District, is constituted as a Democratic State of Law and has as its foundations:

- I – sovereignty
- II – citizenship
- III - the dignity of the human person
- IV- the social values of work and free enterprise
- V- political pluralism (Brasil, 1988) (Emphasis added).

It is a point of high uniqueness and relevance, as it recognizes and dominates each individual as deserving of respect and consideration, regardless of their economic or social condition. In this way, the dignity of the human person is a guiding guideline for the formulation of public policies that aim to ensure decent living conditions for all citizens, promoting social inclusion and well-being.

Sarlet (2018) addresses human dignity as a central principle that permeates the entire legal system. For the author, the dignity of the human person is understood as a supreme value that must be respected and protected in all spheres of social and legal life, so that dignity is not only a right, but a guiding principle that subsidizes the very existence of fundamental rights.

The principle of the dignity of the human person is one of the fundamental bases of the Brazilian legal system, standing out as one of the most relevant and influential principles in the context of the interpretation and application of legal norms. Of an axiological nature, this principle transcends the mere guarantee of individual rights, assuming the status of a supreme value that guides all state and social activity.

Its express consecration in the Federal Constitution of 1988 emanates the commitment of the Brazilian State to the protection and promotion of the dignity of citizens, recognizing the centrality of the human person in the construction of a just and solidary society, based on conceptual bases manifested throughout its text (Brasil, 1988).

Article 3, in turn, defines the fundamental objectives of the Republic, including the construction of a free, fair and solidary society (item I), the guarantee of national development (item II), the eradication of poverty and marginalization and the reduction of social and regional inequalities (item III), and the promotion of the good of all, without prejudice of origin, race, sex, color, age and any other forms of discrimination (item IV).



Art. 3 The fundamental objectives of the Federative Republic of Brazil are:
I - to build a free, fair and solidary society;
II - to guarantee national development;
III - eradicate poverty and marginalization and reduce social and regional inequalities;
IV - to promote the good of all, without prejudice of origin, race, sex, color, age and any other forms of discrimination (Brasil, 1988).

The provisions of Article 3 of the current Political Charter are essential guidelines for the formulation of public policies capable of addressing the structural inequities existing in the country. The essential foundations of the Federative Republic of Brazil are outlined in the article, emphasizing the construction of an inclusive and fair society, balanced national growth, fighting poverty and inequalities, along with this, promoting equality and preventing discrimination.

In the same line of reasoning, Article 5 of the Magna Carta asserts fundamental rights and guarantees, declaring the equality of all before the law, without the possibility of any distinction.

Article 5 - All are equal before the law, without distinction of any kind, guaranteeing to Brazilians and foreigners residing in the country the inviolability of the right to life, liberty, equality, security and property, in the following terms:
I - Men and women are equal in rights and obligations, under the terms of this Constitution;
[...] (Brazil, 1988).

This principle of legal equality establishes the need for public policies that promote equity, providing all citizens with equal opportunities to access essential goods and services, such as education, health, and housing, however, taking into account the specificities of each one.

Furthermore, a range of social rights are enshrined in Article 6, including education, health, work, housing, leisure, security, social security, protection of maternity and childhood, and assistance to the destitute. These are essential elements for the promotion of social justice and serve as a basis for the creation of public policies that enable access to these services and rights for all citizens, especially those in vulnerable situations.

Article 6 - Education, health, food, work, housing, transportation, leisure, security, social security, protection of maternity and childhood, assistance to the destitute, in accordance with this Constitution, are social rights. (Text given by Constitutional Amendment No. 90, of 2015) (Brazil, 1988).

Article 7 characterizes the rights attributed to urban and rural workers, with the fulcrum of improving their social condition: "**Article 7** The rights of urban and rural workers, in addition to others aimed at improving their social condition, are: [...]" (Brazil, 1988).



Among the main rights are fair remuneration, limited working hours, paid weekly rest, vacations, retirement, protection against arbitrary dismissal, unemployment insurance and additional payments for unhealthy activities. Such guarantees are aimed at promoting the equity, safety and well-being of workers throughout the country.

In the context of social rights, education and health are high in *the constitutional corpus*. It is in article 196 that health is established as a right of all and a duty of the State, with guaranteed provision based on social and economic policies that lead to the reduction of the risk of disease and other health problems (Brasil, 1988).

It is verified that the right to health is a subjective right of the citizen and not an act of charity by the State. Its provision is, therefore, a state obligation, serving those who are in a situation of threat or damage to their health, seeking material socioeconomic equality (Vita; Silva, 2014).

Article 205, in turn, states that education is a right of all and a duty of the State and the family, promoted and encouraged with the collaboration of society, aiming at the full development of the person, his preparation for the exercise of citizenship and his qualification for work. The provision emphasizes the importance of educational policies as an instrument for promoting social equality (Brasil, 1988).

According to Scaff and Pinto (2016), the 1988 Constitution gave great importance to the right to education, enshrining it as the first of the fundamental social rights in its article 6 and detailing it from article 205. In addition to these provisions, the 1988 Constitution establishes approximately thirty norms related to the right to education with the objective of ensuring its effectiveness, in a normative context in which the instrumentality of teaching is essential to the Democratic Rule of Law.

Together, the constitutional articles and principles weave a reinforced legal construct, disciplining the formulation and execution of public policies in Brazil, making a state commitment to equality and social justice and requiring concrete actions to minimize inequalities and ensure that all citizens can enjoy a dignified and full life.

According to Vita and Silva (2014), the essential rights to human life, which make up the minimum core for the dignified existence of the human being, are social, economic and cultural rights. These rights cannot remain only in the theoretical sphere; they must be effective and accessible to all individuals in an equal manner.

Public policies, therefore, must be developed and applied with a view to the realization of these rights and principles, combating social and economic disparities and promoting the well-being of the entire population. To this end, the Federal Constitution



included in its core the principles of legal enforceability (justiciability), maximum progressive realization and prohibition of retrogression (Pinto; Ximenes, 2018).

PUBLIC POLICIES AND THE ROLE OF THE STATE IN REDUCING INEQUALITIES

Since the promulgation of the Federal Constitution of 1988, the Brazilian State has been applying the execution of various public policies with the aim of resolving social and economic inequalities. Such policies cover key areas such as education, health, social assistance and income redistribution, reflecting the constitutional principles previously discussed.

Pinto and Ximenes (2018) point out in their studies the guidelines that established guarantees of appropriate, proportional and progressive financing, with a focus on health and education, developing a so-called normative microsystem, which brings meaning to specific sources of revenue and assigns minimum levels of spending, as well as prioritizing rights in budget performance.

In the field of education, the Constitution established education as a right of all and a duty of the State. As a result, several programs and initiatives were created aimed at promoting access to education and improving the quality of teaching indicators. An example is the Fund for the Maintenance and Development of Basic Education and the Valorization of Education Professionals (Fundeb), established in 2007, which finances public basic education and contributes to the reduction of regional disparities.

The University for All Program (ProUni) and the Student Financing Fund (FIES) are other advances that have expanded access to higher education for low-income students. As a result, adjustments in legislative documents subsidized such programs in order to democratize, on various bases, national education (Ferrer; Rossignoli, 2018).

However, challenges remain, such as the marked differences in the quality of education between regions and the need for greater investment in school infrastructure. Despite the explicit provision and regulation of the right to education in various constitutional and infra-constitutional provisions, there is still much controversy as to its enforceability, since social rights in general face several obstacles to be realized (Scaff; Pinto, 2016).

In the field of health, the institutionalization of the Unified Health System (SUS) was a milestone in the promotion of the right to universal and free health. The system, with its legal and principled bases, aims to ensure integral, universal and equal access to health services, ranging from primary care to medium and high complexity procedures.



On a subsidiary basis, the Family Health and More Doctors Programs (MP 621/2013) were created to expand the supply of care in the poorest regions. For Kamikawa and Motta (2014), the Unified Health System is under-resourced, poorly structured and has few professionals to serve the population in the context of Primary Care in places that are unattractive for the establishment of medical professionals, thus, the More Doctors Program implied an initiative to seek the realization of the constitutional right to health

In this sense, even in the face of significant progress, including being an international parameter for health care programs, the SUS faces significant obstacles, including underfunding, insufficient professionals in remote areas, and disparity in access and quality of the services offered.

Rights, in order to be effective, generate financial and social costs for the State. But taxation would serve to maintain the State structure and, inserted in it, the cost for the development of public policies for the realization of the fundamental social rights of citizens. However, the State has justified the non-granting of essential benefits involving social rights in the absence and/or insufficiency of resources (Souza; Olive tree; 2017, p. 78).

In the case of the Right to Health, the right to life itself is assumed, thus, when the provision of the state offer does not satisfy the constitutional prescriptions, it is common for society to resort to the Judiciary to ensure the protection of these rights. The Organic Health Law, in its article 2, advocates health as "a fundamental right of the human being, and the State must provide the indispensable conditions for its full exercise" (Brasil, 1990).

In terms of social assistance, the enactment of the Organic Law of Social Assistance (LOAS) in 1993 stands out, which created the Unified Social Assistance System (SUAS), organizing basic and special social protection services for families and individuals in vulnerable situations.

According to Silveira (2017), the SUAS is recognized as one of the main reforms of the Brazilian State in recent democracy, in the field of social policy, for establishing devices that conceive a state public policy. The SUAS is seen as a state, public and democratic model. However, the current scenario points to regressive trends, sometimes explicit, other times hidden by narratives that exploit the weaknesses still present in the system, such as the difficulty in the execution of the resources transferred by the National Social Assistance Fund to the municipalities and the lack of standards regarding the costs of services.

A point of great socioeconomic reverberation was the Bolsa Família Program, implemented in 2003, constituting one of the best known initiatives, providing direct income transfer to families in poverty and extreme poverty. The program was decisive in the search for the reduction of poverty and income inequality in Brazil, but its effectiveness continues



to depend on the perpetuity of investments and on the improvement of the management and inspection of benefits (Faria; Dias, 2016).

In the area of income redistribution, the strengthening of policies such as the Minimum Wage, readjusted annually, and Social Security have played notable roles in promoting social justice and reducing economic inequalities. Social Security is aimed at ensuring retirement and benefits for urban and rural workers, favoring labor-based economic security for millions of Brazilians (Gimenez, 2016). Despite this, the financial sustainability of the pension system is an ongoing challenge, requiring reforms to ensure its long-term viability.

Although substantial progress has been made since 1988 is noticeable, the effectiveness of effective implementation of public policies remains a significant challenge. Factors such as structural inequality, budget constraints, and the influences of neoliberalism are considerable aspects of this phenomenology.

Furthermore, cultural resistance and social factors also hinder the full realization of constitutional rights. The continuous commitment of the State and society is essential to overcome these challenges and continue to build a more just and egalitarian society.

ECONOMIC AND SOCIAL RESISTANCE TO THE IMPLEMENTATION OF PUBLIC POLICIES

This section lends itself to examining the economic barriers to the effective implementation of public policies in Brazil, exploring the budgetary constraints faced by the state, the influence of neoliberalism on the formulation of economic policies, and the impact of these barriers on the realization of social rights. The analysis includes a review of austerity policies and their effects on social programs.

It is also about social resistance to the implementation of public policies, including the analysis of structural inequalities, cultural prejudices, and ideological resistances that hinder the promotion of social equality. Specific cases of resistance by privileged economic and social groups, as well as social movements that seek to maintain the status quo, will be examined.

ECONOMIC BARRIERS AND INFLUENCES OF NEOLIBERALISM

The effective development of public policies in Brazil faces notorious economic obstacles, which hinder the realization of the social rights embodied in the 1988 Magna Carta. In this vein, it is possible to highlight issues such as budget limitations, the influence



of neoliberalism on the formulation of economic policies, and the effects of austerity policies on social programs (Ribeiro, 2019).

The State, when advocating public policies, must provide satisfactory resources for the effectiveness of fundamental rights for the attention and fulfillment of the essential needs of society, ensuring the existential minimum for a life with dignity (Souza; Oliveira, 2017).

However, budgetary restrictions and limits are impediments to the full implementation of public policies. The Brazilian state faces fiscal constraints that limit its ability to invest in essential areas such as health, education, and social assistance (Lucredi, 2014).

According to Oliveira (2022), the Brazilian tax burden is relatively high, but the collection is often insufficient to cover all the financing needs of public policies, especially in a context of economic and social inequality. The mismanagement of public resources, corruption and administrative inefficiency contribute to the scarcity of resources aimed at social investments.

As Henrique (2018) points out, the influence of neoliberalism in the formulation of economic policies has exacerbated the financial difficulties of the State. Neoliberalism, with its emphasis on market policies, deregulation, and reducing the role of the state in the economy, led to the adoption of measures that prioritized fiscal balance over social investments.

Neoliberal reforms, applied since the 1990s, have included the privatization of state-owned enterprises, the liberalization of trade, and the deregulation of financial markets. Although these measures have been fiercely defended as mechanisms for promoting economic growth, they have also focused on cuts in public spending and a reduction in the State's capacity to finance social policies (Cardoso; Camargos, 2021).

Austerity policies, applied responsively to economic crises and pressure to reduce fiscal *deficits*, have had particularly harmful impacts on social programs. Austerity incorporates the reduction of public spending and the increase of taxes, with the aim of balancing the government's accounts. However, these measures constantly incur budgetary limitations in the areas of health, education, and social assistance, having a direct impact on the most vulnerable population (Henrique, 2018).

For example, Constitutional Amendment 95, approved in 2016, imposed a ceiling on public spending for 20 years, further limiting the State's ability to invest in social policies. The measure has been widely criticized for restricting the resources available to essential areas and for hindering the country's economic and social recovery.



Thus, it is possible to adduce that the repercussion and impact of these economic barriers on the full realization of social rights are intense and profound, since it is notable that the insufficiency of budgetary resources and the predominance of the defense of fiscal balance over social investments compromise the State's ability to ensure universal and equal access to essential services.

Thus, for Verbicaro (2021), cuts in social programs, resulting from austerity policies, exacerbate the vulnerability of impoverished populations and expand preexisting inequalities. The lack of adequate investments in health, education and social assistance prevents the promotion of equal opportunities and the construction of a fairer and more inclusive society, as per the constitution.

In fact, such restrictive economic situations imply considerable challenges for the effectiveness of public policies in Brazil and their overcoming gives rise to a frank reassessment of the country's economic and fiscal priorities, with a renewed commitment to social justice and inclusion.

SOCIAL RESISTANCE, STRUCTURAL INEQUALITY AND CULTURAL CHALLENGES

In addition to economic and budgetary limitations, significant social resistance stands out that hinders the promotion of social equality and manifests itself through structural inequalities, cultural prejudices and ideological resistances, perpetuated by privileged economic and social groups, as well as social movements that seek to maintain the *status quo* (Madeira, 2017).

For Madeira (2017), structural inequalities in Brazil have deep historical roots, dating back to the colonial period and slavery. These inequalities are maintained by a socioeconomic system that favors a small elite, to the detriment of the majority of the population.

The concentration of income, land and political power in the hands of a few impedes social mobility and perpetuates the exclusion of large segments of society. The economic elite exerts a disproportionate influence on political decisions and the formulation of public policies, often resisting changes that could threaten their privileges (Trovão; Araújo, 2021).

From an anthropological perspective, Freitas (2021) states that cultural prejudices act as catalysts in the resistance to the implementation of public policies aimed at social equality. Racism, sexism, homophobia and other forms of discrimination are widely disseminated in Brazilian society. These biases are internalized and perpetuated by social institutions, including the family, the media, and the educational system.



For example, affirmative policies for the inclusion of black and indigenous people in universities and in the labor market face resistance based on meritocratic arguments, which ignore the historical and structural disadvantages faced by these groups (Santos, 2022).

Ideological resistance is still a significant interposition. Conservative and neoliberal ideologies, which advocate minimizing the role of the State in the economy and in the provision of social services, gain strength in contexts of economic and political crisis. The thesis is that the responsibility for social welfare should fall more on individuals and less on the State, disseminating the idea that redistributive policies are ineffective or unjust (Santos, 2022).

Movements such as Escola Sem Partido, which oppose discussions about social inequality and diversity in schools, exemplify this ideological resistance. As a social movement, ESP acts in the school and curriculum spheres by implementing cultural pedagogy and biopolitical strategies that exclude differences in these contexts. This approach involves surveillance, coercion and prohibition, denying certain discussions and positions within the school environment (Carvalho *et al.* 2016).

Among other cases are the opposition of business groups to policies to increase the minimum wage and the regulation of domestic work. These measures, seen as essential to promoting social justice, are often countered by arguments that they would increase costs for employers and hurt the economy. Rural movements such as agribusiness also resist agrarian reform policies, arguing that such policies threaten agricultural productivity and the national economy (Alentejano, 2020).

The Brazilian agrarian conjuncture today has as its fundamental mark the hegemony of agribusiness, reinforcing the power of the latifundia, blocking agrarian reform and putting social movements and rural peoples on the defensive. This process has deepened expropriation and violence against peasants, indigenous people, quilombolas, and other traditional communities and expanded agricultural production centered on large property, articulated with large transnational capital and politically and economically supported by the Brazilian State and ideologically by the corporate media (Alentejano, 2022, p. 252).

On the other hand, social movements that seek to maintain the *status quo*, such as certain segments of the urban middle classes, resist income transfer policies, such as Bolsa Família, and racial and social quota policies in universities. According to Santos (2022), these movements constantly resort to discourses of meritocracy and efficiency to justify their opposition, ignoring the structural inequalities that such policies aim to combat.

In this approach, social resistance to the implementation of public policies in Brazil is multifaceted and deeply rooted. Overcoming them requires a continuous and concerted effort from various sectors of society, including education to raise awareness about

structural inequalities, the promotion of values of inclusion and social justice, and the construction of a political consensus that recognizes the need for effective public policies to promote equality.

FINAL CONSIDERATIONS

This study aimed to analyze the effectiveness of public policies in tackling inequalities in Brazil in the light of constitutional teleology, contemplating the most expressive economic and social barriers that hinder the effectiveness of the execution of these policies. The research addressed the constitutional principles that underlie public policies, economic limitations and social resistances that make up a critical platform in the Brazilian scenario.

The analysis of the constitutional principles revealed that the Federal Constitution of 1988 establishes the search for the promotion of social equality, having in its main principles, which are, the dignity of the human person, equality and social justice the basic guidelines for the formulation of inclusive public policies. It establishes the relevance of ensuring social rights and combating inequalities, providing a consistent normative panorama for the State's action.

However, the study also identified obstacles and obstacles to the implementation of social policies. Budgetary limitations, confronted by an inadequately distributed tax burden and the mismanagement of public resources, compromise the State's ability to invest appropriately in essential issues.

In addition, it was noticed that the incidence of neoliberal conceptions in the formulation of economic policies and austerity policies has further restricted social investments, negatively impacting the realization of social rights. Overcoming such obstacles presupposes a reassessment of the state's economic and fiscal priorities.

Social issues were also unique in the study's scrutiny, reflecting the entrenched resistance in the economic and social elites who benefit from the status quo. Thus, the objectives of the study were effectively achieved. It is suggested that future studies continue to explore the interactions between economic policy, social resistances, and constitutional rights.




REFERENCES

1. Bandeira de Mello, C. A. (2016). *Curso de direito administrativo* (33ª ed.). São Paulo: Malheiros.
2. Bobbio, N. (1992). *A era dos direitos*. Rio de Janeiro: Campus.
3. Brasil. (1988). *Constituição da República Federativa do Brasil de 1988*. Promulgada em 5 de outubro de 1988. Brasília, DF: Senado Federal.
4. Brasil. (1990). *Lei n. 8.080, de 19 de setembro de 1990*. Dispõe sobre as condições para a promoção, proteção e recuperação da saúde, a organização e o funcionamento dos serviços correspondentes e dá outras providências. *Diário Oficial da União: seção 1*, Brasília, DF, p. 18055, 20 set. 1990. Disponível em: http://www.planalto.gov.br/ccivil_03/leis/l8080.htm. Acesso em: 6 jul. 2024.
5. Brasil. (1993). *Lei n. 8.742, de 7 de dezembro de 1993*. Dispõe sobre a organização da Assistência Social e dá outras providências. *Diário Oficial da União: seção 1*, Brasília, DF, p. 18509, 8 dez. 1993. Disponível em: http://www.planalto.gov.br/ccivil_03/leis/l8742.htm. Acesso em: 7 jul. 2024.
6. Cardoso Jr, J. C., & Camargos, R. C. M. (2021). Reformas administrativas em perspectiva internacional: características e resultados. *Cadernos da Escola do Legislativo*, 23(40), 10-39. Disponível em: <https://cadernosdolegislativo.almg.gov.br/cadernos-ele/article/view/413>. Acesso em: 5 jul. 2024.
7. Carvalho, F. A. de, et al. (2016). Uma escola sem partido: dicursividade, currículos e movimentos sociais. *Semina: Ciências sociais e humanas*, 37(2), 193-210. Disponível em: <https://ojs.uel.br/revistas/uel/index.php/seminasoc/article/view/27561>. Acesso em: 5 jul. 2024.
8. Faria, A. A., & Dias, R. B. (2016). Direito à alimentação, transferência de renda e progressividade: o caso do programa bolsa família no Brasil. *Revista Jurídica da Presidência*, 18(114), 145-168. Disponível em: <https://revistajuridica.presidencia.gov.br/index.php/saj/article/download/1210/1134>. Acesso em: 4 jul. 2024.
9. Ferrer, W. M. H., & Rossignoli, M. (2018). Constituição Federal e direitos sociais: uma análise econômica e social do atual estado brasileiro. *Revista Argumentum - Argumentum Journal of Law*, 19(1), 27-50. Disponível em: <http://ojs.unimar.br/index.php/revistaargumentum/article/viewFile/557/271>. Acesso em: 6 jul. 2024.
10. Freitas, M. de A. (2021). Educação escolar e antropologia: a educação indígena e o combate ao sexismo, à homofobia e ao racismo direcionado à cultura Afro-Brasileira. *Educação em Revista*, 22(esp2), 73-92. Disponível em: <https://revistas.marilia.unesp.br/index.php/educacaoemrevista/article/view/10766>. Acesso em: 5 jul. 2024.
11. Gimenez, D. M. (2016). Democracia e a previdência social no Brasil. *Carta Social e do Trabalho*, Campinas, (33), 59-68. Disponível em: <https://www.cesit.net.br/wp-content/uploads/2016/11/Carta-Social-e-do-Trabalho-33.pdf#page=63>. Acesso em: 5 jul. 2024.

12. Henrique, A. C. (2018). Montagem da Agenda e Formulação da Política Pública: Austeridade Fiscal no Brasil. *Journal of Law and Regulation*, 4(1), 111-130. Disponível em: <https://periodicos.unb.br/index.php/rdsr/article/view/19141>. Acesso em: 5 jul. 2024.
13. Kamikawa, G. K., & Motta, I. D. (2014). Direito à saúde e estudo da política pública do Programa “Mais Médicos”. *Revista Jurídica Cesumar - Mestrado*, 14(2). Disponível em: <https://periodicos.unicesumar.edu.br/index.php/revjuridica/article/view/3691>. Acesso em: 7 jul. 2024.
14. Kim, R. P. (2015). Separação de poderes e as teorias interna e externa dos direitos fundamentais: direitos sociais e a inaplicabilidade da teoria externa. *Revista de Direito Brasileira*, 10(5), 273-301. Disponível em: <http://indexlaw.org/index.php/rdb/article/view/2945>. Acesso em: 6 jul. 2024.
15. Lucredi, G. (2014). Princípios como um fator de direito e desenvolvimento: uma visão jurídico-econômica da tutela judicial de direitos fundamentais. *Revista Jurídica da Procuradoria Geral do Estado do Paraná*, (5), 163-192. Disponível em: https://www.pge.pr.gov.br/sites/default/arquivos_restritos/files/documento/2019-10/2014-005_principios_como_um_fator_de_direito.pdf. Acesso em: 2 jul. 2024.
16. Madeira, M. Z. de A. (2017). Questão racial e opressão: desigualdades raciais e as resistências plurais na sociedade capitalista. *Argumentum*, 9(1), 21-31. Disponível em: <https://periodicos.ufes.br/argumentum/article/view/15440>. Acesso em: 5 jul. 2024.
17. Oliveira, M. L. de P. (2022). Políticas públicas, tributação e direitos fundamentais: a contribuição de Amartya Sen. *Revista Direito das Políticas Públicas*, 4(1). Disponível em: <https://seer.unirio.br/rdpp/article/download/12329/12064>. Acesso em: 5 jul. 2024.
18. Pinto, É. G., & Ximenes, S. B. (2018). Financiamento dos direitos sociais na Constituição de 1988: do “pacto assimétrico” ao “estado de sítio fiscal”. *Educação & Sociedade*, 39(145), 980-1003. Disponível em: <https://www.scielo.br/j/es/a/vz4B7TFqdXFYNxHxRgqzDBd/?lang=pt>. Acesso em: 1 jul. 2024.
19. Ribeiro, M. de F. (2019). Efetivação de políticas públicas: uma questão orçamentária. *Revista Argumentum-Argumentum Journal of Law*, 12, 77-102. Disponível em: <http://ojs.unimar.br/index.php/revistaargumentum/article/viewFile/1068/662>. Acesso em: 4 jul. 2024.
20. Santos, D. V. B. (2022). A desigualdade social, marcadores sociais e a meritocracia: um estudo sobre o fracasso escolar. *Kiri-Kerê-Pesquisa em Ensino*, 1(14). Disponível em: <https://periodicos.ufes.br/kirikere/article/view/39074>. Acesso em: 5 jul. 2024.
21. Sarlet, I. W. (2018). *A eficácia dos direitos fundamentais: uma teoria geral dos direitos fundamentais na perspectiva constitucional* (13ª ed.). Porto Alegre: Livraria do Advogado.
22. Scaff, E. A. da S., & Pinto, I. R. de R. (2016). O Supremo Tribunal Federal e a garantia do direito à educação. *Revista Brasileira de Educação*, 21(65), 431-454. Disponível em: <https://www.scielo.br/j/rbedu/a/ySYRxCRBTsNz7CKKF97JSnn/>. Acesso em: 4 jul. 2024.

23. Silveira, J. I. (2017). Assistência social em risco: conservadorismo e luta social por direitos. *Serviço Social & Sociedade*, 487-506. Disponível em: <https://www.scielo.br/j/sssoc/a/LWDC6jLtzyRtGBT3pPS4BGK/?format=pdf&lang=pt>. Acesso em: 7 jul. 2024.
24. Souza, O. de., & Oliveira, L. J. (2017). O custo dos direitos fundamentais: o direito à saúde em frente às teorias da reserva do possível e do mínimo existencial. *Revista de Direitos e Garantias Fundamentais*, 18(2), 77-110. Disponível em: <https://dialnet.unirioja.es/servlet/articulo?codigo=8697495>. Acesso em: 3 jul. 2024.
25. Trovão, C. J. B. M., & Araújo, J. B. de. (2021). Desigualdade multidimensional, insuficiência socioeconômica e concentração de renda no Brasil a partir de um olhar macrorregional. *Desenvolvimento em Debate*, 9(1), 121-157. Disponível em: https://inctpped.ie.ufrj.br/desenvolvimentoemdebate/pdf/dd_v_9_n_1_cassiano_jose_bezerra_marque_trovao_e_%20juliana_bacelar_de_araujo.pdf. Acesso em: 5 jul. 2024.
26. Vita, J. B., & Silva, K. Z. da. (2014). O princípio da reserva do possível e o direito fundamental à saúde. *Revista Jurídica Cesumar*, 14(1), 241-264. Disponível em: <https://dspace.doctum.edu.br/xmlui/bitstream/handle/123456789/2550/O%20PRINC%20C3%8DPIO%20DA%20RESERVA%20DO%20POSS%20C3%8DVEL%20E%20O%20DI%20REITO.pdf?sequence=1&isAllowed=y>. Acesso em: 2 jul. 2024.
27. Verbicaro, L. P. (2021). Reflexões acerca das contradições entre democracia e neoliberalismo. *Revista Direito Público*, 18(97). Disponível em: <https://www.portaldeperiodicos.idp.edu.br/direitopublico/article/view/5115>. Acesso em: 5 jul. 2024.

INFANT MORTALITY IN THE MUNICIPALITY OF RIO VERDE <https://doi.org/10.56238/sevened2024.029-048>

Aline Gonçalves Leão¹, Ana Carolina Donda Oliveira², Gislaine Leão Parreira³, Késsio Guerreiro Furquim⁴, Marina Porto Ferreira Junqueira⁵, Rogério Alves Ferreira⁶ and Vanessa Cervi da Silva⁷

ABSTRACT

Infant mortality is widely recognized as an essential indicator of quality of life and health services in a population. This study was carried out in the municipality of Rio Verde, Goiás, between 2019 and 2023, with the objective of identifying patterns and determinants of infant mortality, in addition to evaluating the effectiveness of local health policies. The descriptive methodology was based on data from the SIM and SINASC systems, analyzing live births and infant deaths, focusing on characteristics such as birth weight, gestational age, causes of death, place of care and socioeconomic profile of the mothers. The results revealed that, over the five years analyzed, there was a gradual reduction in infant mortality, with emphasis on a significant drop between 2021 and 2022, the main causes of death were perinatal complications, neonatal infections, and low birth weight, prevailing among neonates with a gestational age below 37 weeks. A higher mortality rate was also observed among male children, a fact that follows the national trend. The conclusion reinforces the need to strengthen prenatal care, improve the infrastructure of health facilities and train professionals, especially those involved in neonatal care. Interventions aimed at promoting maternal and child health, such as awareness campaigns on the importance of prenatal care, breastfeeding and immunization, are recommended. Improving the quality of death records and continuous surveillance of these data are crucial to guide more effective public policies aimed at the sustainable reduction of infant mortality rates in Rio Verde.

Keywords: Infant mortality. Public health. Prenatal. Health indicators.

¹ Biomedical
Pontifical Catholic University of Goiás (PUC-GO)

² Master of Science in Nursing
UniBras Rio Verde University Center

³ Nurse
University of Rio Verde (UniRV)

⁴ Master in Urban and Regional Planning
Federal University of Rio Grande do Sul (UFRGS)

⁵ Nurse
Pontifical Catholic University of Goiás (PUC-GO)

⁶ Pharmaceutical/Biochemical
Federal University of Mato Grosso (UFMT)

⁷ Nurse
Federal University of Santa Maria (UFSM)



INTRODUCTION

Infant mortality is widely recognized as a preventable event, especially when appropriate public health measures are implemented. However, in developing countries, the risk of death among children under one year of age remains high, reflecting weaknesses in health systems. This scenario demands the use of quality indicators that can assess and evidence the efficiency of health policies aimed at reducing infant mortality (BRASIL, 2019). Infant mortality is one of the most important indicators of public health, as it reflects not only the quality of medical care provided, but also the socioeconomic and environmental conditions that influence the health of the population. It is defined as the number of deaths of live births that occur between birth and less than one year of age (BRASIL, 2005; SANTOS JÚNIOR; JACOBÉ, 2009).

Research on infant mortality is of paramount importance, as this indicator is widely used to assess the quality of health services and the socioeconomic development of a population. Analyzing infant mortality rates allows the identification of gaps in the health care offered to pregnant women and newborns, in addition to providing subsidies for the formulation of public policies aimed at reducing these avoidable deaths. In the context of the municipality of Rio Verde, Goiás, this study becomes particularly relevant, since the localized analysis of infant mortality data can reveal regional particularities, pointing to social, economic, and environmental factors that contribute to the observed rates. The investigation also makes it possible to evaluate the effectiveness of health programs already implemented, monitor the fulfillment of national and international goals, such as the Sustainable Development Goals (SDGs), and propose interventions that can improve maternal and child care, thus contributing to the improvement of the health of the population and the reduction of health inequities.

This descriptive study uses data from the Ministry of Health's Mortality Information Systems (SIM) and Live Births (SINASC), referring to residents in the municipality of Rio Verde, Goiás, with an estimated population of approximately 225,696 inhabitants, according to the Brazilian Institute of Geography and Statistics (IBGE, 2022). The analysis covers records of deaths in children under one year of age and live births in the period from 2019 to 2023, with the objective of investigating patterns and possible determinants of infant mortality in this location.

RESULTS

In the study period, between 2019 and 2023, there were 207 infant deaths in the municipality of Rio Verde - GO, with the years 2019 and 2020 representing the highest

number of deaths (48 deaths) and also the highest number of live births, bringing 3,433 and 3,330 live births, respectively.

The infant mortality rate in the municipality of Rio Verde occurred between 2019 and 2023, represented by table 1, where the highest mortality rate recorded in children under 1 year old was in 2020 with 14.41% (48 deaths) and the lowest in 2022 with 9.56% (31 deaths). With this, we can observe that the infant mortality rate has been reducing over the analyzed period with the greatest impact on this reduction between 2021 and 2022 and, subsequently, rising by 1.35% in 2023.

It should be noted that the Infant Death indicator, between the years 2019 and 2023, followed the trend in Brazil, following what the United Nations (UN) determines, which is ten deaths for every thousand live births, an infant mortality rate in 10 years.

Table 01: Number of infant deaths in the municipality of Rio Verde – GO between the years 2019 and 2023 in relation to the number of live births and the mortality rate

REFERENCE YEAR	NUMBER OF LIVE BIRTHS	NUMBER OF DEATHS	MORTALITY RATE
2019	3433	48	13,98%
2020	3330	48	14,41%
2021	3279	44	13,42%
2022	3244	31	9,56%
2023	3302	36	10,90%

Source: Information System on Live Births (SINASC, 2023).
Source: DATASUS - SIM - Mortality Information System

Although some studies have suggested a possible association between cesarean delivery and a slight increase in the risk of infant mortality, it is important to consider the complexity of these relationships. The type of delivery may be just one of many factors that influence the health outcome of the baby and the mother, and the decision about the method of delivery should be based on a careful assessment of the individual risks and benefits in each clinical situation.

According to care factors associated with infant mortality, in the municipality of Rio Verde - GO in the years 2019 to 2023, when we evaluated the number of infant deaths related to the type of delivery, we can observe that the year 2023 had the highest number of cesarean deliveries during the period evaluated, representing 26 out of a total of 36 deliveries and, Regarding vaginal delivery, throughout the period analyzed, the modality maintained a smaller volume in relation to cesarean delivery. It was also possible to evaluate the quality of the data by showing that part of the data were recorded incorrectly, describing the type of delivery as unknown.

Graph 01: Number of infant deaths that occurred in Rio Verde - Go between the years 2019 and 2023 according to type of delivery.

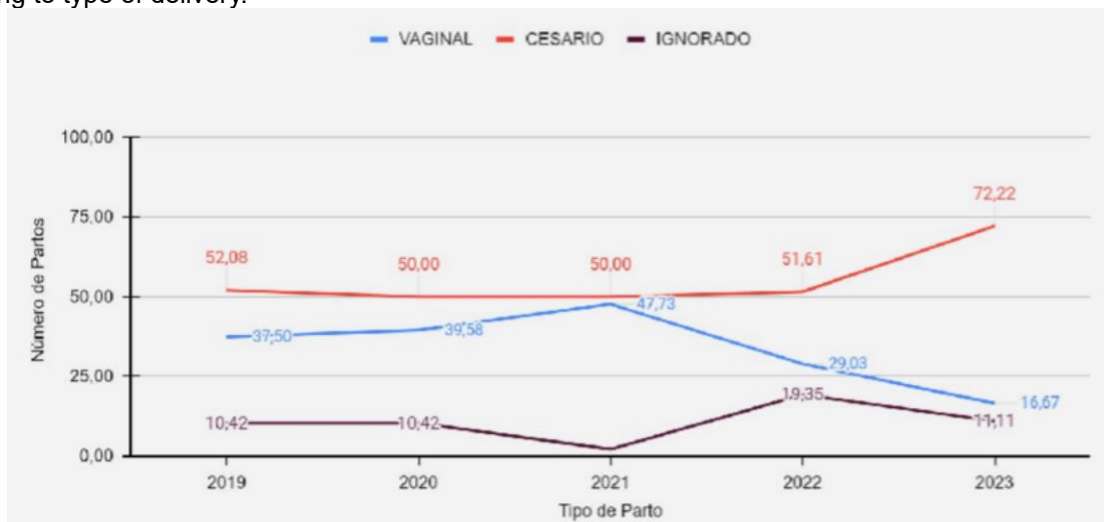


Source: Information System on Live Births (SINASC, 2023).

Both vaginal delivery and cesarean section have their specific indications and should be considered based on the individual medical situation of the mother and baby. The goal is to ensure the safety and well-being of both during the birth process.

When we evaluate the proportion of deliveries performed, we can understand more clearly when we associate the number of live births in the same period in relation to the year to obtain the proportion between the two types of deliveries. As shown in graph 02, we can see that vaginal delivery represents a higher proportion in all the years analyzed, however, in 2023, the difference in the proportion of types of delivery reached a greater distance, reaching 55.56%. The year 2021 was the year where the difference between the types of delivery presented the lowest number, placing cesarean delivery only 2.27% ahead of vaginal delivery.

Graph 02: Proportion of infant deaths that occurred in Rio Verde - GO between the years 2019 and 2023 according to type of delivery.

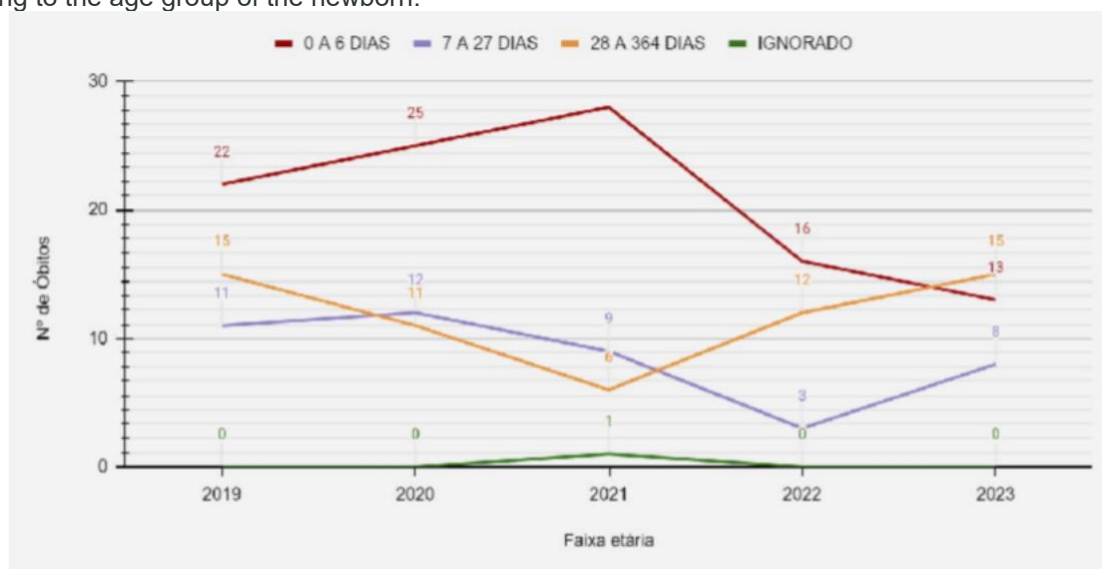


Source: Information System on Live Births (SINASC, 2023).

The risk of infant death can vary according to the baby's age group. The early neonatal period, which comprises the first 7 days of life, is particularly critical in terms of the risk of infant mortality. During this time, newborns are more vulnerable to complications related to childbirth, prematurity, low birth weight, neonatal infections, asphyxia and congenital problems.

The early neonatal mortality rate tends to be higher than the post-neonatal mortality rate throughout the national territory and, in Rio Verde – GO, during the period evaluated, the data present similar data. When we relate the number of infant deaths to age group, we can observe that the mortality rate remained higher in individuals aged between 0 and 6 days during the period evaluated, except in 2023 where deaths in individuals aged between 28 and 364 were higher than the number of deaths in neonates.

Graph 04: Number of infant deaths that occurred in Rio Verde - GO between the years 2019 and 2023 according to the age group of the newborn.

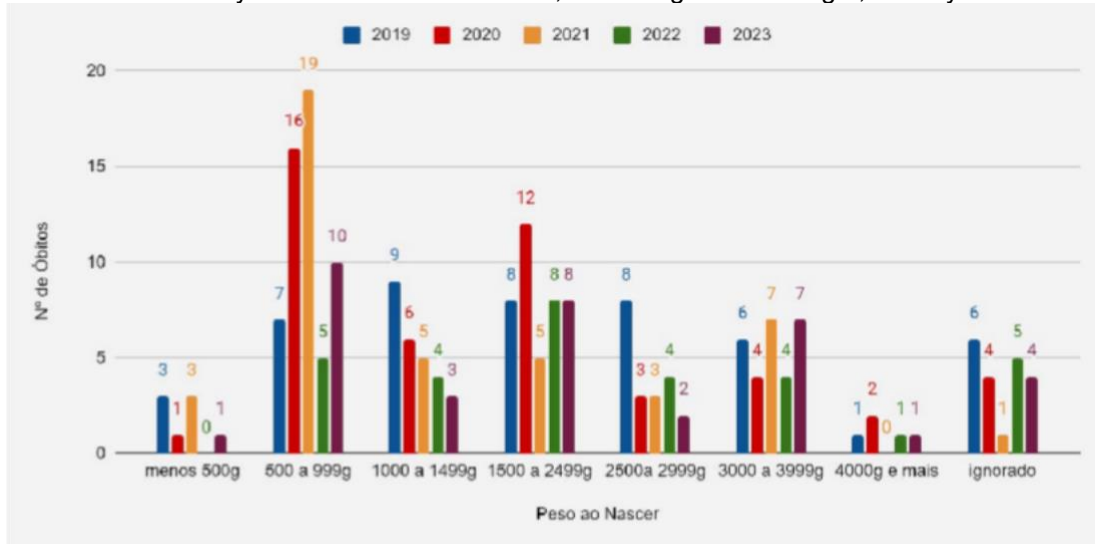


Source: DATASUS - SIM - Mortality Information System

According to the UN, low birth weight represents an important risk factor for morbidity, neonatal mortality, and infant mortality. Low birth weight is an indicator that serves as a predictor of child survival: the lower the birth weight, the greater the probability of early death. Birth weight, according to the World Health Organization (WHO, 1995), is the first measurement made on the newborn. "inadequate or insufficient weight", between 2,500 and 2,999 grams and low weight, if weight less than 2,500 grams. Very low birth weight, when less than 1,500 grams and extremely low birth weight, when less than 1000 grams. (WHO, 2014)

As shown in graph 05, in relation to birth weight, the highest occurrence of infant deaths is among children who weighed between 500g and 999g, evidenced mainly in the years 2020 and 2021.

Graph 05: Infant Deaths by household Rio Verde-GO, according to birth weight, in the years 2019 to 2023.

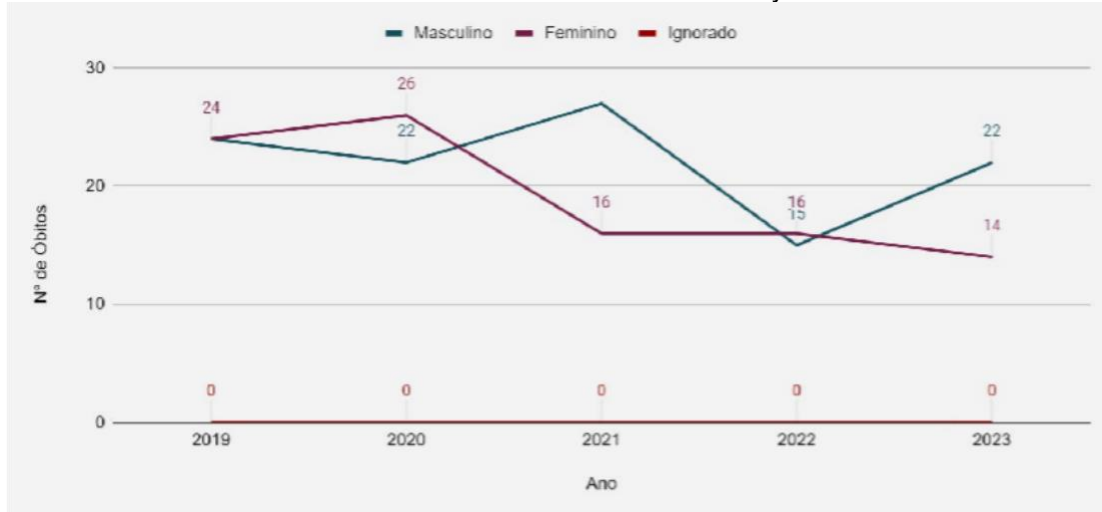


Source: DATASUS - SIM - Mortality Information System

The results showed that in the municipality of Rio Verde in the years 2019 to 2023, of the total of 207 infant deaths, 110 (53.14%) deaths were male, predominantly in relation to female mortality 96 (46.38%) deaths.

Several studies show a higher mortality rate for male children: data from the IBGE, for example, show that in 2015, in Brazil, the probability of male children not completing the first year of life is 14.9 per thousand live births and for females, 12.7 per thousand live births. The causes of this difference are linked to biological factors, which indicate a greater fragility of male babies to some types of disease linked to external causes, such as diarrhea, hemorrhages and pneumonia. Male fetuses have a higher risk of miscarriage due to a higher incidence of genetic alterations. (BRAZIL, 2019).

Graph 06: Number of Infant Deaths that occurred in Rio Verde-GO in the years 2019 to 2023 according to sex.

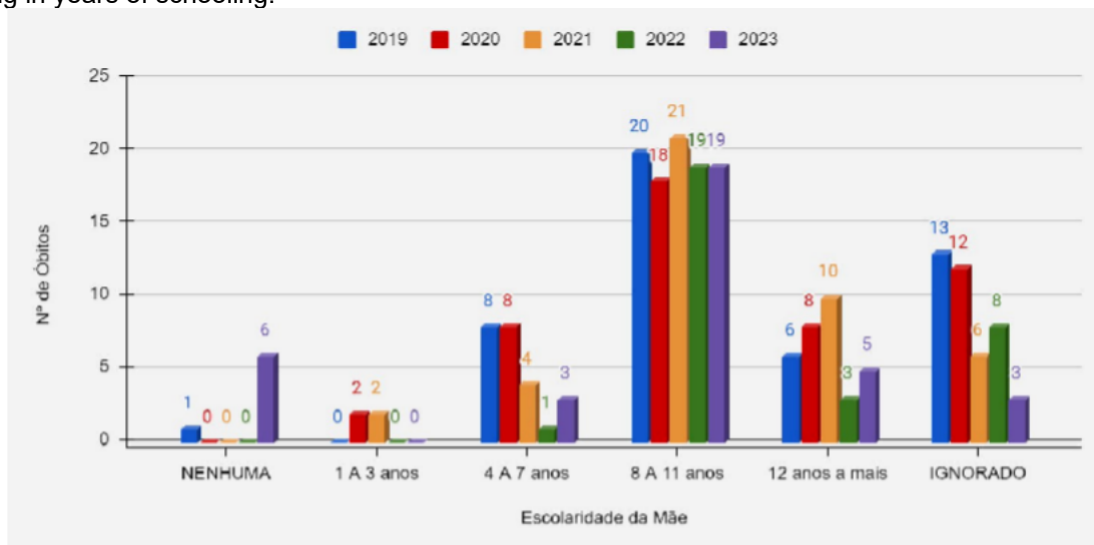


Source: DATASUS - SIM - Mortality Information System

Many authors state that low education is a multivariate factor, since it reflects the socioeconomic and cultural condition in which the newborn's family members live, even influencing family planning and the use, or not, of contraceptive methods (MAIA et al., 2012; LIMA et al., 2015; SANDERS et al., 2017; LANSKY et al., 2014). However, low schooling is not the most important factor linked to infant deaths.

According to graph 7, in the municipality of Rio Verde, it was observed that in the years 2019 to 2023, the trend in the risk of infant death did not decrease as the level of maternal education increased and, based on this, the data show that 97 of the mothers attended school for a period of 8 to 11 years, 46.86% and, only 7 mothers did not attend school at any time, 3.38%.

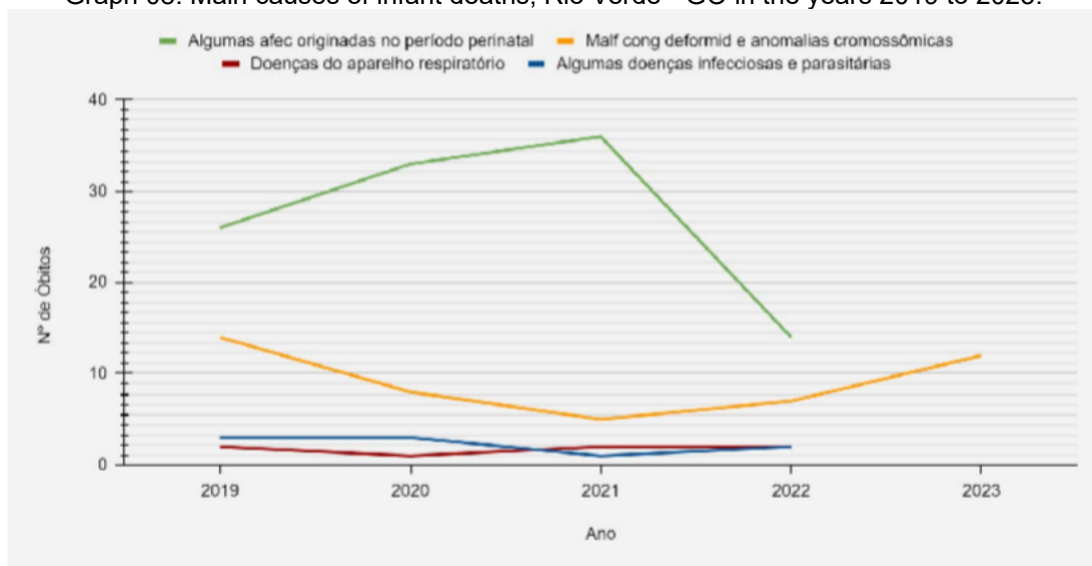
Graph 07: Infant deaths occurred in Rio Verde - GO in the years 2019 to 2023, according to the mother's schooling in years of schooling.



Source: DATASUS - SIM - Mortality Information System

The main causes of infant death are multifactorial and can vary according to socioeconomic context, access to health care, public policies, and other factors. In Brazil, some of the main causes of infant death include respiratory diseases, perinatal complications, infections, and congenital malformations. In the municipality of Rio Verde, the statistics follow the same pattern, as we can see in graph 08, the conditions of the perinatal period lead the main causes in the entire period of analysis, followed by congenital malformations.

Graph 08: Main causes of infant deaths, Rio Verde - GO in the years 2019 to 2023.

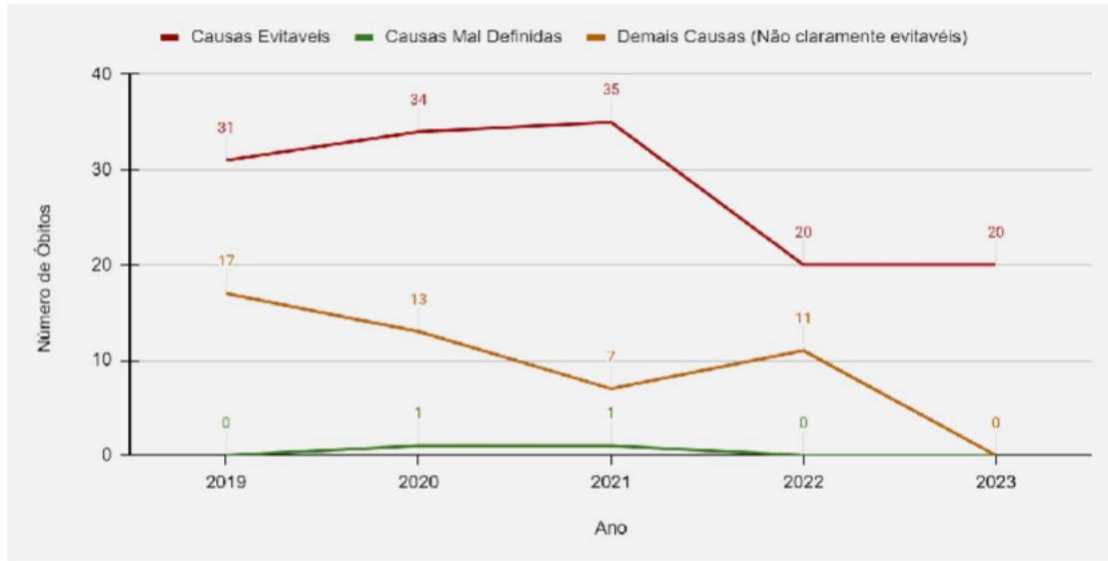


Source: DATASUS - SIM - Mortality Information System

Preventable causes of infant death are those that could be prevented through effective public health interventions, social policies, and adequate access to health care. It is important to note that while the risk of infant mortality can vary by age group, many infant deaths are preventable with adequate access to health care and preventive interventions. Focusing on promoting maternal and child health and preventing illness and injury is critical to reducing the risk of infant death at all ages.

When we evaluate the number of deaths in relation to avoidable causes, we can show that the number of deaths closed with avoidable causes represents the majority of deaths in the entire period between 2019 and 2023 as shown in graph 09.

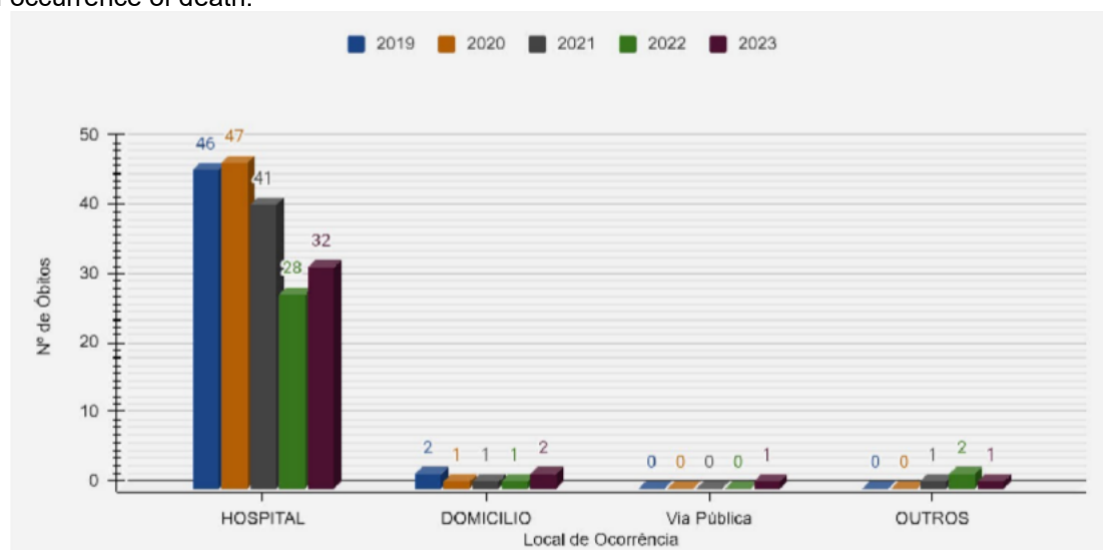
Graph 09: Number of infant deaths that occurred in Rio Verde - GO in the years 2019 to 2023 according to preventable causes.



Source: DATASUS - SIM - Mortality Information System

Of the 207 deaths that occurred in children under 1 year of age living in the municipality of Rio Verde between 2019 and 2023, 194 (93.72%) deaths occurred in hospital units, maintaining them as prevalent in relation to the places of occurrence of death during all years of the period evaluated. In relation to the other places listed, home and public roads, 2 records of infant deaths at home were found in 2019 and 2023, 1 death record in 2020, 2021, 2022 respectively and, in relation to deaths that occurred on public roads, we had 1 record in 2023 as observed in graph 10.

Graph 10: Number of infant deaths that occurred in Rio Verde - GO in the years 2019 to 2023 according to the place of occurrence of death.



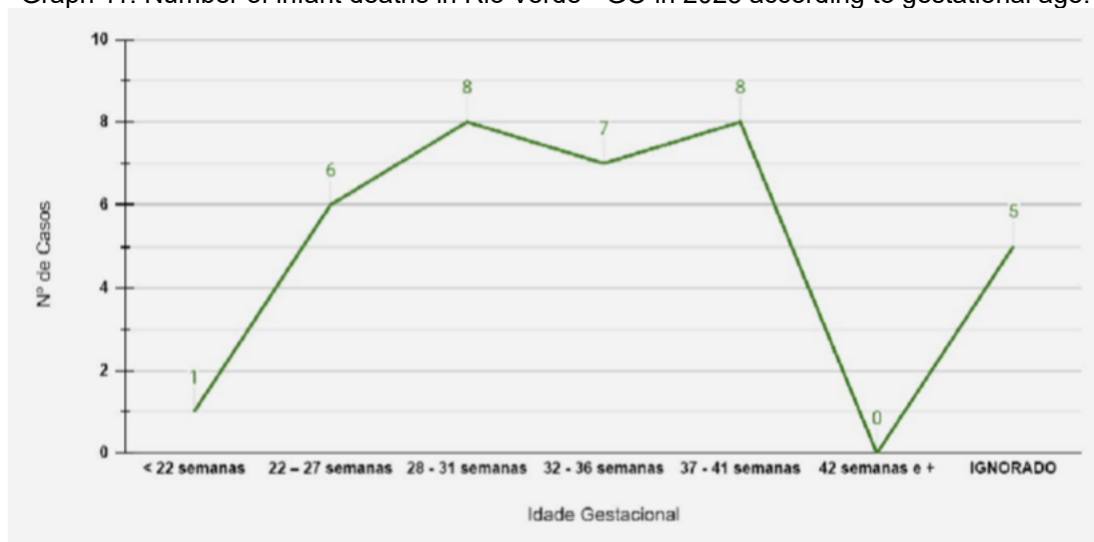
Source: DATASUS - SIM - Mortality Information System

Unfortunately, infant death is a serious and complex issue in many countries, including Brazil. In 2023, the analysis of the infant death profile in Brazil would likely

consider a variety of factors that contribute to this sad reality. In summary, a comprehensive analysis of the infant death profile in the municipality of Rio Verde - GO required a careful evaluation of a variety of factors, including causes of death, access to health care, socioeconomic conditions, government interventions, and regional and cultural challenges. This information is essential to inform health policies and programs aimed at reducing infant mortality and improving the well-being of families in Rioverde and, for this reason, this study was developed based on a temporal analysis of the last 5 years and later a mirror of the year 2023 with the analysis of the epidemiological profile obtained.

When we evaluate the profile of infant deaths that occurred in Rio Verde – GO in 2023 related to the child's gestational age, we can observe that an incidence of deaths occurred in situations where the child had a gestational age between 28 and 31 weeks and 37 to 41 weeks.

Graph 11: Number of infant deaths in Rio Verde - GO in 2023 according to gestational age.

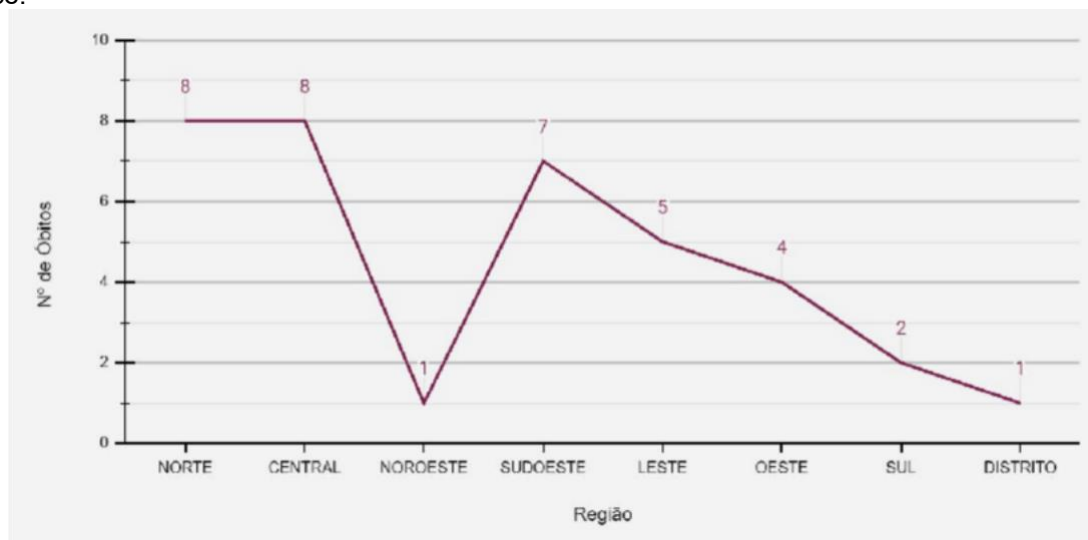


Source: DATASUS - SIM - Mortality Information System

The epidemiological profile of infant death can vary significantly according to the region of residence due to a number of factors, including access to health care, nutrition, socioeconomic conditions, public health policies, and cultural practices, as all these factors contribute to the reduction of infant mortality rates. Effective interventions can vary depending on the specific needs of each region.

As shown in Graph 12, the poorest regions of the municipality of Rio Verde – GO, such as the North, Central and Southeast regions, represent the highest incidence of infant deaths in relation to the other regions.

Graph 12: Number of infant deaths that occurred in Rio Verde - GO in 2023 according to the region of residence.



Source: DATASUS - SIM - Mortality Information System

The International Classification of Diseases (ICD) is a fundamental tool for understanding and analyzing the causes of infant death. It offers a standardized framework for classifying and recording diseases, medical conditions, and causes of death worldwide. The analysis of the causes of infant death according to the ICD allows the identification of patterns, trends and priority areas for intervention and prevention of new deaths. As a result, we analyzed the main causes of infant death in 2023 in Rio Verde – GO, according to the ICD, and we can observe that the three main causes of infant death in the analyzed period were: some conditions originating in the perinatal period, representing 50%, Congenital malformation, deformity, and chromosomal abnormalities, representing 16.67%, and Diseases of the respiratory system, representing 13.89%, as shown in table 02 below.

Table 02: Number of infant deaths in the municipality of Rio Verde – GO in 2023 according to the description of the main causes of death by ICD chapter in children under 1 year of age.

CAUSE OF DEATH BY ICD CHAPTER	No.	%
Some infectious and parasitic diseases	1	2,78
Genitourinary system disorders	1	2,78
External causes of morbidity and mortality	1	2,78
Sint sinais e achad anorm ex clín e laborat	2	5,56
Nervous system disorders	2	5,56
Diseases of the respiratory system	5	13,89
Malf cong deformid and chromosomal abnormalities	6	16,67
Some afec. originated in the perinatal period	18	50

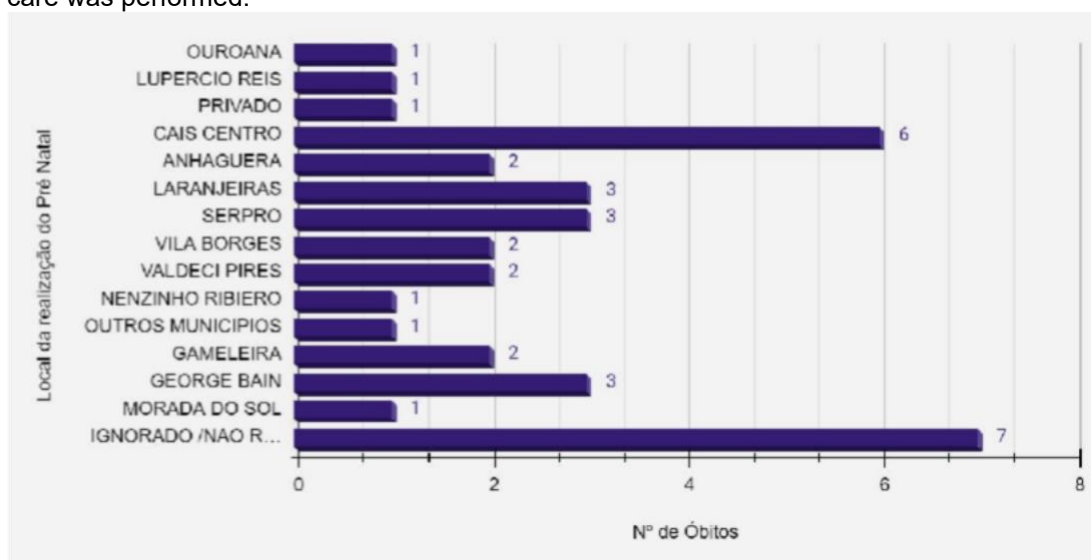
Source: DATASUS - SIM - Mortality Information System

Prenatal care plays a key role in reducing the number of infant deaths, as it offers a series of benefits for both mother and baby as it helps to identify complications in pregnancy

early, promotes healthy habits, allows for early diagnosis and management of medical conditions, and prepares the mother and family for childbirth and newborn care.

The analysis of this variable is essential for the development of actions to prevent complications during pregnancy and reduce the number of infant deaths. In graph 13, we can see that the place with the highest number of visits to mothers of children under 1 year of age during the gestational period and who progressed to death was the CAIS Centro unit. This number may be closely linked to the profile of patients directed to the unit already at risk of complications. During the analysis, it was also possible to observe fragility in relation to data recording, as it was evident that the record of the place where prenatal care was performed was included as unknown/not performed.

Graph 13: Number of infant deaths that occurred in Rio Verde - GO in 2023 according to the place where prenatal care was performed.



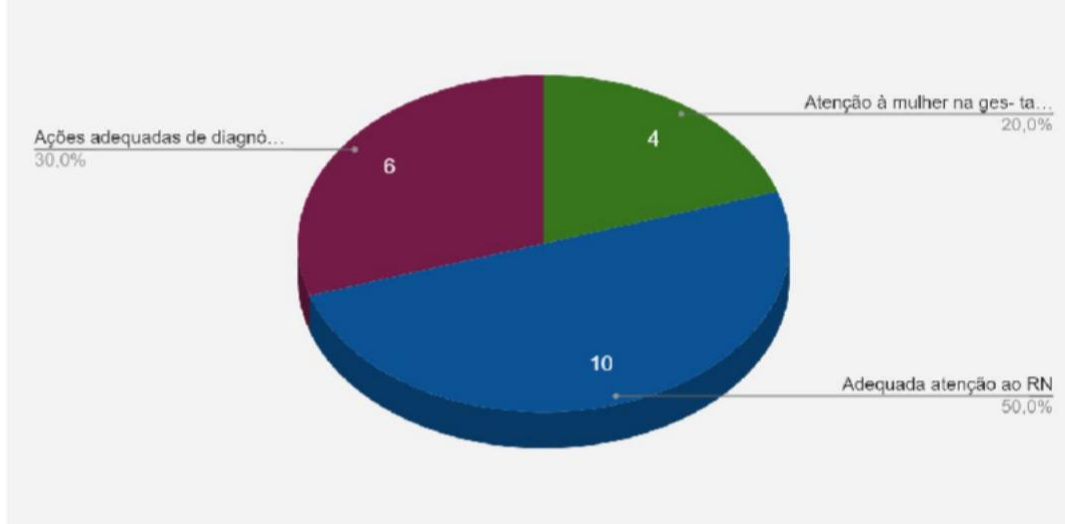
Source: DATASUS - SIM - Mortality Information System

Avoidability actions classify deaths that could be avoided through appropriate medical interventions, care for pregnant women during prenatal care, or changes in the health system. Avoidability actions may vary according to the reality of each municipality or region and, as a result, the analysis of this variable helps to identify avoidability actions according to the profile of the municipality and to identify priority areas. These categories help identify priority areas for intervention and prevention in reducing child mortality.

When we evaluate the profile of the municipality of Rio Verde – GO in relation to the number of deaths in relation to avoidability actions, we can observe that the main actions were attributed to adequate care to the newborn – Newborn, representing 50% of the deaths after the investigation, followed by 30% of the cases related to adequate diagnostic actions and 20% related to care for women during pregnancy.

With this, we can evidence that the city of Rio Verde has advanced in relation to care for women during pregnancy, but it is still necessary to study strategies focused on adequate care for newborns.

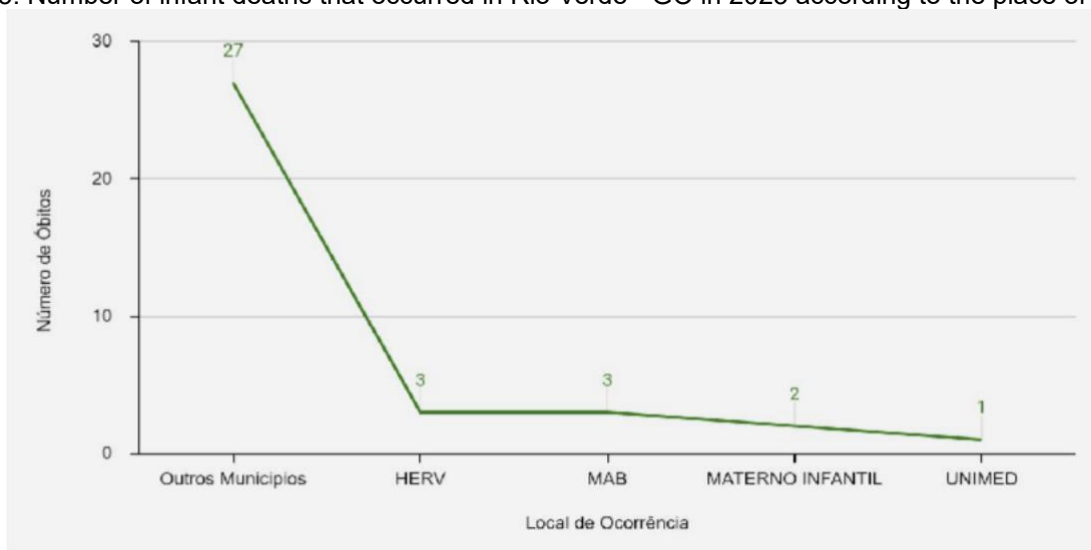
Graph 14: Number of infant deaths that occurred in Rio Verde - GO in 2023 according to avoidability actions.



Source: DATASUS - SIM - Mortality Information System

When we analyze the place of occurrence of infant death in the municipality of Rio Verde - GO, we can observe that the vast majority of deaths, about 75%, occurred in other municipalities. These data can be related to the information presented above, in graph 14, which describes the care of newborns as the main preventability action of infant deaths in children under one year of age.

Graph 15: Number of infant deaths that occurred in Rio Verde - GO in 2023 according to the place of death.



Source: DATASUS - SIM - Mortality Information System

In order to talk about maternal death and death of a woman of ferti age - MIF, we first need to understand the definition of the two terms. MIF - Woman of Childbearing Age refers to women who are at the stage of life where they are able to conceive and give birth to a child. Generally, the age range considered as childbearing age is defined as the age between puberty and menopause. Maternal death, on the other hand, refers to the death of a woman during pregnancy, childbirth or within a period of up to 42 days after the end of pregnancy, regardless of the duration and location of the pregnancy, due to any cause related to or aggravated by pregnancy or childbirth, but not from external causes, such as accidents, diseases unrelated to pregnancy or violence.

Therefore, understanding the maternal and childbearing age death profile involves considering a wide range of social, economic, cultural, and health factors that influence during these critical periods. During the investigation of deaths that occurred in Rio Verde – GO in 2023, it was possible to identify 71 MIF deaths and 1 maternal death. The maternal death is from causes unrelated to pregnancy, registered as AMI – Acute Myocardial Infarction and occurred at the health unit Hospital Municipal Universitário de Rio Verde - HMURV.

Table 03: Number of maternal deaths and deaths of women of childbearing age that occurred in Rio Verde – GO in 2023.

DEATH INVESTIGATION OF MIF – WOMAN OF CHILDBEARING AGE	
Number of deaths MIF – Woman of childbearing age	71
Number of maternal deaths in total (Early and late)	1
Number of maternal deaths identified after investigation	1
Number of maternal deaths from 43 days to 1 year after delivery	1
Maternal death ratio per 100 live births (MMR)	0.01/100 live births
Name of the institution where the death occurred	HMURV
Causes of maternal death	AMI – Acute myocardial infarction

Source: DATASUS - SIM - Mortality Information System

The infant and fetal mortality coefficients are important indicators used to assess the health and well-being of the population, especially in relation to maternal and child health. These coefficients are important tools for health professionals and public managers to monitor and evaluate the effectiveness of maternal and child health policies, in addition to guiding the allocation of resources to areas where infant and fetal mortality is higher.

Analyzing the infant and fetal mortality coefficient indicator in the municipality of Rio Verde – GO in 2023, it was evidenced that the indices presented for the fetal mortality coefficient (12.71%) is slightly higher than the infant mortality coefficient (10.90%).

Table 04: Coefficient of infant and fetal death in Rio Verde – GO in 2023.

INFANT AND FETAL MORTALITY COEFFICIENT		
LIVE BIRTHS	FETAL	INFANTI
	3.302	L 3.302
NUMBER OF DEATHS	FETAL	INFANTI
	42	L
MORTALITY COEFFICIENT	FETAL	36
	12,71%	10,90%

Source: DATASUS - SIM - Mortality Information System

DISCUSSION AND CONCLUSION

According to Brasil (2009), infant mortality directly affects the conditions of environmental infrastructure, socioeconomic development, access and quality of resources available for maternal health care and the child population, and can be prevented through the development of studies to survey the needs of each region, in a unique way, and thus carry out interventions and create strategies that reduce this mortality.

Potrich et al. (2011) mention that the child's weight, the type of delivery and the mother's education directly influence the infant mortality figures. The investigation of deaths contributes to the improvement of records and enables the adoption of preventive measures and is part of the strategy to reduce mortality rates in the country (BRASIL, 2019).

The variables related to infant mortality in the city of Rio Verde were mostly associated with deaths that occurred in boys, of brown color, with birth weight below normal, whose mothers were young, with good schooling and who had a single pregnancy, born vaginally, which occurred in public health units.

According to BRASIL (2022), primary care coverage in the municipality of Rio Verde in December 2015 was 35.30%, 2016 and 2017 45%, and in 2018 and 2019 51%. Thus, one of the hypotheses that can be raised in the municipality in relation to this increase in infant deaths that have occurred in recent years is in relation to health care.

Oliveira (2013) shows that in order to have adequate and quality prenatal care, it is also necessary to improve infrastructure, physical, material, human and financial resources, multidisciplinary care, guidance and conduct, which would make promotion and prevention actions positive. Therefore, it is necessary not only a professional qualification, but also a

mobilization of the professionals involved in this network, in addition to an adequate investment of managers in the Maternal and Child Health sector in order to allow efficient actions and strategies for the system.

In summary, it is notorious that there has been a reduction in infant mortality in recent years in the municipality of Rio Verde. However, although it has been an advance for public health, even with positive changes in relation to the health of mothers and children, infant mortality remains a substantial concern within public policies.

CONCLUSION

In view of the results presented in this study on infant mortality in the city of Rio Verde - GO, it is clear that there is a need to adapt public health strategies to the specificities of the epidemiological profile of the local community. Interventions should consider available resources, health infrastructure, and the socioeconomic characteristics of the population, ensuring a more effective approach to reducing infant mortality rates.

One of the main recommendations is continuous investment in improving access to and quality of maternal and child health care. This includes ensuring adequate prenatal care for all pregnant women, the presence of qualified professionals at the time of delivery, and the availability of appropriate postnatal care. The promotion of maternal and child health, through awareness campaigns on the importance of prenatal care, safe delivery, breastfeeding, adequate nutrition and immunization, should also be intensified.

The study also highlights the importance of training health professionals, especially those involved in neonatal care, since most infant deaths occur during the first month of life. To this end, it is essential to ensure access to appropriate equipment and medicines and to integrate maternal and child health services with other programs, such as nutrition, mental health, infectious disease prevention, and family planning.

In addition, promoting evidence-based care and carrying out continuous monitoring and evaluation of health indicators are indispensable actions for the early detection of problems and the adoption of effective corrective measures. Strict monitoring of indicators, such as infant mortality, vaccination coverage, and number of live births, will enable more targeted and efficient interventions.

The role of nursing professionals in the surveillance of infant mortality is also a highlight. These professionals must be trained and updated to monitor the main causes of death and contribute to the organization of work processes, with emphasis on improving the care offered to pregnant women and newborns in health units.




Finally, improving the quality of epidemiological surveillance information, through the proper completion of death certificates and hospital records, is crucial to ensure reliable data that can guide strategic actions. The commitment to improving the quality of health services, associated with the coordinated effort between the government, health professionals and the community, is essential to promote a significant and sustainable reduction in infant mortality rates in the municipality of Rio Verde - GO.

REFERENCES

1. Abreu, C. F. R. (2007). Relação entre as causas de morte evitáveis por atenção à saúde e a implementação do Sistema Único de Saúde no Brasil. **Revista Panamericana de Salud Pública, 21*(5)*.
2. Almeida, S. D. M., & Barros, M. B. A. (2004). Atenção à saúde e mortalidade neonatal: estudo caso-controle realizado em Campinas. **Revista Brasileira de Epidemiologia, 7*(1), 22-35*.
3. Areco, K. C. N., Konstantyner, T., & Taddei, J. A. A. C. (2015). Tendência secular da mortalidade infantil. **Revista Paulista de Pediatria, 34*(3)*.
4. Brasil, Ministério da Saúde. (2000). **Gestação de alto risco: manual técnico** (4a ed.). Brasília, DF: Ministério da Saúde.
5. Borba, G., et al. (2014). Fatores associados à morbimortalidade neonatal: um estudo de revisão. **Revista Saúde (Santa Maria), 40*(1), 9-16*.
6. Brasil, Organização das Nações Unidas. (2015). Brasil cumpre meta de redução da mortalidade infantil. Brasília, DF: ONU. Disponível em: <http://www.brasil.gov.br/cidadania-e-justica/2015/09/onu-brasil-cumpre-meta-de-reducao-da-mortalidade-infantil>. Acesso em: 18 de abril de 2024.
7. Brasil, Organização das Nações Unidas. (2007). **Situação da Infância Brasileira**. Brasília, DF.
8. Brasil, Ministério da Saúde. (2016). **Portal da Saúde**. Brasília, DF. Disponível em: <http://portalsaude.saude.gov.br/>. Acesso em: 20 de abril de 2024.
9. Brasil, Fundo das Nações Unidas para a Infância. (2006). **Situação da Infância Brasileira**. Brasília, DF. Disponível em: <http://portalsaude.saude.gov.br/>. Acesso em: 20 de abril de 2024.
10. Brasil, Ministério da Saúde. (n.d.). **Banco de dados do Sistema Único de Saúde-DATASUS**. Disponível em: <http://www.datasus.gov.br>. Acessado em: 19 de abril de 2024.
11. França, E., & Lansky, S. (2009). Mortalidade infantil neonatal no Brasil: situação, tendências e perspectivas. In **Rede Interagencial de Informações para a Saúde (RIPSA)**. Demografia e saúde: contribuição para análise de situação e tendências. Brasília: Organização Pan-Americana da Saúde.
12. Francisco, W. C. (n.d.). Mortalidade infantil no Brasil. **Brasil Escola**. Disponível em: <http://brasilecola.uol.com.br/brasil/mortalidade-infantil-no-brasil.htm>. Acesso em: 23 de abril de 2024.
13. Frias, et al. (2013). Correção de Informações Vitais: estimação da mortalidade infantil. **Revista Saúde Pública, 47*(6), 1048-1058*. Disponível em: <http://www.scielo.br/pdf/rsp/v47n6/0034-8910-rsp-47-06-01048.pdf>. Acesso em: 23 de abril de 2024.

14. Jorge, L., Laurenti, N., & Nubila, M. (2010). O óbito e sua investigação: reflexões sobre alguns aspectos relevantes. *Revista Brasileira de Epidemiologia, 13*(4), 561-576.
15. Medeiros, B., Boehs, F., & Heidemann, L. (2012). O papel do enfermeiro e as recomendações para promoção da saúde da criança nas publicações enfermagem brasileira.
16. Menezes, et al. (2014). Classificação das mortes infantis em Belo Horizonte: utilização da lista atualizada de causas de morte evitáveis por intervenções do Sistema Único de Saúde do Brasil. *Infant, 14*(2), Recife / Juni.
17. Oliveira, H., & Minayo, M. C. S. (2001). A auto-organização da vida como pressuposto para a compreensão da morte infantil. *Ciência e Saúde Coletiva, 6*, 139-149.
18. Saporolli, E. C. L., & Adami, N. P. (2007). Avaliação da qualidade da consulta de enfermagem à criança no Programa de Saúde da Família. *Acta Paulista de Enfermagem, 20*(1), 55-61. Disponível em: <<http://dx.doi.org/10.1590/S0103-21002007000100010>>. Acesso em: 25 de abril de 2024.
19. Sardinha, L. M. V. (2014). Mortalidade infantil e fatores associados à atenção à saúde: estudo caso-controle no Distrito Federal (2007-2010). Tese de doutorado, Universidade de Brasília, Brasília, DF. Disponível em: <<http://repositorio.unb.br/handle/10482/16396>>. Acesso em: 25 de abril de 2024.
20. Goiás, Secretaria da Saúde do Estado de Goiás. (n.d.). Disponível em: <<http://www.saude.go.gov.br/view/3556/goias-mais-competitivo-mortalidade-infantil-e-atencao-basica-saopriordades-dasaude#sthash.j4z0TVMV.dpuf>>. Acesso em: 24 de abril de 2024.
21. Silva, C. F. (2006). Fatores de risco para mortalidade infantil em município do Nordeste do Brasil: linkage entre bancos de dados de nascidos vivos e óbitos. *Revista Brasileira de Epidemiologia, 9*(1), 69-80. Disponível em: <<http://www.scielosp.org/pdf/rbepid/v9n1/04.pdf>>. Acesso em: 25 de abril de 2024.
22. SIM - Sistema de Informação sobre Mortalidade. (2022). Portal da Saúde.
23. Szwarcwald, et al. (2002). Estimação da mortalidade infantil no Brasil: o que diz a informação sobre óbitos e nascimentos do Ministério da Saúde? *Saúde Pública, Rio de Janeiro*, Nov-Dez.

LIFE AS A SCANDAL OF TRUTH: MICHEL FOUCAULT'S PHILOSOPHICAL TESTAMENT

 <https://doi.org/10.56238/sevened2024.029-049>

Lucas Nogueira do Rêgo Monteiro Villa Lages¹

ABSTRACT

This article aims to analyze the last course taught by Michel Foucault at the Còllege de France, in 1984, extracting from it a kind of philosophical testament. I begin by seeking to emerge from this Foucaultian self-writing a parrhesiastical accountability, in which Foucault speaks frankly about the dimensions of his work and his horizon of concern with the intertwining of three major themes: truth, power and the subject. Subsequently, I analyze how these three themes are linked by Foucault around the central issue of his last course: *parrhesia*. I expose the development of the concept of *parrhesia* in connection with the theme of true life in the Socratic-Platonic tradition, in Cynicism and in primitive Christianity to, in the end, conclude that Foucault leaves us a vast legacy, including the legacy-mission of, from the tradition opened by Cynicism, promoting a rereading of the history of philosophy no longer as a metaphysics of the soul, but as an aesthetics of existence.

Keywords: *Parrhesia*. Self-Care. Foucault. Cynicism. Aesthetics of Existence.

¹ Post-Doctorate from Universität Hamburg, Germany. Doctor in Law from Uniceub. Master in Philosophy from the Federal University of Piauí. Professor at the Federal University of Piauí, assigned to the Department of Legal Sciences, in the Graduate Program in Philosophy (Master's and Doctorate) and in the Professional Master's Degree in Philosophy.

Affiliation: Professor at the Federal University of Piauí - UFPI. Teresina, Piauí, Brazil.

E-mail: lucasvilla@ufpi.edu.br

ORCID: <https://orcid.org/0000-0003-1771-7107>

LATTES: <http://lattes.cnpq.br/1680393644793054>

INTRODUCTION

Between February 1 and March 28, 1984, Michel Foucault taught his last course at the *Collège de France*, entitled "The Courage of Truth" (FOUCAULT, 2011). On June 25 of the same year he died of AIDS (at a time when little was known about the disease). There is, as perceived by Frederic Grós (In: FOUCAULT, 2011, p. 303), a temptation to see this last course as a kind of philosophical testament. It seems to me that this temptation is justified.

In those last lectures, Foucault resumed themes with which he had been involved since the beginning of the eighties² and which marked the ethical dimension of his final philosophy: the processes of subjectivation and veridiction (telling the truth), the care of the self, *parrhesia* (frank speech) and the philosophical life (*bíos philosophikós*). He takes them up, however, in a new, subtly autobiographical sense, which signals two concerns: 1) to give an account of his work as a philosopher (and, perhaps, of his philosophical life); and 2) leaving a legacy and a philosophical mission. To put an end to these concerns, he inserts a new element of analysis: cynicism, cynical life (*bíos kynikós*).

In this article, I intend to articulate two facets of the subliminal writing of the self that emerges from the final course of this parrhesiast Foucault, who seems to want to say, without veils, a truth-of-the-self. To this end, I begin with the French philosopher's primary concern, already in the classes of February 1, 1984: to explain the three dimensions of his work, showing how the "phases" of the archaeology of knowledge, the genealogy of power and ethics (or the techniques of the self) are related to each other. Later, I dedicate myself to the analysis of the concept of *parrhesia* in classical antiquity, especially from the Socrates of the Platonic dialogues. Foucault will argue that it is possible to find the root of two different Western philosophical traditions, based on the theme of Socratic-Platonic truth-telling: a metaphysics of the soul, inaugurated in "Alcibiades I" (Plato, 2022), and an aesthetics of existence, which can be extracted from "Laches" (Plato, 2016). Then, I analyze the *cynical parrhesia* and the experience of scandal that, in cynicism, takes the tradition of the aesthetics of existence to the extreme, transvaluing true life into another life. I also deal with *parrhesia* in primitive Christianity, a point where Foucault prematurely interrupts his history of the aesthetics of existence.

In the end, I propose to extract from this intellectual testament of Michel Foucault, in addition to the philosophical heritage bequeathed, a mission that the French thinker left open, to be continued by others: to reinvent the narrative of Western thought, no longer as

² Check, for example, the courses of the years 1980 (FOUCAULT, 2014), 1981 (FOUCAULT, 2016), 1982 (FOUCAULT, 2006) and 1983 (FOUCAULT, 2010) at *the Collège de France*, as well as volumes II (FOUCAULT, 2007a), III (FOUCAULT, 2007b) and IV (FOUCAULT, 2021) of the *History of Sexuality*.

a history of the metaphysics of the soul, but in the form of a history of the aesthetics of existence, of life as possible beauty.

ACCOUNTABILITY, SELF-WRITING AND *PARRHESIA*: "ABOVE ALL, DO NOT CONFUSE ME"

Sensing, perhaps, the abrupt end of his intellectual activities, Nietzsche, in 1888, his last year of lucidity, submerged himself in a creative whirlwind. Among the various works written that year is "*Ecce homo*", a kind of intellectual autobiography. In the prologue, the German philosopher justifies that exercise of writing about oneself: "in these circumstances there is a duty (...) which is to say: *Listen to me! For I am such and such. Above all, don't confuse me!*" (NIETZSCHE, 2008, p. 15). It seems that, in his last course, Foucault (2011) is moved by the same spirit of self-clarification and accountability. He wants to be understood, he wants to give meaning to the global project in which his production is inserted, so that we do not speak of isolated "phases" of his thought as if there were, among them, more ruptures than continuities. Above all, he wants not to be confused³.

It is a common interpretation that Foucault's work can, chronologically, be divided into three moments: 1) an archaeological phase, concerned with the production of knowledge; 2) a genealogical phase, concerned with the exercise of power; and 3) an ethical phase, concerned with the practices of subjectivation (GRÓS, 2007; ARAÚJO, 2004; VEIGA-NETO, 2003). Already in the first class of his final course, returning to the theme of *parrhesia*, Foucault seeks to clarify that these supposed "phases" of his thought are not independent, they are all articulated around the same task, which he states has always been his job: "The articulation between the modes of veridiction, the techniques of governmentality and the practices of the self is, basically, what I have always tried to do" (FOUCAULT, 2011, p. 9). He continues, explaining his craft:

And you are seeing that, insofar as it is a question of analyzing the relationships between modes of veridiction, techniques of governmentality and forms of self-practice, the presentation of research as well as an attempt to reduce knowledge to power, to make knowledge the mask of power, in structures where the subject has no place, it cannot be more than pure and simple caricature. On the contrary, it is an analysis of the complex relations between three distinct elements, which are not reduced to each other, which do not absorb each other, but whose relations are constitutive of each other. These three elements are: knowledge, studied in the specificity of its veridiction; the relations of power, studied not as an emanation of a substantial and invasive power, but in the procedures by which the conduct of men is governed; and, finally, the modes of constitution of the subject through the practices of the self. It is by making this triple theoretical shift – from the theme of

³ It is true that the singularity of "*Ecce homo*" goes beyond that of a simple rendering of accounts and that Foucault had the habit of referring, in the first classes of his courses, not only in "The Courage of Truth", to his previous works, but it seems that a certain parrhesiastical tone finds, in these authors, its climax precisely in these two works.

knowledge to the theme of veridiction, from the theme of domination to the theme of governmentality, from the theme of the individual to the theme of the practices of the self – that it is possible, so it seems to me, to study the relations between truth, power and subject, without ever reducing them to each other (FOUCAULT, 2011, p. 10).

The relations between truth, power and subject: this is Foucault's perennial concern, and it is by returning to the theme of *Greek parrhesia* that he synthesizes the three key elements of his thought: "*Parrhesia* (...) It is etymologically the activity that consists of saying everything: *pan rēma*. (...) The parrhesiast is the one who says everything" (FOUCAULT, 2011, p. 10). Around this theme of frank speech, of truth-telling (veridiction) about everything, including oneself, the issues of allurgy (production of truth), governmentality (government of others) and subjectivity (government of the self) will be intertwined. Foucault (2011, p. 59) goes so far as to argue that there are, in the practice of *parrhesia*, three poles, which coincide precisely with the three dimensions of his philosophical work: 1) truth (*alētheia*); 2) the government (*politeia*); 3) the formation of the subject (*ethos*).

The problem of truth, present in the title of his final course, is, in fact, the guiding thread of Foucault's production, which could be described, as Cesar Candiotto (2006) suggests, as "a critical history of truth". There was, in Greco-Roman culture, a great principle: it is necessary to tell the truth about oneself (FOUCAULT, 2011, p. 5). *Parrhesia* is precisely the practice of speaking frankly and sincerely (CASTRO, 2023, p. 213), of saying everything, bluntly, of telling the truth, including about oneself. This practice, however, is not a solitary activity. It requires the other, an interlocutor, be it a philosopher, a teacher, a friend, a lover. This other necessary for truth-telling, in antiquity, is precisely the figure of the *parrhesiast*, who finds in Socrates, as we shall see, his model par excellence.

Already in his 1983 course, Foucault (2010) had paid attention to the fact that the notion of *parrhesia* is initially founded on a political dimension. He dedicated that course ("The government of oneself and others") to this analysis of *parrhesia as a political concept*. In "The Courage of Truth", however, he returns to the theme of *parrhesia as an ancient history of the practices of telling-the-truth about oneself* (FOUCAULT, 2011, p. 9). Initially, Foucault draws attention to the fact that, already in antiquity, *parrhesia* could be valued both positively and negatively. In Aristophanes, for example, the term is associated with the figure of the chatterbox, the loudmouth, the one who says anything about anything, without indexing his discourse to principles of rationality and truth. In a positive sense, *parrhesia* is the telling of the truth, without dissimulation, reserve or rhetorical ornament that can cipher or mask it – it is the saying of everything attached to the truth (FOUCAULT, 2011, p. 11).

In this positive sense of the term, which is what Foucault (2011) will be interested in, *parrhesia* will depend on four conditions: 1) saying everything; 2) telling the truth; 3) saying what you think (not paying lip service); 4) taking a risk. It is precisely in the fourth condition that we find the justification for the title of the course: the courage of truth. The parrhesiast needs to have the necessary courage to face at least two great dangers arising from his practice of telling the truth: 1) the danger of breaking the bond of fundamental intimacy he has with his interlocutor, by telling him uncomfortable truths; 2) the physical danger, which can affect one's own life, when telling uncomfortable truths to the polis or the sovereign. Thus, *parrhesia* finds in rhetoric and flattery its two greatest enemies. In rhetoric there is no link of belief between the speaker and what is said, but it is intended to establish a link between what is said and the one to whom the speech is addressed - the speaker wants to make the interlocutor believe in something in which he himself does not necessarily believe. In *parrhesia*, there is an inseparable bond between the one who says and what is said, in addition to the risk of breaking the bond between the one who speaks and the one who listens, due to a certain effect of offending the truth. In flattery, on the other hand, the speaker says only what the interlocutor intends to hear, without any commitment to the truth and, above all, without any courage to expose to danger the existing bond with the listener - on the contrary, the flattering speech is intended not to tell the truth, but to strengthen the bond with the interlocutor.

In addition to *parrhesia*, according to Foucault (2011), there are three other fundamental modalities of veridiction (telling the truth): prophecy, wisdom, and technique (teaching). The characteristics of the prophet that differentiate him from the parrhesiast are the fact that: 1) he does not speak in his name, he is a spokesman/intermediary (the parrhesiast speaks in his own name); 2) he tells the future to men (the parrhesiast shows men the present of themselves); 3) speaks through riddles (the parrhesiast, of course, leaves nothing to interpret). In turn, the characteristics of the wise man are the fact that he: 1) speaks in his own name (just like the parrhesiast); 2) it is structurally silent, it does not need to speak (unlike the parrhesiast, who has the duty to tell the truth); 3) their answers can be cryptic (like the prophet, as opposed to the parrhesiast); 4) it talks about the truth of being (the parrhesiast talks about the truth of what the interlocutor is). The (technical) teacher, in turn, is the one who: 1) does not take any risk (unlike the parrhesiast, who puts himself in danger); 2) it ensures the survival of knowledge received by another teacher and that will be, in the future, passed on by another. In the words of Foucault (2011, p. 24/25):

The parrhesiast is not the prophet who tells the truth by unveiling, in the name of another and enigmatically, destiny. The parrhesiast is not a sage, who, in the name of wisdom, says, when he wants and on the background of his own silence, being

and nature (a *phýsis*). The parrhesiast is not the teacher, the instructor, the man of *know-how* who says, in the name of a tradition, the *tékhne*. He therefore says neither destiny nor being nor *tékhne*. On the contrary, to the extent that he takes the risk of going to war with others, instead of solidifying, like the teacher, the traditional bond [speaking] in his own name and in all clarity, [unlike] the prophet who speaks in the name of another, [to the extent] ultimately [that he tells] the truth of what is – the truth of what is in the singular form of individuals and situations, and not the truth of the being and nature of things – well, the parrhesiast brings into play the true discourse of what the Greeks called *ethos*.

Prophecy: verdict of destiny. Wisdom: veridication of being. Teaching: veridiction of the *tékhne*. *Parrhesia*: veridiction of ethos. Here are the four fundamental forms of truth-telling. These are, however, modes of veridication that do not necessarily represent distinct characters or social roles. Often these modes combine. Socrates, for example, considered the parrhesiast par excellence, combines with *parrhesia* elements of prophecy, wisdom and teaching.

METAPHYSICS OF THE SOUL X AESTHETICS OF EXISTENCE: THE SOCRATIC-PLATONIC PARRHESIA

The theme of *parrhesia* was introduced by Foucault as early as his 1983 course at the Collège de France, entitled "The government of oneself and others" (FOUCAULT, 2010). The focus at that moment, however, was the political dimension of frank speech in antiquity. Foucault found in *parrhesia* a forgotten foundation of Athenian democracy and also a common practice of the Prince's political advisors in tyrannies. Political *parrhesia* demanded a courage of truth, because telling the truth to the polis, in democracy, and to the Prince, in tyranny, could endanger the very life of the *parrhesiast*. In "The Courage of Truth", a course from 1984, the concern is with another dimension of *parrhesia*: ethics.

Foucault (2011, p. 63) describes Socrates as the model of parrhesiast of antiquity: "Socrates is the one who has the courage to tell the truth, who accepts to risk death to tell the truth, but practicing the test of souls in the game of ironic interrogation". It introduces the theme of *ethical parrhesia* from the trilogy of the death of Socrates: the Platonic dialogues Crito, Phaedo and the Apology (Plato, 2019). This theme of death, insistently evoked under the pretext of analyzing the meaning of Socrates' death, defined as being "at the very heart of Western rationality" (FOUCAULT, p. 106), reinforces the testamentary and autobiographical character of his last course. Reflecting on the value of Socrates' philosophical life and death, Foucault invokes, between the lines, the specter of his own death and the balance of his intellectual life.

From the trilogy of the death of Socrates, especially the Apology, Foucault questions the reason for the Socratic turn from *political parrhesia* to *ethical parrhesia*: after all, why

didn't Socrates do politics? He answers: Socrates did not do politics because if he did, he would be killed. Socrates is and is not afraid of death. It is not a fear of ceasing to exist, but of not being able to abandon your divine mission before your time. This mission is precisely to take care of the other and teach the other to take care of himself (FOUCAULT, 2011, p. 69).

Since his 1982 course ("The Hermeneutics of the Subject"), Foucault (2006) has been proposing a reading of Western thought based on the intertwining of two originally Socratic themes: the knowledge of the self (*gnôthi seautón*) and the care of the self (*epiméleia heautoû*). In "The Courage of Truth", he takes up the Socratic dialogues to propose, based on "Alcibiades I" and "Laches", two lines that would have conditioned different developments of philosophical thought in the West: on the one hand, a "metaphysics of the soul", on the other, an "aesthetics of existence" (FOUCAULT, 2011, p. 138).

There are, between "Alcibiades I" and "Laches", points of convergence and divergence. In both dialogues, for example: 1) Socratic *parrhesia* serves to ask the interlocutors if they are capable of taking care of themselves; 2) this *parrhesia* leads the interlocutors to the conclusion that they need to take care of themselves; 3) Socrates appears as the one who is capable of taking care of others, helping them to take care of themselves. On the other hand, the two dialogues are distinguished by the fact that: 1) in Laches, Socrates practices frank speech with adults; in Alcibiades, with a young man; 2) in Laches, no conclusion is reached on the central theme (the truth of courage); in Alcibiades a conclusion is reached about what man is: his soul (*psykhé*) (FOUCAULT, 2011, p. 138).

In Alcibiades (Plato, 2022), Socrates, in love with the handsome and ambitious young man who gives his name to dialogue, debates with him about his intention to perform great feats in his political career. Socrates is committed to demonstrating that, in order to take care of the things of the polis, that is, to take care of the other, one must first know how to take care of oneself: "one cannot well govern others (...) if one is not occupied with oneself" (FOUCAULT, 2006, p. 48). Taking care of oneself, however, presupposes knowing what this "self" is that one must take care of, that is, to take care of oneself one must first know oneself: "what, then, is the self that one must take care of when one says that one must take care of oneself?" (FOUCAULT, 2006, p. 50). Thus Socrates arrives at the motto of dialogue, which is the Delphic commandment of know thyself (*gnôthi seautón*): "by knowing ourselves, we will automatically know how to take care of ourselves; not knowing, but we will never know" (PLATO, 2022, p. 137). Interspersing refutation and maieutics, Socrates leads his interlocutor to discover that taking care of oneself is not taking care of

one's body, but of the soul, since man is one's soul: "*psykhês epimeletéon* (one must occupy oneself with one's own soul)" (FOUCAULT, 2006, p. 67).

The soul (*psykhé*) is the rational self that uses the body as the shoemaker uses the hammer to make shoes, as the musician uses the sitar to make music. The shoemaker, however, is not the hammer, just as the musician is not the zither. Likewise, the subject is not his body, but his rational soul (*psykhé*) (Plato, 2022, p. 142). This soul, in Plato, as is well known, belongs to another world and inhabits the body in a precarious way. The need to deal not with the body or the world that can be perceived by the body (sensible world), but with the soul and the world that can only be reached by it (intelligible world), launched in this dialogue, inaugurates the metaphysical tradition of Western thought. In Alcibiades, the role of Socratic veridiction "is to lead this soul back to the way of being and to the world that are theirs", and thus "circumscribes what will be the place of the discourse of metaphysics" (FOUCAULT, 2011, p. 139).

In the "Laches", on the other hand, another dimension of Socratic veridiction emerges. In it, Lysimachus and Melesias take counsel with Laches and Nicias about the education of their children. From the outset, the dialogue reveals a tension between ethical and political care: Lysimachus and Melesias, sons of illustrious Athenians responsible for great political deeds, resent not having feats themselves that, like those of their parents, can inspire their offspring. They attribute their failure in public life to the fact that their parents, too busy taking care of the affairs of the city, neglected their children⁴.

After watching a presentation by Stesilau in which the warrior demonstrated his skill in combat with breastplates, Laches and Nicias disagree about the usefulness of this warlike knowledge for the education of young men in general and the sons of Lysimachus and Melesias in particular. For Nicias, "it is a practice whose learning proves to be beneficial in several ways to young people" (PLATÃO, 2016, p. 170). For Laques, combat with breastplates "is not worth the effort spent on its learning" (Plato, 2016, p. 173). Socrates, then, is summoned to break the tie with his vote, to which he responds by contesting the very suffragette structure of the debate: "if we want to make decisions correctly, it is by the criterion of knowledge that we must make them and not by the criterion of the greatest number" (Plato, 2016, p. 174). The confrontation of the opinions of Nicias and Laques about the master of arms had taken the form of a political-judicial debate: the

⁴ "None of us has our own feats to report. We can't help but be embarrassed in front of our boys because of this, and we blame our parents for allowing us to have an easy life when we entered our youth, while they were busy with other people's business" (Plato, 2016, p. 166). In the course manuscripts, Foucault (2011, p. 116) gives an account of this tension "between the care of others in the political form (...) and the ethical care of oneself and others".

parties presented their arguments and, after that, the votes followed. Socrates' intervention, however, promotes three transformations in the discussion: 1) the passage from the political-judicial model of discussion to the model of technical veridiction; 2) adoption of the interrogation procedure (*exétasis*) and accountability on the competence of the interlocutors; 3) displacement to the game of ethical *parrhesia* (FOUCAULT, 2011).

In the course of the dialogue, it is clear that Socrates redirects the issue of technical accountability and competence to accountability for the way one lives (*hóntina trûpon nûn te zê*). It is about understanding the relationship between the subject and reason (*lógos*). The theme of true life as philosophical life, life lived according to reason, enters the scene: "it is this domain of existence, the domain of the manner of existence, of *the tropes* of life, it is this that will constitute the field in which Socrates' discourse and *parrhesia* will be exercised" (FOUCAULT, 2011, p. 126). It is no longer a metaphysics of the soul, as in *Alcibiades*, nor of technical knowledge, but of the form that is given to life. It is about submitting life to what Socrates calls the touchstone (*básanos*), which allows us to separate what is good from what is bad. *Socratic parrhesia*, in *Laches*, leads to this operation of screening life through the examination of the self, a principle of proof of life that must be pursued throughout one's existence.

And what allows Socrates to be placed in this position of touchstone, capable of examining and sorting the soul of the other, this position of master of care? Laches is the one who gives the key to understanding him: he recognizes in Socrates a harmony, a symphony between his discourse and his way of life. *Socratic parrhesia* is frank speech in accordance with the way of existing: "when the life (the *bíos*) of the speaker is in conformity, there is a symphony between someone's discourses and what that someone is, it is at that moment that I accept the discourse" (FOUCAULT, 2011, p. 129). Socrates' way of saying and way of living are in harmony and conformity.

Here we arrive at a formula: "frank speech is articulated from lifestyle" (FOUCAULT, 2011, p. 129). Truth-telling committed to the care of oneself and of the other is found precisely in the task of putting one's way of life to the test. This is the ethical *parrhesia*: equalization between the truth of what is said and the truth of what is done, harmony between true discourse and true life. *Socratic parrhesia*, in *Laches*, does not lead to a metaphysics of the soul, as in *Alcibiades*, but to something quite different: "it leads us to *the bíos*, to life, to existence and to the way in which this existence is conducted" (FOUCAULT, 2011, p. 139). This is where another possible key to the reading of the history of philosophy is inaugurated, no longer as a metaphysics of the soul, but as an aesthetics of existence, as a stylistics of life: the construction of life as a beautiful work, as a work of art. Foucault

denounces that we have been much more concerned with making a history of philosophy as a metaphysics of the soul than as a stylistic of existence.

It is through this return to Socrates that Foucault introduces the theme of true life (*alethés bíos*), which will serve as a bridge for his analysis of cynicism and cynical life (*bíos kynikós*). He then ends his lecture on February 22, 1984 with a posthumous account of himself, declaring that he has just accomplished a task that he could not die without carrying out: "It is necessary, for a professor of philosophy, to give at least once in his life a lecture on Socrates and the death of Socrates. It's done. *Salvate animam meam*" (FOUCAULT, 2011, p. 134).

LIFE AS A SCOURGE OF TRUTH: CYNICAL PARRRESIA

If, in Laques, Socrates inaugurates the articulation between way of life and truth-telling, it is the cynics, according to Foucault, who take this relationship to the extreme, making it almost insolent. Cynical *parrhesia* will always be marked by an ambivalence: on the one hand it is frank speech, on the other, it is insolent speech (FOUCAULT, 2011, p. 144/145). Antisthenes, a disciple of Socrates and founder of cynicism, radicalizes *parrhesia*. Remembering that flattery is the enemy of frank speech, he used to say, using a pun filled with Socratic irony, that he preferred to be among the crows (*kórax*) than among the sycophants (*kólax*), since the former devour corpses, while the latter devour living beings (LAERCIO, 2013, p. 306).

If Plato was responsible for driving the philosophical line that leads from Socrates to the metaphysical tradition, Antisthenes, his antipode⁵, launches cynicism towards the stylistics of life. His disciple, Diogenes of Sinope, would be the greatest protagonist of this journey towards the cynical life, taking to the limit the experience of a life of detachment and scandal, in total conformity with nature and return to animality.

The history of cynicism was more a history of attitude than of doctrine. Foucault (2011, p. 156) draws attention to the fact that the cynical doctrine has practically disappeared, and that studies on movement are rare. Normally, interpreters of cynicism tend to consider individualism as its core, to which Foucault (2011, p. 158) opposes it, suggesting that what is at the core of the movement is "the form of existence as a living scandal of truth". Taking up the lives of cynical thinkers such as Antisthenes, Diogenes,

⁵ Diogenes Laertius reports on some occasions in which Antisthenes made clear his antagonism towards Plato. One of them tells that, when Plato was ill, Antisthenes went to visit him and when he saw the basin where he had vomited, he said to him: "here I see your bile, but I do not see your vanity", implying that the most famous disciple of Socrates should also expel this other harmful secretion: vanity (*typhos*) (LAERCIO, 2013, p. 308).

Crates, Hipparchia, Demonax, Demetrius and Perstus, the French philosopher outlines the diversity of the spectrum of cynicism, but also the commonalities of cynical life.

The typical portrait of the cynic is that of the man with a long, hirsute beard, disheveled hair, short cloak, bare and dirty feet, who carries a saddlebag and a staff. A subject with the air of a beggar who is always on the streets, at the doors of temples and in squares, questioning people to tell them truths that are often uncomfortable (FOUCAULT, 2011, p. 171). The cynic spoke to everyone and the recruitment of disciples, in cynicism, took place outside the cultivated elites. Dio Chrysostom suggested that there are three categories of philosophers: 1) those who are silent because they think that the crowd is not capable of being convinced; 2) those who reserve their words for a select audience; 3) the cynics, who make philosophy a popular practice and speak in the streets (FOUCAULT, 2011, p. 180).

Cynicism intended to prepare man for life by teaching him to free himself from what is not necessary (material goods, fame, power, vanity...) and to live in accordance with nature. More than transmitting doctrine, cynicism intended to teach how to live:

For the Cynics, philosophical teaching did not essentially have the function of transmitting knowledge, but, above all and above all, of giving the individuals who were trained an intellectual and moral training at the same time. It was a matter of arming them for life, so that they could face the events (FOUCAULT, 2011, p. 181).

The Cynics banished from the domain of philosophy disciplines such as logic and physics. Everything that is difficult to understand is also unnecessary for life. That which conforms to nature stands out, without concealment⁶. The only truly philosophical discipline is morals. Promoting the reduction of life to itself, cynicism represents the shortest path to virtue, as opposed to the long path of doctrine (FOUCAULT, 2011, p. 183).

Cynical pedagogy, much more than with writings or speeches, was transmitted by the example of life or through the *khreîai*, brief anecdotal accounts of the life of the Cynics. For example, the anecdotes about Diogenes, such as the account of his meeting with Alexander, who blocked his sun, are famous; the occasion when he learned from a child to drink water with his cupped hands, freeing himself from his mug; or when he threw a plucked chicken at Plato's feet – "here is your man", he said to the famous philosopher, who defined the human being as an implume biped (LAERCIO, 2013). From these almost

⁶ Demetrius taught that "what, in nature, is difficult to know, is only hidden, deep down, because its knowledge is useless for life. (...) They are hidden, because they are useless. On the other hand, all that is necessary for existence, necessary for this struggle in which cynical life must consist, all this is available to all. They are the most familiar and most evident things that nature has thus arranged around us so that we can learn them and make use of them. Cynical teaching is a simple teaching, a practical teaching. It is a teaching that the cynics themselves said consisted of a shortcut, a short path" (FOUCAULT, 2011, p. 182/183).

mythical accounts a new figure emerges: the philosophical hero. Foucault (2011, p. 186) suggests that the essence of philosophical heroism resides in cynicism itself, which "has shaped in a certain way the way in which philosophical life itself has been perceived and practiced in the West until now".

In cynicism, then, the themes of *parrhesia* and philosophical life meet: "cynicism appears as this way of manifesting truth, of practicing allegory, the production of truth in the very form of life" (FOUCAULT, 2011, p. 191). The cynical life (*bíos kynikós*) corresponds to the true life (*alethés bíos*), which makes Foucault (2011, p. 192/193) return to what, according to him, would be the four meanings of what is meant, in classical Greek thought, by *alethés* (true): 1) that which is not hidden, not concealed (*a-létheia*); 2) that which does not receive any addition or supplement, does not suffer mixture, is pure; 3) what is straight, without beating around the bush or detouring; 4) that which is sovereign, immutable, and incorruptible. True life, therefore, in ancient thought, is the undisguised, pure, upright, and sovereign life.

This idea of true life is found in Socrates, Plato, and virtually all of classical Greek philosophy. The cynics, however, raise it to extreme, scandalous levels. Cynicism ends up functioning as a broken mirror of ancient philosophy: it reflects what is familiar about it and at the same time distorts this reflection, making it strange. This scandalous banality of philosophy appears in him: he says what all philosophies say, but makes the very fact of saying it inadmissible (FOUCAULT, 2011, p. 203/204).

Cynical scandal constitutes a third kind of *parrhesia* in antiquity, in addition to political bravery and Socratic irony. The political bravery of opposing an error with the courage to tell the truth characterizes *political parrhesia*. The Socratic irony of introducing into someone the awareness of their ignorance and the need to take care of themselves characterizes ethical *parrhesia*. On the other hand, the cynical scandal of telling the truth by the way one lives, condemning and insulting people based on the radicalization of the very principles in which they believe, characterizes practical *parrhesia* (FOUCAULT, 2011, p. 205/206).

According to Foucault (2011, p. 209/210), cynicism reposes the question of philosophical life based on five principles: 1) philosophy is preparation for life; 2) preparation for life requires self-care; 3) to take care of oneself, one should study only what is really useful for life; 4) one must live according to the precepts it formulates; 5) it is necessary to transvalue the values, to change the value of the currency (*parakharáttein tò nòmisma*).

The cynical transvaluation represented by the imperative *parakharáxon tò nòmisma* comes from an account of the life of Diogenes of Sinope that has already been told in

several versions (LAÉRCIO, 2013, p. 315/316). The most illustrative is that the philosopher, who, together with his father, was in charge of the public bank of Sinope, went to Delphi to consult with the oracle, to whom he asked what he should do to obtain fame and success. He received a command as an answer: *parakharáxon tò nòmisma*, which he interpreted as "counterfeit your currency". He acted according to the oracle, taking advantage of his position to manufacture counterfeit coins and thus become rich and famous. It turns out that his crime was discovered, resulting in exile for him and his father. Having to leave Sinope, he went to Athens, where he became a disciple of Antisthenes, converting to cynicism and finally understanding that he had misinterpreted the Delphic commandment. The verb *parakharáttein*, in addition to "falsify", can also be translated as "modify", "alter". Similarly, *nòmism*, in addition to meaning "currency", can also mean "value", "custom" or even "law" (given the common root with *nomos*). *Parakharáxon tò nòmisma*, therefore, more than "counterfeit your currency", should have been understood by Diogenes as "altering your values". The priestess of Apollo wanted to tell the future philosopher that his question was wrong. He shouldn't care about fame, success, or wealth. Rather, if he was in search of a true life, he should completely transvalue his values. And it was precisely this transvaluation of all values that made him plunge into a completely different life: the cynical life.

Thus, "the principle 'changes your currency', 'changes the value of your currency', is seen as a principle of life, including the most fundamental and most characteristic principle of cynics" (FOUCAULT, 2011, p. 211/212). This is because the currency appears there as a metaphor: "to alter the *name* is also to change the custom, to break with it, to break the rules, habits, conventions and laws" (FOUCAULT, 2011, p. 213). As Michel Onfray (2007, p. 143) suggests, counterfeiting currency is to set in motion a task aimed at producing new values, new imperatives.

Antisthenes, the first Cynic, founded his philosophical school at the Cynosargus, a gymnasium located outside the walls of Athens, intended for those who, because they did not have Athenian citizenship, were on the margins of society, such as those born to slaves, prostitutes, and foreigners. *Cynosarges*, in Greek, means "white dog", "agile dog". The gymnasium would have received this name in honor of a pale dog that surreptitiously seized a piece of meat offered in sacrifice to Hercules (ONFRAY, 2007, p. 36/37). Hercules, by the way, was an archetype often invoked by the Cynics: a god born among men, who did not live on Olympus, but on pilgrimage; that faced the jungle and lived by hunting; that he was not the brilliant hero, happy in his exploits, but that he was always fighting and dying. Hercules is the example of someone who turned his life into a fight for survival.

There are at least two reasons why the disciples of Antisthenes and Diogenes were known as Cynics (from the Greek *kyōn*, genitive *kynos*, meaning dog): because of the place where they settled (Cynosargus) and because they led the life of a dog. According to Foucault (2011, p. 214), there are four meanings that we can give to the expression dog's life, or cynical life (*bíos kynikós*): 1) life without shame or shame; 2) life indifferent to everything (*adiáphoros*); 3) life that barks, that distinguishes friends from enemies and barks against enemies (*diakritikós*); 4) life of a guard, who is dedicated to saving and protecting friends (*phylaktikós*). The cynical life, therefore, is a "life of shamelessness, life *adiáphoros* (indifferent), life *diakritikós* (diacritical, of distinction, of discrimination, life in a certain way barking) and life *phylaktikós* (life of a guard, of a watchdog)".

This cynical life, then, takes up the Socratic theme of true life. The lives of others, non-philosophical lives, are seen by the cynic as counterfeit currency, without value. The true life, then, is a life different, different not only from that which men in general lead, but also from that which other philosophers lead. This, for Foucault (2011, p. 215), is the great question posed by cynicism: "Shouldn't life, to truly be real life, be another life, a radical and paradoxically different life?". Thus, two categories are developed that structure Western philosophy, both rooted in Socrates: the tradition of the other world (Platonism) and the tradition of the other life (cynicism).⁷

Foucault then takes up the four aspects of true life (*alethés bíos*) of the ancients, showing how the Cynics subvert each of them until they become a scandal: 1) undisguised life; 2) life without mixture (pure); 3) Straight life; 4) Sovereign life. Cynics transvalue the Stoic version of undisguised life. For Seneca, true life is one that must be lived as if we were always in front of the gaze of the other, therefore, a life of modesty (FOUCAULT, 2011, p. 211). The Cynics, however, transform this non-dissimulation of life into a public spectacle of shamelessness: absence of home, absence of clothes, meals in public, sex in public, masturbation in public, physiological needs in public, death in public (Diogenes died at the gates of a gymnasium in Corinth, Peregrinus made his suicide public by setting himself on fire in a public square). The cynical life is a life of absolute visibility, based on the principle that one must live without being ashamed of what one does:

The game, which makes this dramatization turn into scandal and into the very inversion of the undisguised life of the other philosophers, is as follows: an undisguised life is a life that would not hide anything that is not bad and would not

⁷ In this regard: "Perhaps – once again forgive the schematism, they are hypotheses, dotted lines, outlines, possibilities of work – it could be said that Greek philosophy, in essence, has posed since Socrates, with and through Platonism, the question of the other world. But he also posed, based on Socrates or the Socratic model to which cynicism referred, another question. Not the question of the other world, but of the other life. The other world and the other life were, it seems to me, in the end, the two great themes, the two great forms, the two great limits between which Western philosophy has not ceased to develop" (FOUCAULT, 2011, p. 215).

do evil because it would not conceal anything. Now, say the cynics, can there be any evil in what nature wants and in what it has put in us? (...) All this constitutes the form of this undisguised life, according to the principle that Diogenes and Crates often take up, namely: how could making love, having sexual relations, be considered an evil, if this has been inscribed in our nature? If it is inscribed in our nature, it cannot be an evil. Therefore, there is no need to conceal it (FOUCAULT, 2011, p. 224).

This is how, applying the idea of undisguised life to the letter, cynicism ends up imploding the code of modesty that served as the foundation of the very principle of non-dissimulation present in other philosophies.

Likewise, the principle of life without mixture will be transvalued by cynicism and transformed into a stylistics of independence dramatized in the form of poverty. True life is one that not only does not depend on material goods, but repudiates them. Cynical poverty, unlike Stoic or Epicurean poverty, is real, active, and indefinite poverty. He is always looking for possible strippings. The pure, unmixed life is the self-sufficient life of rude misery: "cynical poverty ... it is the affirmation of the self-worth and intrinsic value of physical ugliness, dirt and misery" (FOUCAULT, 2011, p. 227/228). It is not enough not to depend on material goods, it is necessary to effectively exercise this independence, rejecting them. This life of extreme poverty and even begging leads to *adoxia* (bad reputation). In cynicism, the systematic practice of dishonor is conduct with positive meaning and value. Seeking humiliating situations exercises the cynic to resist everything: opinions, beliefs, conventions, or judgments.

The commandment of the right life, as an attribute of the true life, will also be taken up by the Cynics, but in such a way as to make this life according to the laws of nature a totally different life. There was, in the other ancient philosophical traditions, an ambivalence in relation to the notion of an upright life: if on the one hand it was linked to a life in accordance with nature and with the *logos*, on the other it was also connected to the idea of a life in conformity with the laws, rules, customs and conventions of men. There was, therefore, this ambiguity around the idea of upright life, which was linked at the same time to a nucleus of naturalness and to another artificial nucleus linked to social laws. The cynics will remove this artificial dimension from the right life, making it another life, indexed only to the domain of natural law: "no convention, no human prescription can be accepted in cynical life, if it is not exactly in accordance with what is found in nature, and only in nature" (FOUCAULT, 2011, p. 232). In this sense, the return to animality becomes an exercise and perpetual trial, but also a scandal for others.

Finally, the theme of sovereign life will also undergo a cynical reversal: "the cynics make the very simple, very stripped-down, totally insolent affirmation that the cynic himself

is king" (FOUCAULT, 2011, p. 242). Sovereign of himself, owner of himself, the cynic has a relationship of enjoyment-possession and enjoyment-pleasure to himself. Because he does not depend on a crown, wealth, fame or power, the cynic is the only true king. He takes to the extreme the ideal of autarky and self-sufficiency: ruler of himself, nothing outside of him can shake the power he possesses over the kingdom of himself. This position of anti-king as the only true king denounces the illusion of political royalty, so well portrayed in the famous anecdote that relates the meeting between Diogenes and Alexander the Great.

Foucault (2011, p. 250) summarizes the cynical transvaluation of the themes of true life:

Through the different themes already evoked, we have seen that the Cynics had reversed the idea of the disguised life by dramatizing it in the practice of nakedness and shamelessness. They had reversed the theme of independent living by dramatizing it in the form of poverty. They had reversed the theme of the right life by dramatizing it in the form of animality. Well, we can also say that they reverse and invert this theme of sovereign life (tranquil and beneficial life: tranquil for oneself, enjoying oneself, and beneficial for others) by dramatizing it in the form of what we could call militant life, a life of combat and struggle against oneself and for oneself, against others and for others.

Thus, the cynical life projects itself as militancy that seeks more than just to provide its adherents with the means to achieve happiness. It is a militancy that intends to change the world, to make it another world through the practice of a scandalously different life. In short, cynicism merges the theme of true speech (*parrhesia*) with that of true life (*alethés bíos*). The question of the cynic is "to exercise in his life and for his life the scandal of truth" (FOUCAULT, 2011, p. 152).

This scandal that is the cynical life truly characterizes a mission: "the cynic is an employee of humanity in general, he is an employee of ethical universality" (FOUCAULT, 2011, p. 266). The Cynic philosopher, then, is responsible for humanity and has the mission of taking care of the care of men. This mission, however, is not a burden, but a gift. The cynical life is a happy life: the cynic says yes to his fate, establishing a relationship with himself in the form of contented acceptance. It is a question of "sovereignty that manifests itself in the brightness of the joy of those who accept their destiny and therefore know no lack, no sadness and no fear" (FOUCAULT, 2011, p. 272).

This blessed life, according to Foucault (2011, p. 273), characterizes the very courage to tell the truth. It is a matter of summoning those who do not lead the cynical life to this form of existence which is the only true existence and which consists in a change of oneself and of the world itself. To do this, it is necessary to escape the banal: to work, to produce wealth, to marry, to have children, to fight for one's homeland – all of this was outside the horizon of projection of cynical life (ONFRAY, 2007, p. 173). The world can only

be transformed into another world at the cost of a complete alteration of the relationship one has with oneself and the transvaluation of all values and customs. It is necessary, on the part of the cynic, willingness and courage to go beyond the common man⁸.

TREMBLING OBEDIENCE AND SELF-DENIAL: *PARRHESIA* IN EARLY CHRISTIANITY

From Socrates, through Cynicism, we see this figure of the missionary of truth, who comes to men to give them the ascetic example of the true life and to proclaim another world. Foucault did not have time to develop more than a brief outline of the analysis of this passage from pagan asceticism to Christian asceticism.

His reading in this sense begins by perceiving the continuity between the practices of asceticism, the forms of resistance and the modes of exercise found in both Cynicism and Christianity. These practices include, for example, relations with food, fasting, and a kind of dietary asceticism that was important both for ancient thought and for primitive Christianity. The cynic practiced a reduced form of eating with the aim of obtaining maximum pleasure with minimum means. In Christianity there is also the idea that it is necessary to impose limits on food. This, however, occurs in a different way: it is not a question of the search for a point of equilibrium of pleasure, but of the denial of all pleasure, "in such a way that neither food nor drink ever provoke, in itself, any form of pleasure" (FOUCAULT, 2011, p. 280). There is, therefore, between cynicism and Christianity, with regard to this theme, a relationship that is both one of continuity and rupture.

The cynical theme of scandal as indifference to the opinion of others and to the structures of power also appears in primitive Christianity and cenobitism. In the same way, Christian asceticism, in some texts and traditions such as that of eremitism, rescues the theme of bestiality. The theme of extreme poverty also reappears in Christian asceticism through mendicant orders such as the Franciscans and Dominicans. The cynical theme of the other world, however, undergoes a platonic inversion, becoming another world. Christian asceticism, then, connects Platonic metaphysics to cynical asceticism, linking the themes of the other life as true life and access to the other world as access to truth (FOUCAULT, 2011, p. 280/282).

Christianity, however, attaches great importance to a principle that cannot be found in either Cynicism or Platonism: the principle of obedience. Obedience to God, conceived as

⁸ Perhaps it would be possible, in a work that had as its specific objective a more detailed analysis of Nietzsche's influence on Foucault and of the French philosopher's reading of the Cynics, to suggest that, in his final course, he subliminally roots in cynicism four themes of Nietzsche's thought: 1) the transvaluation of all values (through the principle of changing currency and transvaluing the dimensions of true life); 2) the philosophy of grand style (stylistic existence and life as a beautiful work); 3) amor *fati* (the joy of saying yes to fate); 4) the beyond-man (the cynic as the one who has the courage to transform himself to go beyond the common man).

the despot to whom we are all slaves, becomes the only way of access to true life and to the true world. From this arises a new type of power relationship of the subject towards himself and a new regime of truth that will characterize *parrhesia* in the Christian experience: *parrhesia* as a relationship with the other world and as obedience to God and others (FOUCAULT, 2011, p. 283).

In pre-Christian texts, *parrhesia* is no longer situated on the axis of horizontal relations between individuals, but on the vertical axis of a relationship with God. It becomes a movement by which the pure soul rises to God, manifesting to him its truth. In the New Testament texts, *parrhesia* also designates the courageous attitude of those who preach the Gospel. The figure of the martyr appears as the portrait par excellence of the parrhesiast, who places his entire trust in the divine will. As the Christian life becomes an institutionalized practice, however, this principle of trust makes room for a principle of trembling obedience (FOUCAULT, 2011, p. 292).

The relationship between believer and God, once direct, becomes possible only when intermediated by authority figures established within institutional relations. Souls are entrusted to pastors, priests and bishops. In these authorities one must trust, even if one must distrust oneself, since without the intermediary access to the divine is prohibited: "By oneself and in oneself, one cannot find anything but evil, and it will be only by renouncing oneself and applying this general principle of obedience that man will be able to achieve his salvation" (FOUCAULT, 2011, p. 293). Thus, *parrhesia*, as self-confidence and courage to tell the truth, becomes reprehensible, presumptuous and arrogant behavior.

This *parrhesia*, which now takes on the features of defect and vice, also loses its connection with the principle of care: taking care of oneself is pride and vanity, renouncing oneself is virtue. Foucault (2011, p. 295) suggests, then, that, through the principle of trembling obedience, from the institutionalization of Christianity, an inversion of the value of *parrhesia* is promoted. This is what he called the passage from the mystical tradition of Christianity to its ascetic tradition:

And you have, in Christianity, another pole, an anti-parrhesiastical pole that founds not the mystical tradition, but the ascetic tradition. It is the pole according to which the relationship with the truth can only be established in fearful and reverential obedience to God, and in the form of a suspicious decipherment of oneself, through temptations and trials. This anti-parrhesiastic, ascetic, trustless pole, this pole of distrust of oneself and fear of God, is no less important than the parrhesiastical pole. I would even say that it was historically and institutionally much more important, since it was around him, after all, that all the pastoral institutions of Christianity developed. (...) Truth of life before true life: it was in this inversion that Christian asceticism fundamentally modified an ancient asceticism that always aspired to lead true life and real life at the same time and that, at least in cynicism, affirmed the possibility of leading this true life of truth (FOUCAULT, 2011, p. 296).

Thus, with Christian asceticism, there is a transvaluation of *parrhesia*, with the consequent denial of the body, the world and life in favor of another world and another life – which have nothing to do with the other world or with the other life of cynicism⁹.

FINAL CONSIDERATIONS: INHERITANCE AND MISSION

Through the theme of *parrhesia*, chosen not by chance for his last course, Foucault intertwines the three major questions that were the object of reflection in all his work: truth, power and subject. Rescuing the idea of philosophical life as an art of living and the path to true life, the philosopher inserted ancient cynicism as a category of analysis in which he subliminally projected not only the stylistics of the existence of his philosophical heroes (such as, for example, Nietzsche), but also and especially his own vision of how life and philosophy should be. When Foucault, in "The Courage of Truth", speaks of the Cynics, he speaks, in fact, of Foucault. When he speaks of the cynical life, he speaks of the life of Foucault, the life that he carved out as a work of art and that, already on the threshold of death, he claims for himself and proudly signs.

Western philosophy has progressively eliminated, or at least neglected, the problem of philosophical life. Foucault (2011, p. 207) points out as possible causes of its disappearance: 1) the confiscation of the theme of true life by religious practice; 2) the institutionalization of veridication practices in the form of science. Since the Middle Ages, with the institutionalization of Christianity, religion has hijacked for itself the position of saying how life should be lived. On the other hand, modernity has annulled the problem of true life by handing over to science the monopoly of truth-telling practices. The return to ancient philosophy and *parrhesia* was the path opened by Foucault so that one could once again discuss the art of living, the aesthetics of existence.

No one better than François Ewald, Foucault's assistant at the Collège de France, to testify to the testamentary and autobiographical character of this last course by the French thinker, who thematized the relations between *parrhesia* and philosophical life, with a marked emphasis on ancient cynicism:

None of his courses were so beautiful and so moving. He wanted to show how *parrhesia*, the true saying, reached with Plato and Diogenes, not only philosophical activity, but also the life of the philosopher, characterizing his style of existence. In reality, Foucault did nothing more than describe himself, just as he would have liked to have been, as he was and as he would have liked to be. In front of us, clearly, he made his autobiography. Thus, finally, shortly before his death, Foucault recognized himself, with great tranquility, again as a philosopher. As if he had accepted his identity as a philosopher, making it desirable. As if he was aware, at last, of who he

⁹ Although Foucault (2011, p. 283), in the first hour of the class on March 28, 1984, criticized the terms in which Nietzsche supposedly proposed the opposition between ancient asceticism and Christian asceticism.

was. Foucault, I believe, died reconciled with himself (EWALD, Apud CHAVES, 2013, p. 18/19).

Foucault, in his final course, does more than the aforementioned accountability of his entire production and the way he articulated his three major themes: truth, power and subject. In this intellectual testament, he reconciles himself with philosophy, recognizes himself, at last, as a philosopher, and leaves to the philosophical community a collection that is, at the same time, heritage and mission. By legacy, it leaves an open path to rethink the history of philosophy as a history of the art of living. It signals, in countless senses, how it is possible, from *Laches* and, especially, from cynicism, to trace the origin of the non-metaphysical tradition of the art of living that goes from Socrates not to Plato, but to Antisthenes and Diogenes, and from them leads to the mystique of primitive Christianity, to Spinoza, to Nietzsche, to Foucault himself and, we could say, to contemporary authors such as Derrida, Rorty, Butler, Preciado, etc. Foucault bequeaths us the way to redeem philosophy and its mode of veridiction: to retell its history by another way, not the way of *psykhé*, but the way of *bíos*, because "this neglect of philosophical life made it possible for the relationship with truth to no longer be validated and manifested now except in the form of scientific knowledge" (FOUCAULT, 2011, p. 208). Only the rescue of the theme of philosophical life as true life would allow the revalidation of the knowledge of philosophy.

Foucault interrupted his sketch of the history of philosophy as the history of the art of living prematurely, but left several paths that can be followed. The very redescription of ancient cynicism and the concern with thinking about the reflexes of the movement in contemporary figures has already been echoed by authors such as Michel Onfray, Peter Sloterdijk and, in Brazil, Ernani Chaves, for example. If, on the one hand, Foucault sees cynical marks in the lives of nineteenth- and twentieth-century revolutionaries and in the artistic lives of figures such as Baudelaire, Flaubert or Manet, wouldn't it be equally possible to find the same marks in movements such as punk music and aesthetics, with all their countercultural scandal of preaching a diacritical life and detachment? Ademias, when Foucault speaks of the Cynics, to what extent could he be showing the influence of other important authors in his formation, such as Nietzsche? How much of Nietzschean influence is there in Foucault's reading of the cynics and how much of cynical influence does Foucault propose to be in Nietzsche's philosophy? All these are loose threads that Foucault leaves us as an inheritance in his final course and that deserve development in new works.

What if, on the other hand, when he spoke of the cynics, Foucault was talking about himself? What if the scandal of the cynical, huge, hirsute beard is the scandal of the shaved head? What if the scandal of public masturbation and sex in *the agora* is the scandal of

sadomasochism and gay saunas in San Francisco? What if the public preaching of the Cynics, made to the people in the streets and squares, are the courses in the Collège de France, obligatorily open to the public, without the possibility of esoteric teaching exclusively for initiates? What if the life of struggle and cynical militancy is the militancy in favor of the infamous lives, together with the movements for the abolition of asylums and prisons? What if the outcasts welcomed in the Cynosargus are the abnormal, the insane, the criminals, the sorceresses, the hermaphrodites and all those sorts of lives that develop on the margins and that were a permanent object of Foucault's concern? To what extent would it not be in Foucault himself that cynicism would find its clearest projection and contemporary reinterpretation? To what extent was cynicism not the broken mirror in which Foucault projected, rather than the distorted image of all philosophy, a fragmented image of himself?

If Foucault were alive and still concerned with making a critical history of the present, he would perhaps be finding, in the cult of the perfect body and the fitness/healthy life of gyms, nutrition clinics, crossfit boxes, beauty salons, steroid compounding pharmacies and plastic surgery hospitals, an inversion of the Socratic principle of self-care. Understood no longer as deep care of the soul, but as banal care for the body? Would you be seeing in self-help literature, self-entrepreneurship, high-performance coaches and grating spiritual gurus of social networks mercantile or vulgarized forms of Socratic know-thyself? Would the evasion of privacy, bloggers and influencers, the narcissistic, voyeuristic and exhibitionist lifestyle and the evasion of privacy of tiktoks, instagrams, twitters and facebook be new forms of writing of the self? Would hyper-information and the possibility that everyone is a "content producer" and "opinion maker", with the commandment that it is necessary to have and express an opinion about everything, be a form of "post-modern" veridiction? What courage does it take to tell the truth in the age of *fake news* and post-truth? What risks does political *parrhesia* run in contemporary democracies? In what terms is it still possible and useful to speak, in the present day, of a true life as another life? How to think of existence as a work of art and life as possible beauty?

All these questions are loose threads that Foucault bequeaths to us as an inheritance in his final course and that deserve development in new works. Foucault leaves open the way to construct (or invent) a history of philosophy as an aesthetics of existence and, above all, as a history of ourselves, of how we become what we are. He himself reminded us: "I don't write a book so that it is the last. I write so that other books are possible, not necessarily written by me" (FOUCAULT, 1994, p. 162). It is up to us to write




these books, appropriating their heritage. This is the mission that Foucault leaves us as a legacy in his philosophical testament.



REFERENCES

1. Araújo, I. L. (2004). Foucault, um arqueogenealogista do saber, do poder e da ética. *Revista de Ciências Humanas*, *35*, 37-55.
2. Candioto, C. (2006). Foucault: uma história crítica da verdade. *Trans/Form/Ação*, 29*(2), 65-78.
3. Castro, E. (2023). *Introducción a Foucault: guía para orientarse y entender una obra en movimiento*. Siglo Veintiuno.
4. Chaves, E. (2013). *Michel Foucault e a verdade cínica*. Editora PHI.
5. Foucault, M. (2011). *A coragem da verdade: o governo de si e dos outros II*. Editora WMF Martins Fontes.
6. Foucault, M. (2006). *A hermenêutica do sujeito*. Martins Fontes.
7. Foucault, M. (1994). *Ditos e escritos, t. II*. Forense Universitária.
8. Foucault, M. (2007a). *História da sexualidade 2: o uso dos prazeres*. Edições Graal.
9. Foucault, M. (2007b). *História da sexualidade 3: o cuidado de si*. Edições Graal.
10. Foucault, M. (2010). *O governo de si e dos outros*. Editora WMF Martins Fontes.
11. Foucault, M. (2014). *O governo dos vivos*. Editora WMF Martins Fontes.
12. Foucault, M. (2016). *Subjetividade e verdade*. Editora WMF Martins Fontes.
13. Grós, F. (2007). *Michel Foucault*. Amorrortu.
14. Laercio, D. (2013). *Vidas y opiniones de los filósofos ilustres*. Alianza Editorial.
15. Nietzsche, F. W. (2007). *A genealogia da moral: uma polêmica*. Companhia das Letras.
16. Nietzsche, F. W. (2008). *Ecce homo: como alguém se torna o que é*. Companhia das Letras.
17. Onfray, M. (2007). *Cinismos: retrato de los filósofos llamados perros*. Paidós.
18. Platão. (2022). *Alcíades I*. Penguin-Companhia das Letras.
19. Platão. (2019). *Diálogos III: Fedro, Eutífron, Apologia de Sócrates, Críton, Fédon*. Edipro.
20. Platão. (2016). *Diálogos VI: Crátilo, Cármides, Laques, Ion, Menexeno*. Edipro.
21. Sloterdijk, P. (2012). *Crítica da razão cínica*. Estação Liberdade.
22. Veiga-Neto, A. (2003). *Foucault e a educação*. Autêntica.

FUNCTIONAL IMPACT IN PATIENTS WITH ACUTE BRAIN INJURY <https://doi.org/10.56238/sevened2024.029-050>

Amanda Ellen Gomes Amaral¹, Tais Kaybers², Marden Junior Sousa Ferreira³, Jason Silva de Almeida Junior⁴, Juan Rodrigues Nina Monteiro⁵, Jayne van Silva Nunes⁶, Gabriel Melo Maia⁷, Janaína Rodrigues da Rocha⁸, Thayane Nataly Maia de Albuquerque⁹, Jaqueline dos Santos Sousa¹⁰, Camila Nobre de Barros¹¹ and Bruna Mayane Martins Ferreira¹²

ABSTRACT

Acute brain injury (ABI) affects about 100 million individuals annually, which interferes with the length of hospital stay of these individuals. The most visible complication of the hospital stay is ICU-acquired muscle weakness (FAUTI), which has a negative impact on functionality. The objective of this study was to observe the pattern of neurocritical individuals hospitalized in an adult intensive care unit, its relationship with the impact that the pathology has on strength and, respectively, on functionality. This is a cross-sectional, retrospective and descriptive research, with a quantitative approach, 41 medical records of individuals who were admitted between January and December 2022 at Hospital Regional do Baixo Amazonas Dr. Waldemar Penna (HRBA) were analyzed. In the study, it was observed through the IMS scale that the sample obtained a prevalence of score 3 (sitting by the bedside) in 25 individuals (61.0%), indicating a low level of functionality. However, when the mobilization protocols were initiated, the clinical outcome for these patients was discharge from the unit, even with the delay in the beginning of mobilization.

Keywords: Functionality. Muscle weakness. Early ambulation.

¹ Physiotherapist - Instituto Esperança de Ensino Superior - IESPES

² Physiotherapist - Instituto Esperança de Ensino Superior - IESPES

³ Specialist Physiotherapist - State University of Pará - UEPA

⁴ Specialist Physiotherapist - Instituto Esperança de Ensino Superior - IESPES Juan Rodrigues

⁵ Physiotherapist - Instituto Esperança de Ensino Superior - IESPES

⁶ Physiotherapist - Instituto Esperança de Ensino Superior - IESPES

⁷ Physiotherapist - Instituto Esperança de Ensino Superior - IESPES

⁸ Physiotherapist - Instituto Esperança de Ensino Superior - IESPES

⁹ Physiotherapist - Instituto Esperança de Ensino Superior - IESPES

¹⁰ Physiotherapy Student - Instituto Esperança de Ensino Superior - IESPES

¹¹ Physiotherapy Student - Instituto Esperança de Ensino Superior - IESPES

¹² Physiotherapist

Hope Institute of Higher Education - IESPES

INTRODUCTION

Acute brain injury (ABI) affects about 100 million individuals annually, and is named by the Seattle Consensus on Traumatic Brain Injuries (SIBICC) (2019) as a severe neurological and neurosurgical condition that can present as impairments of traumatic origins, pathologies linked to the brain or cerebrovascular diseases, with a predominance of cases of traumatic brain injury (TBI) and cerebrovascular accident (CVA). These injuries can result in a variety of neurological symptoms, such as loss of motor function, changes in consciousness, cognitive deficits, and other complications, depending on the area and severity of the brain injury, substantially affecting health and function, resulting in high mortality rates of the population (Frisvold et al., 2023; Hawryluk et al., 2019).

The length of hospital stay of neurocritical individuals is generally longer in the intensive care unit (ICU), they need support for several organ systems, favoring prolonged hospitalization (Ribeiro et al.; 2021). In this context, individuals with neuroinjury need constant monitoring and specific measures in order to avoid secondary injuries that progress over a certain period of time, this neuroprotection includes tools that measure intracranial pressure (ICP), blood oxygenation, and gas levels in the arterial bed, in addition to checking temperature as well as vital signs (Veldeman et al., 2021). There is also protective mechanical ventilation (MV) and care with the artificial airway, for those individuals in need of advanced ventilatory support and at risk of bronchial aspiration, this tool has a significant contribution in this scenario, since it makes it possible to adjust the level of carbon dioxide (CO²) in blood plasma, which when dysregulated is extremely harmful to brain tissue (Asehnoune et al., 2023).

In the same way that controlled ventilation has its benefits for neuroprotection, its extended time may generate complications intrinsic to prolonged pressurization, which will include infections, the need for tracheostomy for weaning, immobility, among others. In this way, the MV time, when minimized, reduces the number of pulmonary, functional, and cognitive disorders (Feliciano et al., 2019).

Among the risks mentioned, immobility has a high incidence in individuals with ICA, where they have a significant reduction in the ability to move or respond to motor stimuli. This can be caused by damage to the areas of the brain responsible for motor control, such as the primary motor cortex, the premotor cortex, or the descending motor pathways. The most visible complication of the hospital stay is muscle weakness acquired in the ICU (FAUTI), which becomes noticeable after the first week of bed restriction and, combined with the use of sedatives and corticosteroids, atrophies muscle fibers in the various body segments. The estimated muscle loss is around 30%, caused by disuse, which contributes

negatively to the increase in the mortality rate and decreased mobility (Santos et al., 2017). There is a certain degree of difficulty in mobilizing individuals with this profile, given that in these cases sedation is done routinely, restricting the application of therapeutic exercises (Costa; silva; silva, 2020; Paiva et al., 2018). However, such measures, when implemented, prevent possible weaknesses and recover degrees of strength that are already absent, which influence the individual's hospitalization phase and post-hospital discharge (Feliciano, 2019).

In this context, the present study aims to observe the pattern of neurocritical individuals hospitalized in an adult intensive care unit, its relationship with the impact that the pathology employs on strength and respectively on functionality.

METHODOLOGY

The present study is based on a cross-sectional, retrospective and descriptive study, with a quantitative approach, with data collection from the medical records of neurocritical patients of an adult intensive care unit of both sexes, carried out at the Regional Hospital of Baixo Amazonas do Pará Dr. Waldemar Penna (HRBA). The collection was carried out during the year 2023 in the months of January and February and 41 medical records of individuals who were admitted in the period between January and December 2022 were analyzed. This study was submitted to the Research Ethics Committee (CEP) of the State University of Pará – Campus XXII – Tapajós (UEPA) with pacerer number 5,727,678 through attachment to Plataforma Brasil.

The inclusion criteria were medical records with information on neurocritical adult individuals (15-90 years) admitted to the ICU on mechanical ventilation with data on a minimum invasive ventilation time of 24 hours; individuals who were discharged improved or cured and also those whose final outcome was death. Considering that 41 medical records immersed in the collection period were evaluated, data related to age, diagnosis, clinical profile, sedation analgesia, functionality scale, sedation and agitation level scale, gait, dynamometry, mobilizations and outcome were noted in a specific protocol for research. The results were obtained using frequencies and percentages for the qualitative characteristics; measures of central tendency (mean and median) and measures of dispersion (standard deviation) for quantitative measures. The study adhered to the guidelines established in Resolution No. 466/12 CNS/CONEP, which regulates the conduct of research involving human beings. This legal regulation reinforces the importance of the ethical and moral principles inherent to research, including the guarantee of the anonymity of participants and the confidentiality of the information collected. In addition, the study

followed the provisions of the July 2017 Resolution, specifically article 2, which stipulates the commitment to maintain the confidentiality and privacy of research data, as well as the guarantee that such data will be used exclusively for the purposes of the study in question.

RESULTS

A total sample of 41 medical records of individuals admitted to the ICU was obtained. Table 01 showed a predominance of the age group of individuals between 50 and 59 years old (31.7% (p-0.0236)). The cause of hospitalization with the highest incidence was oncological diagnosis (51.2%) (p-0.0005), cerebrovascular diseases with 43.9% and hypoxic ischemic encephalopathy with 4.9%.

Table 01 - Description of the characteristics and clinical conditions of the individuals

Sociodemographic profile and diagnosis	N	%	p-value
Age group			0.0236*
Under 20 years old	2	4,9%	
From 20 to 29 years old	5	12,2%	
From 30 to 39 years old	3	7,3%	
From 40 to 49 years old	6	14,6%	
From 50 to 59 years old	13	31,7%	
From 60 to 69 years old	4	9,8%	
From 70 to 79 years old	5	12,2%	
From 80 to 90 years old	3	7,3%	
(Mean ±Standard Deviation)	51.8±18.3 years		
Diagnosis			0.0005*
Cerebrovascular Diseases	18	43,9%	
Hypoxy Ischemic Encephalopathy	2	4,9%	
Oncological	21	51,2%	

*significant result for the Chi-square test.

Source: Survey data

Regarding sedation analgesia in table 02, all of them used it, with Midazolam and Fentanyl being the most used, due to the fact that they are the drugs commonly administered by the hospital. Regarding the level of Richmond sedation and agitation (RASS), there was a superiority of -5 score, totaling 39 individuals (95.1%).

Table 02 - Characteristics of the clinical profile of the individuals

Clinical profile	n	%	p-value
Analgesia			< 0.0001*
Fentanyl	41	100,0%	
Remifentanil	0	0,0%	
Sedation			< 0.0001*
Midazolan	41	100,0%	
Ketamine	0	0,0%	
Dexmedomidina	0	0,0%	
Propofol	0	0,0%	
Level of sedation (Rass Scale)			< 0.0001*
-3	1	2,4%	
-4	1	2,4%	
-5	39	95,1%	

*significant result for the Chi-square test.

Source: Survey data

The data analyzed in table 03 show the distribution of the components of the mobilization group, where 38 (92.7%) of the individuals underwent the protocol, with this, only 3 (7.3%) were not submitted to it. Regarding the time to start the mobilization, the predominance was 2 to 3 days (24.4%) and 4 to 7 days (39.0%). Among the analysis, it was noticed that 31 (75.6%) individuals did not perform out-of-bed mobilization, because when compared to the ICU Mobility Scale (IMS), used to assess functionality, the predominance was the score of 3 points obtained by 61.0% of the individuals, thus justifying the relationship with out-of-bed mobilization. Regarding gait, the data indicated that 82.9% (34) of the individuals did not walk, 14.6% (6) performed the same and only 1 (2.4%) patient did not apply the walking protocol. Peripheral muscle strength was assessed using dynamometry, which obtained a predominant result between 6 and 10 kg/f, totaling 16 individuals (39.0%), the second highest percentage reached a score of 0 kg/f, which totaled 22.0%, observed in 9 individuals, thus justifying the low functionality index in the above predictors.

Table 03 – Protocols for mobilization and functional level assessment

Mobilization	n	%	p-value
Mobilization			< 0.0001*
Not applicable	1	2,4%	
No	2	4,9%	
Yes	38	92,7%	
Time to start the mobilization			0.0003*
Not applicable	2	4,9%	
Up to 01 day	2	4,9%	
From 02 to 03 days	10	24,4%	
From 04 to 07 days	16	39,0%	
From 08 to 14 days	8	19,5%	
Above 14 days	3	7,3%	
Out of bed			0.0018*
No	31	75,6%	
Yes	10	24,4%	
IMS (ICU Mobility Scale)			< 0.0001*
0	7	17,1%	
1	2	4,9%	
3	25	61,0%	
5	3	7,3%	
6	2	4,9%	
8	2	4,9%	
March			< 0.0001*
Not applicable	1	2,4%	
No	34	82,9%	
Yes	6	14,6%	
Dynamometry (kgf)			0.0023*
0	9	22,0%	
From 1 to 5	5	12,2%	
From 6 to 10	16	39,0%	
From 11 a.m. to 3 p.m.	5	12,2%	
From 16 to 20	4	9,8%	
From 9 to 25	2	4,9%	

*significant result for the Chi-square test.

Source: Survey data

Table 4 shows that during the study, 39 individuals were discharged from the intensive care unit (95.1%) and only 2 died (4.9%).

Table 04 – Outcome analysis

Denouement			< 0.0001*
Loud	39	95,1%	
Death	2	4,9%	

*significant result for the Chi-square test.

Source: Survey data

COMPARISONS

In the present study, the routine use of fentanyl and midazolam was observed as the most prevalent sedation analgesia during the hospitalization of neurocritical individuals with

a percentage of 100% in both medications, and when compared with the RASS scale, the index with the highest superiority was the score of -5 (95.1%), this index with excessive sedation analgesia correlates with the current study where a high time for the beginning of mobilization is observed with a percentage of 4 to 7 days in 16 individuals (39.0%), thus inferring a delay in the protocol; when this topic is discussed about the barriers to its application, the literature shows that sedation has its participation in a common way in this context, even though sedated patients with no level of consciousness can still be submitted to passive mobilizations, but without presenting as many significant benefits as in assisted or active active training (Carol et al., 2023). Thus, studies present neuromuscular electrical stimulation (NMES) for those cases where there is no way to stimulate the individual in a conventional way, this resource shows potential to increase muscle mass in addition to reducing the appearance of pressure injuries with increased blood circulation, and can also be applied in cases of individuals with RASS -5, going against the present study where mobilization is not applied to individuals without a level of consciousness (Baron et al., 2022).

Regarding peripheral muscle strength presented through evaluation with handgrip dynamometry, the highest incidence was 6 kg/F to 10 kg/F in 39.0% of the sample, presenting considerable muscle weakness acquired in the ICU in individuals with ICA, since the cut-off values are 11 kg/F for men and 7 kg/F for women, lower numbers than those mentioned above refer to the confirmation of severe weakness (Roque, Souza, Taveira., 2017). According to Zudin (2017), reduced strength and decreased muscle mass is a common complication in critically ill patients, occurring in 25% to 50% of cases, especially in individuals undergoing MV, corroborating the present study, since the daily loss of muscle mass averages 2 to 3% in the first 10 days, and this decrease is inferred in the lower rate of mobilizations outside the bed reported in the analysis with a product of 75.6% of the cases, and can be correlated with the results of the IMS scale that observes the highest degree of functionality performed by the subject with or without assistance, where in his sample a prevalence of score 3 (sitting by the bedside) was obtained in 25 individuals (61.0%), followed by a score of 0 (restricted to bed) in a total of 7 (17.1%) of the individuals in the study. Such results of this score can also be inferred in gait, thus justifying the cause of the high prevalence of individuals who did not walk during hospitalization, which resulted in a total of 34 individuals in the analysis (82.9%), in similarity with the allegation that low scores on the IMS scale indicate that patients have mobility restrictions and may require greater assistance in their daily tasks, which is not aligned with walking ability (Hodgson et al., 2022).



In the present study, 39 individuals were discharged (95.1%) and only 2 died (4.9%), and no statistical correlation between the mobilization protocol and mortality was evaluated.

FINAL CONSIDERATIONS

Therefore, this synthesis presents significant data on the functional impact on patients with ABI, where it points out indices of patients in an adult intensive care unit in relation to strength and functionality, correlating with patient mobilization and its clinical outcome. The impact was on neurocritical patients on mechanical ventilation and sedation analgesia who had the onset of mobilization postponed due to coma, so the findings demonstrated the high rate of muscle weakness acquired in the ICU and consequently the decrease in functionality, where the highest value found was bedside sedation. However, when the mobilization protocols were initiated, the clinical outcome for these patients was discharge from the unit, even with the delay in the beginning of mobilization.


REFERENCES

1. Asehnoune, K., Rooze, P., Robba, C., Bouras, M., Mascia, L., Cinotti, R., & Roquilly, A. (2023). Mechanical ventilation in patients with acute brain injury: a systematic review with meta-analysis. *Critical Care*, 27*(1), 1-10.
2. Baron, M. V., Silva, P. E., Koepp, J., Urbanetto, J. D. S., Santamaria, A. F. M., Dos Santos, M. P., & Pinheiro da Costa, B. E. (2022). Efficacy and safety of neuromuscular electrical stimulation in the prevention of pressure injuries in critically ill patients: a randomized controlled trial. *Annals of Intensive Care*, 12*(1), 53.
3. Carol, L., Hodgson, Michael, Bailey, Rinaldo, Bellomo, Kathy, Brickell, Tessa, Broadley, Heidi, Buhr, Belinda, J., Gabbe, Doug, W., Gould, Megan, Harrold, Alisa, Higgins, Sally, Hurford, Theodore, J., Iwashyna, Ary, Serpa, Neto, Alistair, Nichol, Jeffrey, J., Presneill, Stefan, J., Schaller, J., Sivasuthan, Claire, J., Tipping, Steven, A., R., Webb, & Paul, J., Young. (2023). Early active mobilization during mechanical ventilation in the ICU. *The New England Journal of Medicine*, 387*(19), 1747-1758.
4. Costa, F. A. R., da Silva, V. Z. M., & Silva, P. E. (2020). Avaliação de uma nova ferramenta para mensuração da força muscular em pacientes críticos não colaborativos. *Comunicação em Ciências da Saúde*, 31*(4), 79-84.
5. Feliciano, V., Albuquerque, C. G., Andrade, F. M. D., Dantas, C. M., Lopez, A., Ramos, F. F., & França, E. É. T. (2019). A influência da mobilização precoce no tempo de internamento na Unidade de Terapia Intensiva. *Assobrafir Ciência*, 3*(2), 31-42.
6. Frisvold, S., Coppola, S., Ehrmann, S., Chiumello, D., & Guérin, C. (2023). Respiratory challenges and ventilatory management in different types of acute brain-injured patients. *Critical Care*, 27*(1), 1-11.
7. Hawryluk, G. W., Aguilera, S., Buki, A., Bulger, E., Citerio, G., Cooper, D. J., & Chesnut, R. M. (2019). A management algorithm for patients with intracranial pressure monitoring: the Seattle International Severe Traumatic Brain Injury Consensus Conference (SIBICC). *Intensive Care Medicine*, 45*, 1783-1794.
8. Hodgson, C. L., Bailey, M., Bellomo, R., Brickell, K., Broadley, T., Buhr, H., & Young, P. J. (2022). Early active mobilization during mechanical ventilation in the ICU. *The New England Journal of Medicine*, 387*, 1747-1758.
9. Ribeiro, H. A., Rodrigues, A. N. A., & Silva, G. F. (2021). Efeitos da mobilização precoce em pacientes neurocríticos: uma revisão de literatura. *Revista de Ensino, Ciência e Inovação em Saúde*, 2*(2), 1-12.
10. Roque, S. M., Souza, F. G. L., & Taveira, G. S. (2017). Utilização do Escore Medical Research Council (MRC) e da dinamometria de preensão palmar no diagnóstico de fraqueza muscular adquirida em unidade de terapia intensiva (UTI): revisão bibliográfica. *Revista Inspiração*, 10*(1), 1-14.
11. Santos, L. J. D., Silveira, F. D. S., Müller, F. F., Araújo, H. D., Comerlato, J. B., Silva, M. C. D., & Silva, P. B. D. (2017). Avaliação funcional de pacientes internados na Unidade de Terapia Intensiva adulto do Hospital Universitário de Canoas. *Fisioterapia e Pesquisa*, 24*, 437-443.



12. Paiva, D. R., Guerreiro, C. F., & dos Anjos, J. L. M. (2018). Correlação entre desempenho funcional e o tempo de permanência de pacientes neurocirúrgicos na unidade de terapia intensiva. *Revista Pesquisa em Fisioterapia, 8*(2), 167-174.
13. Veldeman, M., Albanna, W., Weiss, M., Park, S., Hoellig, A., Clusmann, H., & Schubert, G. A. (2021). Invasive multimodal neuromonitoring in aneurysmal subarachnoid hemorrhage: a systematic review. *Stroke, 52*(11), 3624-3632.
14. Puthucheary, Z. (2017). An update on muscle wasting in ICU. *Signa Vitae, 13*(3), 30-31.

**FROM FEUDALISM TO THE DIGITAL AGE: A HISTORY OF TAX
CONSTITUTIONALISM AND THE SEARCH FOR TAX JUSTICE AND HUMAN
RIGHTS**

 <https://doi.org/10.56238/sevened2024.029-051>

José Rossini Campos do Couto Corrêa¹, Maurin Almeida Falcão², Charles Sarmiento Abreu³, Rudson Domingos Bueno⁴, Heroldes Bahr Neto⁵, Eulírio de Farias Dantas⁶, Clarimar Santos Motta Junior⁷ and Rita de Cássia Antunes Gomes Mascarenhas⁸

ABSTRACT

This article analyzes the evolution of tax constitutionalism, from feudal economies to the challenges of globalization and digitalization, focusing on the impact of these transformations on human rights. The research investigates how the transition from a tax system based on feudal relations to a model shaped by the monetary economy, mercantilism and mass production has impacted the organization of societies and the guarantee of rights. The study highlights the growing influence of private authoritarianism, as warned by Karl Popper, and the role of big tech companies in tax policymaking. The interdisciplinary methodology combines a bibliographic review of authors such as Bloch, Rossini Corrêa, Maurin Falcão, Pirenne, Braudel, Wallerstein, Marx and Hobsbawm with a critical analysis that integrates economic history, sociology and tax law. Using Edoardo Celeste's concept of "constitutional ecosystem", the study examines how digital technology affects the balance of powers and fiscal sovereignty of states, implying the emergence of digital constitutionalism as a new field of study. The research concludes that globalization and digitalization pose challenges to tax constitutionalism, threatening the fiscal sovereignty of states and the guarantee of human rights. The rise of private authoritarianism calls for new regulations and international cooperation to ensure tax justice and the protection of human rights. The study contributes to the debate by offering a historical and critical analysis of tax constitutionalism, providing subsidies for public policies that promote tax justice and sustainable development, considering the implications of digital constitutionalism for taxation in the digital age.

¹ Post-Doctorate in Law (USP), PhD in Sociology (UnB)
Master in Religious Sciences from the Faculty of Theology Antioch International, Lawyer, Poet, Essayist, Jurist and University Professor

² Post-doctor at the University of Paris I-Panthéon-Sorbonne
Doctor in Public Law from the University of Paris 11-Sud,
Translator and University Professor

³ Master in Law from (UCB) and Doctorate student in Law at I.D.P-DF
Tax Auditor of the Federal District Revenue

⁴ Master in Law from (UCB) and Doctorate student in Law at I.D.P-DF
Tax Auditor of the Federal District Revenue and University Professor

⁵ Master in Law from UniBrasil-PR and Doctorate student in Law at I.D.P-DF
Lawyer

⁶ Master in Law from (UCB) and Doctorate student in Law at I.D.P-DF
Member of the Association of Writers – ANE and University Professor

⁷ Master in Law from I.D.P-SP and Doctorate student in Law at I.D.P-DF
Lawyer

⁸ Master in Accounting and Controllershship from the Federal University of Amazonas and Doctorate student in Law at I.D.P-DF
Federal Auditor of External Control of the Federal Court of Accounts



Keywords: Tax constitutionalism. Globalization and taxation. Digital constitutionalism and fiscal sovereignty. Private authoritarianism and human rights. Tax justice and sustainable development.



INTRODUCTION

The present study aims to investigate the evolution of tax constitutionalism, tracing an overview from its origins in feudal economic structures to the contemporary challenges of globalization. Anchoring the analysis in authors such as Marc Bloch, Henri Pirenne, Fernand Braudel, Immanuel Wallerstein, Karl Marx, Rossini Corrêa, Maurin Falcão, Edoardo Celeste and Eric Hobsbawm, the research will explore how historical and contemporary transformations in the systems of power and tax collection have shaped the organization and functioning of societies.

The originality of this study lies in the interdisciplinary approach that intertwines economic history, sociology and tax law, seeking to understand the complex interaction between trade, power and taxation. By investigating the roots of tax constitutionalism in the feudal period, the research will examine the transition from natural to monetary economy, the role of merchants in the breakdown of feudal structures, and the rise of mercantilism.

The relevance of the research is manifested in the critical analysis of the implications of globalization and digitalization for tax constitutionalism. The challenges posed by tax evasion, the need to harmonize tax policies between nations and the impact of private authoritarianism exercised by big tech companies will be examined, using the critical lens of Karl Popper, who warns about the dangers of unrestricted economic freedom and the concentration of power in the hands of a few, threatening human rights. The research will focus on the Brazilian experience, contextualizing it in the tax relations between global actors such as the United States and China, and analyzing the role of trade blocs, such as the European Union, in the search for solutions to contemporary challenges of taxation.

In this context, the work of Edoardo Celeste, with his concepts of "constitutional ecosystem" and "normative countermeasures", will be fundamental to analyze how digital technology impacts the balance of powers and fiscal sovereignty of nation-states. Big tech companies, with their complex structures and global operations, are emerging as new poles of power, challenging traditional tax constitutionalism. The research will investigate how these companies influence the formulation of tax policies, the need for international agreements to harmonize the taxation of digital activities, and cooperation mechanisms for the exchange of tax information.

Through the literature review and the critical analysis of emblematic cases, this study aims to contribute to the academic debate, shedding light on the historical transformations and future trends of tax constitutionalism. The research, therefore, will offer a comprehensive perspective on the relationships between power, economy and taxation in a



globalized and digitized world, providing subsidies for the formulation of public policies that promote fiscal justice and sustainable development.

BRIEF HISTORY OF TAX CONSTITUTIONALISM: FROM THE FEUDAL ERA TO THE GLOBALIZED WORLD

Discussing tax law and its origins necessarily implies addressing foreign trade and the internationalization of business, especially in the context of the formation of nation-states in Europe and, at an earlier stage, in feudal Europe. The evolution of tax law cannot be dissociated from the historical and economic context in which it developed, especially with regard to foreign trade and the consolidation of European nation-states. As authors such as John Tiley (2004) and Robert S. Lopez (1976) argue, tax practices evolved in close connection with the expansion of trade and the strengthening of emerging state structures. Charles Tilly (1993) also underlines the central role of tax collection in the formation of European nation-states, while Richard Musgrave (2000) explores the impact of international trade on fiscal policies. Understanding this historical link is critical to a comprehensive analysis of contemporary tax law.

In this context, the relevance of tax law is revealed in several aspects. First, we live in a capitalist society, whose genesis took place in tension with the feudal order then in force. Feudalism, in turn, was an economic and social structure based on local life and the natural economy. Rodney Hilton et al. (1976) thoroughly investigate the transformations of Europe's economic and social structures, highlighting the rise of capitalist relations of production and the gradual decline of feudal forms. Marc Bloch (1961) complements this perspective by examining the local economy and its dynamics, emphasizing the agricultural practices and local exchange networks that shaped the medieval economic environment. On the other hand, Fernand Braudel (1992) illuminates the tensions between the established feudal system and the emerging capitalism, showing how trade and financialization began to challenge traditional forms of power and production.

During the feudal period, production was predominantly geared toward subsistence consumption rather than trade. When surpluses occurred, the practice of barter—the direct exchange of commodities without monetary intermediation—was widely used, reflecting the non-monetary character of the feudal economy (Bloch, 1961). Henri Pirenne (1963), in his work "Economic and Social History of Medieval Europe", explores the predominance of barter and the absence of a significant monetary economy in this period. As time passed, however, the gradual introduction of the monetary economy and the development of trade were imperative for the transition from feudal to modern economic structures.

Henri Pirenne (2014), a Belgian historian, is widely recognized for his theory on the continuity of European trade after the fall of the Roman Empire, challenging the traditional view of a complete interruption during the Middle Ages. He argues that despite the fall of Rome, trade flourished, especially in the cities and among the Germanic peoples, questioning the notion of an economic "Dark Ages". Peter Heather (2005), in "The Fall of the Roman Empire: A New History", examines the causes and consequences of this collapse, showing how it brought about profound changes in Europe, including the resurgence of trade. Robert J. Temin (2017), in "The Roman Market Economy", reinforces this continuity by analyzing how the Roman economy influenced European trade during the Middle Ages.

With the fall of Rome, a new Germanic territorial-based society emerged, bringing with it its own institutions. Among these, the "settlement" stands out, a fundamental institution for the feudal order. The word "fief", in its origins, referred to "cattle" or "herd",⁹ but over time it came to designate the set of serfs of a feudal estate. This new society, founded on livestock, agriculture and crafts, and with a pre-monetary spirit, between the tenth and twelfth centuries, began to see the rise of merchants, who challenged established economic structures. In this way, the transition to a Germanic territorial-based society paved the way for feudalism, and with it, the stage was set for the complex interplay between trade, law, and taxation (BLOCH, 1961, p. 106; PIRENNE, 1963; 2014)¹⁰.

The merchant, a figure who had existed for centuries, resurfaced in history by clearing the routes of the Mediterranean Sea, using them to facilitate trade. This trade was no longer concentrated in rural areas, but in the cities. Between the tenth and twelfth centuries, cities such as Bordeaux, Barcelona, Venice, Porto and Amsterdam stood out as port and mercantile centers, located around rivers, lakes and seas, a phenomenon known as the Urban Renaissance. The growth of these cities reflected the return of the merchant as an economic force, the "townhouser", a term that originates the word "bourgeoisie".

⁹ Among the various theories, the most widely accepted is that of the French historian Marc Block, and relates fief to the Frankish term *fehu-ôd*, in which *fehu* means "cattle" and *ôd* means "goods", indicating "a movable object of value".

¹⁰ The decline of feudalism meant a longitudinal process, in which the disaggregating fractures were dialectically evidenced in connection, even, with great scenarios of systemic change, in which territorial, scientific, technical and productive conquests typical of the revolution of a material civilization, validated the established order, becoming real, positive and concrete. The vectors of change, personified by the Merchants, around whom the port cities reappeared, between the tenth and twelfth centuries, determining the return to the great trade, which had already existed in caravans of the ancient world, grew against the evidence. The mercantile act, although allowed by the transit on the liquid road of the waters of the Mediterranean Sea, in order to be consummated, required the penetration of the countryside, where the democratic concentration of feudal communities was, subject to the consumption of goods, since it registered the passage from the natural economy to the monetary economy, with the replacement of labor income and product income by money income. Thus, the Feudal Lord forced serfs and peasants to produce in agriculture, livestock and handicrafts, leading them to sell and buy in the Market, which was feudal, but would be capitalist, in order to receive a sound metal income, with the relative minimization of the rich (CORRÊA & FALCÃO, 2016, p. 146).



With the need to move between the countryside and the city - where the majority of the population lived - merchants played a fundamental role in the intermediation of rural and urban trade. Authors such as Pirenne (2014) and Braudel (1992) analyze the rise of port cities and the impact of trade, while Bloch (1961) emphasizes the importance of this transformation for the development of medieval cities. This new economic dynamic profoundly altered the economy of medieval Europe, marking trade as an essential factor for both urban and rural development.

Michael Postan (2002), in his studies of medieval economics, explores the dynamics of consumption and trade in feudal communities, underlining the challenges faced by peasants when trying to obtain currency to acquire goods from merchants. The transition from the feudal economy to a developing monetary economy changed the relations of exchange and consumption, highlighting the growing importance of money. E.P. Thompson (1998) deepens this analysis by examining how the introduction of currency impacted social and economic relations in rural communities, while Karl Polanyi (2011) argues that the monetization of social relations in medieval Europe was a complex process, profoundly transforming life in feudal villages and towns.

The traditional view of feudal economics as predominantly pre-monetary has been challenged by scholars who observe a gradual transition to an emerging monetary economy, driven by significant change. Among them is the perception of income by the land barons, who distinguished themselves from the Roman lords by being rentiers, and not direct producers. The barons received income from the work of the feudal community, through a vast allocation of land. However, these lands did not formally belong to the feudal community in terms of ownership, but only in possession (Thompson, 1998). Land ownership was held by the barons, and work on the land was governed by a system of service, in which the community worked six days on the baron's land in exchange for a day's work on their own communal land. This dynamic exemplified the complex relationship of work and income transfer that characterized the feudal economy (WICKHAM, 2016).

With the growth of needs and the expansion of property, a second form of feudal rent emerged: product rent. At this stage, the barons employed a large number of serfs and peasants, appropriating most of the agricultural, livestock and artisanal production, while only a small part was distributed to the community. This inequality of distribution reflects the asymmetrical relations of production and power in feudal society (THOMPSON, 1998).

Faced with unpredictable risks, such as natural disasters or epidemics, the barons developed a third form of income: cash income. In this model, peasants were compelled to pay tribute in currency, which forced them to become market agents, producing to sell and

thus paying tribute to the baron. This development marked a significant transition in the feudal economy, where economic risk was transferred to the peasants. The emerging monetary economy also undermined, in the long run, the dominant position of the barons, as it allowed the emergence of new economic actors, such as capitalist entrepreneurs (BRAUDEL, 1992; POSTAN, 1975).

The territorial fragmentation of feudal society, with its multiple taxes and tariffs, limited the process of wealth accumulation by mercantile entrepreneurs. These, in turn, aspired to the formation of a unitary state, where they could pay a single tribute, instead of facing a multiplicity of taxes imposed by the local barons (WALLERSTEIN, 2011; HOBBSBAWM, 1995). This aspiration reflected the search for a more centralized economic order, which would facilitate trade and the accumulation of capital¹¹.

Karl Marx (2013) and Karl Polanyi (2011) offer significant contributions to this debate. Marx analyzes the transition from feudal to capitalist relations, while Polanyi addresses the social and economic transformations that accompanied this change. Both highlight the impact of these transformations on the distribution of power and wealth, central elements in the rise of capitalism.

In the context of feudal society, merchants emerged with a new ethic, characterized by the acceptance of risk and perseverance in the face of adversity. For them, the market was a space of opportunities and uncertainties, where success and failure coexisted as a natural part of the mercantile process. This new mentality anticipated the rise of capitalism, challenging the rigid structures of feudal society (WEBER, 2004; SIMMEL, 2014; SOMBART, 2014; HARVEY, 1990).¹²

¹¹ The material ascent of the Merchant, retarded by the scorching system of feudal taxes and surcharges, knocking on the door of each baron of the Earth and lowering his average rate of profit, led him to aspire to a new political situation, of a rational nature, which would allow him to pay a single tribute. In the traditional alliance, in force in the Christian Kingdoms, the uncomfortable situation, absurd as it may seem, was circumscribed to the King, who was, in a factual way, a Viceroy of himself, owing allegiance to the true King, who was the Pope, bearer of the insignia of the divine origin of power, who bequeathed them to this or that, crowning him in the name of God, for themselves and for the Church. The King's secret aspiration was to cease to be, in fact, Viceroy, and to become, effectively, King: autonomous, uncontested, absolute. The problem of the Christian King lay in the fact that the material foundation of his authority, without which power does not exist, belonged to the Church, which had become a notable Feudal Lady, receiving land as a donation, by the delivery of the plenary indulgence to potentate sinners. Now, concentration of authority, with the transformation of the Christian Kingdom into a Sovereign Nation State: it was the emerging, spiraling, accelerating wealth of the Merchant. The new alliance had arrived: KING + MERCHANT X POPE + BARON OF THE EARTH (CORRÊA & FALCÃO, 2016, p. 152).

¹² It so happens that, immediately earning the most comfortable income from money, the Baron of the Earth, between conquest and leisure, ploughed the sea in the space of the mediate, fortifying the Market as the central space of the economic spheres, which, in their commercial potentiality, and not of pure territoriality, required a mobile actor, and not with roots; bold, and not attached to honor; open to risk, and not in search of certainty. The Feudal Lord was a co-participant in the construction of the Market, benefiting from it, without realizing that, historically, he would devour it, considering that the Merchant was the type born par excellence, for the economy of exchange and monetary, dissociated from the logic of use and barter, in its non-territorial origin: urban, port and business (CORRÊA & FALCÃO, 2016, pp. 146-147).



Merchants who traded between city and country faced a series of obstacles, such as tribute and the risk of robberies promoted by local barons¹³. Faced with these difficulties, Diaspora Jews identified a business opportunity by offering financial services to merchants, such as the safe transportation of capital at a small discount. This model was the precursor of the first banks and the banking system, a genius financial innovation for the transition from feudal to monetary economics (WALLERSTEIN, 2011; LANDES, 2003; DAVIS, 1973).

It was no longer feasible to reduce the complexity of reality in the sphere of material, institutional, and spiritual interests, because, although with often contrasting meanings, the driving forces of power began to be divided into four poles: Pope, King, Baron of the Earth, and Merchant. The latter, initially a simple 'street vendor in the village', arose against all odds of success in a world rigidly marked by serfdom. However, even under constant risk, he managed to accumulate capital in a primitive way, becoming an active participant in the new businesses. Bankers and merchants began to play fundamental roles, promoting proactive attitudes that echoed the Schumpeterian type, whose boldness and innovative spirit led them to accept the risk of earning more, even in the face of the possibility of losing everything (SCHUMPETER, 1964, p. 1385; CORRÊA & FALCÃO, p. 149).

It is worth mentioning the research of Davis (1973), who proposes a detailed analysis of the development of the Atlantic economies. Davis highlights the essential role of banks and financial institutions in the expansion of trade and capitalism during the seventeenth and eighteenth centuries. In addition, Davis explores how financial innovation and the creation of credit markets have contributed to the economic integration and growth of port cities, facilitating the transition to more complex and globalized economies¹⁴.

In this context, merchants also played a challenging role in the primitive accumulation of capital and in the financing of science and technology research during the transition from feudal economy to capitalism (HOBBSAWM, 1995). Recognizing the need to break with feudal structures, these merchants invested in scientific and technological

¹³ The drama of the Merchant consisted in having to move from the village to the fiefdoms, knocking on the door of each one, in the feudal world and atomizing, to be taxed and overtaxed, by the sequence of Barons of the Earth, in which each one was an autarky, an autonomy, a county in itself.

¹⁴ There were no longer any possibilities of dissociating Merchants and Bankers from the economic changes underway in the feudal fabric, whether related to energy resources and the agricultural revolution, or related to mineral wealth and wars as a business. A perfect example of this truth is found in the 12 external Crusades, in which, between the Market and the Sacred, Popes, Kings, Barons of the Earth and Merchants, the fourth force already included, joined together in search of the creation of the Christian Kingdom of Jerusalem, either by recovering the Holy Grail or by dominating the trade routes of the Mediterranean Sea. The need for accounting calculation and the demand for the security of capital associated the Merchant with the Banker, who gained from the sale of insurance, policies and bills of exchange, while, under the ecclesiastical condemnation of usury, he legitimized the collection of interest in the prosaic world. Although unequal, the interface remained established, relating Merchants to Popes (who rejected and condemned them as heretics, in the unbiblical service of usury), Kings (who received them as the necessary evil of the plebeians who could be useful) and Barons of the Earth (who repudiated them until the umpteenth generation, as illegitimate representatives of sterile wealth) (LE GOFF, 1991, p. 100; CORRÊA & FALCÃO, pp. 149-150).



schools to increase navigation capacity over long distances. This expansion was essential for economic and social progress, allowing the beginning of the cycle of discoveries and the encounter with new lands and cultures. Landes (2003), for example, examines the origins of technological development in Europe, highlighting the relevance of private funding to boost research and innovation¹⁵.

Mercantilism emerges as a projection of European economic power during the great navigations, characterized by the intense circulation of people and goods. It represents a new historical reality, especially during the Renaissance, marked by the largest scenario of commercial and cultural exchange ever seen (ELLIOTT, 2007; POMERANZ, 2001). This system profoundly influenced political, economic, and cultural relations between the continents.

In Brazil, mercantilism has had a significant impact, particularly in regions such as Pernambuco. Historian Gilberto Freyre (2003) highlights the role of Jews in the development of trade and production of sugarcane in port cities such as Recife (SCHWARTZ, 1986). At the end of the sixteenth century, it was common to find a variety of products and influences from different parts of the world in Brazilian homes and mills, reflecting the emergence of a society shaped by the magnitude of mercantilism and global exchange.

In addition, mercantilism promoted the global exchange of natural species, such as the coconut tree, brought from India, and sugarcane, introduced from Cape Verde by the Portuguese (CURTIN, 2010). Crosby (2003) explores the biological and cultural consequences of this species exchange during the era of the great navigations, noting how it contributed to the development of commercial capitalism¹⁶.

The evolution of capitalism goes through three stages: commercial, industrial, and, finally, financial capitalism (MARX, 2013). These stages unify into a new economic order driven by manufacturing production and the decoupling of wealth from the land. This phenomenon, from the beginning, was marked by a global perspective, significantly

¹⁵ In any case, complex vectors were concocted, with the presentation of endogenous renewing currents that, in the organic fabrics of feudalism, sought ruptures capable of producing complex patterns of productivity and efficiency, especially between the eleventh and thirteenth centuries. the exploitation of river energy; the presence of advanced hydraulic mills; the capacity to build dams and the sum of tidal and wind energy to fluvial energy (GIMPEL, 1977, pp. 11-31; CORRÊA & FALCÃO, p. 147). Moreover, the finalistic meaning of everything had as its purpose production, whether the old, agricultural or the replaceable, mineral.

¹⁶ In the agricultural and pastoral dimension, new methods of climatological research were suggested; the expansion of the horse's profitability, through horseshoes and hitching; development of agricultural sciences, with the sophistication of sowing, rotation, leafing, as well as plant and animal genetics; qualification of sheep livestock, for the advent of long wool; setting up advanced farms and model farms; change in the food system with the increase in the consumption of proteins, existing in vegetables, eggs, meat and fish, which accompanied the traditional bread and wine; and the consequent European population increase, which was 27 million in 700 AD and rose to 70 million in 1300 AD, with a peak growth in 1200 AD, of the order of 22%, when it reached 61 million souls (GIMPEL, 1977, pp. 47-71; CORRÊA & FALCÃO, pp. 147-48).



transforming the world economic structure (HOBBSAWM, 1996; HARVEY, 1990; ARRIGHI, 2010).

The Industrial Revolution, which began in England, marked a historical break with handicrafts, by introducing serial production (LANDES, 2003). This phenomenon allowed the mass manufacture of identical products, such as cell phones, profoundly influencing economic development and the transformation of societies around the world.

The feudal artisan, in turn, exercised control over his production process, seeking aesthetic fulfillment in his creations, although serial production replaced this artisanal approach. Research by Norbert Elias (2000) and Johan Huizinga (2016) details these cultural and social shifts, demonstrating how the mindset of medieval artisans was deeply linked to creativity and aesthetics.

Serial production not only democratized access to goods and services, but also highlighted the importance of science and technology in the global market, which began to replace the local market, typical of feudalism. This transformation has shaped the economic, legal and tax dynamics of the states, improving the tax collection system. (APPADURAI, 1986; BRAUDEL, 1992; MARX, 1992).

TAX CONSTITUTIONALISM AND THE EVOLUTION OF THE TAX IN INTERNATIONAL MARKETS: IMPLICATIONS FOR BRAZIL AND THE GLOBALIZED WORLD

Magna Carta, signed in 1215, represented a key milestone in limiting the absolute power of English monarchs, setting a legal precedent that subordinated the king to the law. Originally conceived as a response to tensions between King John, the Church, and the barons, Magna Carta imposed significant restrictions on royal authority, requiring that certain legal rights and procedures be respected. Although centered on ecclesiastical and baronial liberties, it laid the foundations for the development of a governance based on consent and the limitation of power, principles that, centuries later, would influence the emergence of tax constitutionalism. By subordinating the will of the monarch to the law, Magna Carta prepared the ground for the creation of mechanisms that would control the power to tax, which would be deepened in later milestones (TURNER, 2009).¹⁷

This movement evolved more clearly in the context of tax constitutionalism, which emerged as a direct response to the need to contain state power in tax collection, while

¹⁷ King John of England, often referred to as "Landless John" and widely regarded as one of England's worst monarchs, is remembered for his military incompetence and his disastrous fiscal administration. During his reign, he lost important territories in Normandy and faced difficulties in his military campaigns, which led him to exploit his subjects with illegal and oppressive taxes. His unpopularity, fueled by his temperamental personality and cruel acts, culminated in the revolt of the English nobility, which forced him to grant the Magna Carta in 1215, a landmark mark that limited royal powers and laid the foundation of modern constitutionalism.



simultaneously guaranteeing the rights of citizens. The Bill of Rights of 1689, in England, consolidated this transformation by establishing that the imposition of taxes depended on the consent of parliament, an advance in relation to the principles introduced by the Magna Carta. Similarly, the United States Constitution of 1787 reaffirmed the importance of a legal framework that would ensure uniformity in taxation, linking the fiscal powers of the State to respect for fundamental rights. Throughout history, the tax has evolved, reflecting not only economic changes but also political and social advances, as demonstrated by the introduction of the progressive income tax in Germany in the late nineteenth century, which sought not only to increase revenue but also to promote social justice and reduce inequality (AVI-YONAH, 2000).

Historically, taxes have played an essential role in financing state activities and public policies. However, the form of its implementation and collection reflects the power relations and the predominant economic interests in each period. In the Middle Ages, for example, taxes were often used by feudal lords as a tool for consolidating power over the peasants. The French Revolution, in turn, brought a significant break by replacing the feudal tax system with a more equitable model, aligned with the new ideals of equality and social justice.

With the rise of ism and the rise of modern states, the tax came to play an unquestionable role in economic regulation and redistribution of wealth. Progressive taxes, for example, contributed to mitigating the economic inequalities exacerbated by the Industrial Revolution. However, increasing economic complexity and the globalization of markets have created new challenges to international taxation, such as tax evasion and the need to harmonize tax policies between nations (IBRD & ZOLT, 2003).¹⁸

In Brazil, tax constitutionalism has been a central tool in the search for tax justice and equity in the distribution of the tax burden (BITTENCOURT, 2015). The 1988

¹⁸ Between the Market and the State, under the imperative of the historical affirmation of the individual, what was called modernity, unfolded between the Renaissance and the French Revolution. The subsumption of science and technology to the material world moved in the direction of the establishment of a new mode of production and production, bringing capitalism as a symbol of the new wealth, manufacturing, in urban industrial parks, and transnational mass manufacturing, with its globalization. In the spiritual sphere, in turn, a unique philosophical anthropology, connected to Humanism, the Reformation and Utopianism, opened to man expectations whose precedents were in the culture of Paganism, in which the relativist Protagoras proclaimed that: *"man is the measure of all things, of those that are by what they are and of those that are not by what they are not"* (REALE & ANTISERI, 2003, p. 76; CORRÊA & FALCÃO, p. 156). In other words, the phrase "man is the measure of all things" is part of his relativistic conception of knowledge and truth. The **philosophical** interpretation of this saying suggests that truth and reality are relative to human perception. In other words, what is true or real depends on the subject who observes. "Man" here symbolizes the human being in his ability to judge, perceive and interpret the world around him. The second part of the sentence - "of those who are for what they are and those who are not for what they are not" - reinforces this point by indicating that what exists or does not exist, what is or is not, can only be understood from human perception. If an individual perceives something as true, for him, it is true; if he does not perceive it, then that, for him, does not exist or is not real. From a **sociological** perspective, this idea of Protagoras can also be related to the concept of the social construction of reality. What we consider "real" in a society is often shaped by human norms, cultures, and subjectivities.

Constitution established fundamental principles, such as the progressivity of taxes and the allocation of public resources for social welfare. These precepts aim to ensure that tax collection is fair and that resources are directed to reducing social inequalities and improving the quality of life.

In 2023, during President Lula's government, there was a significant tax reform in Brazil, aimed at modernizing the Brazilian tax system, making it more suited to the demands of the global market. The proposal sought to simplify the system, reduce the tax burden on specific sectors and increase transparency and efficiency in collection. The reform, by extinguishing five taxes, including PIS, Cofins, and IPI, reinforced the commitment to tax simplification and modernization (AGÊNCIA SENADO, 2023).

In the international context, tax relations between global actors, such as the United States and China, have been marked by trade disputes and retaliatory policies (IBRD & ZOLT, 2003).¹⁹ The creation of trade blocs, such as the European Union, has encouraged the harmonization of tax policies and promoted cooperation between member countries. In addition, the advancement of digital technologies and the growing relevance of the digital economy are putting pressure on traditional tax systems to adapt to new forms of value generation and cross-border transactions, requiring continued tax reforms to address issues such as base erosion and profit shifting (DEVEREUX & VELLA, 2014).

TAX AND DIGITAL CONSTITUTIONALISM: CONTEXTUALIZED REFLECTIONS

Both Edoardo Celeste (2021, pp. 63-91) and Jane Reis Gonçalves Pereira and Clara Iglesias Keller (2022, pp.-6454-2616) bring an important reflection on digital constitutionalism. Both works the problem of tax constitutionalism is not directly focused on the textual panoramas presented, which focus on the discussion of digital constitutionalism and its challenges. However, we can weave some reflections from the concepts present in the texts to address the central issue that this work deals with.

Celeste's article (2021, p. 60) highlights the impact of digital technology on the "constitutional ecosystem", arguing that it affects the balance of powers, with private actors such as large technology companies emerging as new poles of power. This shift of power directly impacts tax constitutionalism, which has traditionally been based on the fiscal

¹⁹ Sérgio Caldas Mercador Abi-sad mentions that "the death of Mao Zedong in 1976, the removal, soon after, of the remnants of the Cultural Revolution ("the gang of four"), the liquidation of the uninspired leadership of Hua Guofeng (General Secretary of the CPC from 1976 to 1978) and, above all, the irresistible rise of Deng Xiaoping as the top leader of the People's Republic of China - PRC had a strong impact on the profile of Chinese foreign relations. The "denguist era" marked the beginning of an ambitious program of economic reforms and opening up to the outside, which broke head-on with the line previously followed by the People's Republic under Maoist tutelage" (ABI-SAD 1996, p. 84; YAHUDA, 1983).

sovereignty of nation-states. So it can be said that: in a globalized and digitized world, the ability of States to tax transactions and economic activities that take place in the digital environment is challenged (TEUBNER *apud* JOERGES; SAND, 2004; RODOTÀ, 2010; TEUBNER, 2004; 2012); and that the cross-border nature of the internet and the difficulty in determining the physical location of businesses and online users make it difficult to enforce traditional tax laws.

The author also mentions the emergence of "normative countermeasures" to deal with changes in the constitutional balance (2021, p. 67). In the tax context, these countermeasures could act as follows:

- (a) international agreements to harmonise the taxation of digital activities and to prevent double taxation or tax avoidance.
- b) New laws and regulations that adapt tax systems to the digital reality, such as the creation of taxes on digital services or the taxation of profits of multinational companies based on their effective economic presence in each country.
- c) International cooperation mechanisms for the exchange of tax information and the supervision of companies operating globally.

The text by Jane Reis and Clara Keller addresses the concern with the concentration of private power in the digital environment (2022, p. 2657), arguing that digital constitutionalism can be used to legitimize this concentration. This argument also applies to the tax context.

Continuing the analysis, large technology companies, with their complex structures and global operations, can influence the formulation of tax policies to their benefit (REIS & KELLER, 2022, pp. 2679-80). The lack of transparency in the operations and tax practices of these companies makes it difficult to inspect and collect taxes (DIJCK; NIEBORG; POELL, 2019, p. 3; BELLI, 2022; COHEN, 2019, p. 2). The proliferation of "internet bills of rights", which can be used as self-regulatory instruments by these companies, raises the question of the legitimacy and effectiveness of non-state mechanisms for the protection of rights and the promotion of tax justice (REIS & KELLER, 2022, pp. 2650-51 and 2669; CELESTE, 2019, p. 124; YLMA, 2017, p. 128; HOFFMANN-RIEM, 2022).

From the reflections of the texts, we can conclude that tax constitutionalism in a globalized and digitized world faces significant challenges, such as:

- a) The erosion of the tax base of nation-states due to the difficulty in taxing digital activities.
- b) The shift of power to private actors, who can influence the formulation of tax policies in their favor and hinder the inspection and collection of taxes.
- c) The need to find new ways to ensure tax justice and equity in taxation, taking into account the specificities of the digital environment and the rights of taxpayers.

Although the articles are not directly dealt with tax constitutionalism, the reflections developed here are based on concepts present in these studies. From them, it is possible to establish networks between global economic practices and the impact of private authoritarianism, especially in scenarios of deregulation, as seen in the major economic powers - Brazil, China and the USA. Karl Popper already warned about the risks of unrestricted economic freedom, which, without state safeguards, can concentrate power in the hands of a few and threaten human rights. This challenge is even more evident in an interdependent world, where the balance between economic growth and the protection of fundamental rights is essential.

PRIVATE AUTHORITARIANISM, BRAZIL, CHINA, THE U.S. AND HUMAN RIGHTS: POPPER AND THE RISKS OF DEREGULATION

In addressing the intersection between tax constitutionalism and human rights in the context of international markets, especially with China and the United States as central economic actors, it is crucial to consider the impact that different models of political economy have on social and political freedoms. The challenge lies in balancing the role of the State in economic regulation and in the protection of individual rights. Extreme models, such as state totalitarianism or unregulated market capitalism, compromise both economic justice and political freedoms. As Karl Popper²⁰ announced, the promotion of individual freedoms should not be used as a pretext to dismantle state safeguards, as this can open space for a private authoritarianism that imposes severe inequalities (KINLEY, 2013, p. 56). Brazil and the globalized world face the challenge of integrating these elements, seeking solutions that reconcile the protection of human rights with the balanced management of the economy, avoiding the dangerous extremes of both systems.²¹

Elon Musk's stance, often characterized by a resistance to state regulations and labor laws, as well as the purchase of votes in the 2024 US presidential election, in favor of

²⁰ This was a consequence of what Popper called the "paradox of freedom" (KINLEY, 2013, p. 161 *apud* POPPER, 1945, Notes to the Chapters, Chap. 7, Note 4).

²¹ Fernando Mezzetti (2000, p. 496) when dealing with the issue of human rights in China, makes an interesting exposition saying that "Free men cannot fail to offer solidarity and support to any human being persecuted for their ideas in contrast to those of power, precisely with the hope that the economic pluralism already underway will lead to an evolution of the political structure. However, even if we maintain firm and clear positions on respect for life, the person and his rights, and without forgetting Tiananmen, we cannot ignore the progress achieved by the country: a fifth of humanity freed from hunger, a multitude no longer subject to the mass arbitrariness of political campaigns, a great civilization torn from backwardness and self-isolation, brought back to the world and history, with an internal development and international relations promoted by a regime that will long be challenged by its own successes. Today in China there is already a "space" of freedom that not even the most dreamy and idealistic of Tiananmen would have imagined. New and increasingly powerful independent economic agents will inevitably seek political representation. And with that, the party itself, now entrenched in the defense of the last and fundamental weapon it has left, political control, will undergo profound transformations within itself."

the Republican candidate Donald Trump (DOUTRADO, 2024), illustrates the dangers that Karl Popper announced in relation to private authoritarianism. Musk, by repeatedly defying rules and regulations in various parts of the world - such as his frictions with Brazil over the use of satellites (the case of the Starlink satellites), his conflicts with authorities in Australia over the deployment of energy systems, and with the European Union and the United Kingdom over data privacy issues and business practices - exemplifies an approach of extreme economic freedom, that ignores state safeguards. This type of attitude can generate an imbalance of power between the private sector and states, with the risk of concentrating vast economic and political power in the hands of individuals or corporations, compromising both tax justice and human rights. Thus, the absence of control can allow these corporations to act without due consideration for the laws that protect the rights of populations, reinforcing the need for a balance between economic freedoms and intervention (BALAGUER CALLEJÓN, 2022, NUNES, 2024)²².

For Brazil, inserting itself in this globalized scenario implies challenges and opportunities. The need to align their tax policies with international practices can encourage reforms that make the tax system more efficient and competitive. Adherence to tax cooperation agreements, such as the Multilateral Convention to Prevent Base Erosion and Profit Shifting (BEPS), promoted by the OECD, is a step in this direction (OECD, 2013). However, the country faces the challenge of attracting foreign investment, while preserving its fiscal sovereignty, ensuring sufficient revenues to sustain its public policies and social programs (AVI-YONAH, 2007).

Trade disputes between major economies, such as the US and China, have direct implications for Brazil, especially with regard to global supply chains and access to markets. The trade war between these countries offers opportunities to increase Brazilian exports, but it can also generate uncertainties for trade and investment (IRWIN, 2015). Strengthening regional trade blocs, such as Mercosur, is an effective strategy for Brazil to improve its position in international trade negotiations, while regional integration requires commitments to fiscal transparency and cooperation in the implementation of common tax rules. Let's see a summary of these scenarios:

²² Popper's concept of the role of the state as a "necessary evil" to ensure freedom of expression and protect society from abuse also applies to the context presented, where a lack of control can result in an imbalance of power between the private sector and the state.

Opportunities for Brazil	Challenges and Uncertainties
<p>1. Increased Exports: Brazil can benefit from the trade diversion resulting from the tariffs imposed by the US on Chinese products. With China looking for alternatives, there is an expectation of an increase in demand for Brazilian products, especially soybeans and meat. China is the main market for Brazilian soybeans, and reduced U.S. soybean imports could contribute to Brazilian sales. In addition, steel production in Brazil may also increase, as the country is one of the main suppliers of this product to the USA (CARVALHO et al, 2019, pp. 1-20; DUARTE, 2018; AMÉRICO, 2024).</p> <p>2. Strengthening Mercosur: in the face of intensifying global trade tensions, such as increased protectionism and trade disputes between major powers, Brazil may be led to strengthen regional trade blocs such as Mercosur. This strategy allows Brazil to strengthen its position in international negotiations and obtain greater economic security. At the same time, the country can promote, within the bloc, commitments to fiscal transparency and common tax standards (CARVALHO et al, 2019; KALOUT & COSTA, 2022).</p>	<p>1. Impact of Protectionism: U.S. protectionism and China's retaliation may affect Brazilian export levels in other sectors. Although there are gains in sectors such as soybeans and steel, other products may face difficulties due to the increase in tariffs (DUARTE, 2018; KALOUT & COSTA, 2022).</p> <p>2. Economic Vulnerability: the slowdown in the Chinese economy, caused by the trade war, may lead to a decrease in demand for Brazilian commodities such as oil and iron ore, harming exports (TREVIZAN, 2019; AMÉRICO, 2024). In addition, a general variation in the global economic scenario can impact real levels and increase inflation in Brazil (DUARTE, 2018; TREVIZAN, 2019).</p>

In this context, it is essential that Brazil and other nations strengthen their tax policies and cooperate internationally to face the fiscal challenges of a globalized world (SLEMROD, 2014).²³ The adoption of effective measures to combat tax avoidance, promote transparency and ensure tax justice, both nationally and internationally, not only ensures the efficient collection of resources, but also contributes to the well-being of the population. In addition, these actions reinforce the pillars of democracy and the rule of law, by promoting a fairer and more balanced tax system, which enables sustainable economic development and social justice, which are fundamental for building more equitable societies.²⁴

²³ "Although located in a geostrategic and even geoeconomic context, very different from the Brazilian one, China has a specific international weight that should not be neglected. The importance of China's foreign policy action, particularly on the Asian continent and also as a result of its position as a permanent member of the United Nations Security Council, represents a considerable element to be taken into account for Brazil's broad diplomatic planning. In addition, because China is what it is, with its imposing population, with its varied natural resources, with its productive apparatus in full expansion and with its strategic defensive potential of magnitude, it is justified to attribute to it a particular place in Brazilian foreign action" (ABI-SAD, 1996, p. 191).

²⁴ How can we sustain the values of the dreamed universal communion among men, if the poor of the world have a standard of consumption 16 (sixteen) times lower than that earned by the rich, whose closed club constitutes the caste of the financial domination of existence? How can we legitimize the tax mechanics in local, national and international societies if the 'common contribution' of organized citizenship does not correspond, on the part of the power of the State, to the minimum counterpart or the reasonable return of services, benefits, improvements, public policies, in short, the guarantee of rights? How can we forget the dramatic situation of social exclusion and starvation in the prospective scenario that signals the morally harmful idea that, by the end of the twenty-first century, the trifle of 90% of the Earth's wealth will belong to 1% of the elect of the god Mammon, to the detriment of any and all prospects of aspiring to a more humane being, into a more

By revisiting the evolution of tax constitutionalism, from feudal economic structures to the challenges posed by contemporary globalization, it is clear that economic and social transformations have profoundly shaped tax practices and policies. The transition from feudal barter to the monetary economy, driven by mercantilism, fostered the development of a more complex and efficient tax system. The Industrial Revolution and mass production democratized access to goods, while global interconnectedness posed unprecedented challenges to taxation. Understanding this historical trajectory is decisive for proposing future reforms that seek balance and fiscal justice in a dynamic and competitive international scenario.

FINAL CONSIDERATIONS

Taxation, as demonstrated in this study, occupies a central position in the organization and functioning of societies, from feudal structures to the globalized and digitized scenario that characterizes the contemporary world. The research confirmed that tax systems have evolved profoundly, reflecting the changes in power relations and dominant economic models in each historical period.

The analysis of the transition from the feudal system to the monetary economy, driven by mercantilism and the rise of international trade, revealed the importance of taxation for the financing of state activities and the construction of nation-states. It was observed that the Industrial Revolution, with the introduction of serial production, democratized access to goods and services, while intensifying the need to improve tax collection mechanisms.

However, the study also showed that globalization and the digitalization of the economy impose significant challenges on contemporary tax systems. Tax evasion and avoidance, facilitated by the complexity of international transactions and capital mobility, require the strengthening of international cooperation. The taxation of the digital economy, in turn, requires the creation of new rules and the adaptation of traditional tax systems to ensure tax justice in a cross-border digital environment.

In the face of these challenges, the study recommends the adoption of concrete measures, such as:

- Strengthen international cooperation: Coordinated actions between countries are essential to combat tax evasion and avoidance, harmonize tax policies, and ensure fair taxation of the digital economy. Brazil's active participation in

common good? This is the challenge of Humanism in the face of Taxation (JACQUARD, 1996, p. 112; CORRÊA & FALCÃO, 2016, p. 167).

international forums, such as the OECD, and adherence to the Multilateral Convention to Prevent Base Erosion and Profit Shifting (BEPS) are important steps in this direction;

- Implement domestic tax reforms: It is crucial to modernize tax systems, simplifying legislation and promoting tax justice¹⁰. Reforms must seek a balance between the need to raise resources to finance public policies and the guarantee of a fair tax system that promotes sustainable development;
- Strengthen regional trade blocs: Regional integration, through blocs such as Mercosur, offers opportunities for Brazil to strengthen its position in international trade negotiations and promote the harmonization of tax policies¹⁵. Cooperation among member countries can contribute to the creation of a more stable and predictable economic environment, favoring trade and investment.

The study also demonstrated the importance of integrating the debate on tax constitutionalism with the protection of human rights. The concentration of economic power in the hands of private actors, such as big tech companies, can threaten democracy and fundamental rights, especially in contexts of deregulation.

As warned by Karl Popper, unrestricted economic freedom can lead to private authoritarianism, compromising social justice and the ability of states to ensure the well-being of the population. The case of Elon Musk, with his frequent resistance to state regulations, vote-buying in the 2024 US presidential election, illustrates the dangers of this unchecked concentration of power.

This study contributes to the debate on tax constitutionalism by presenting a comprehensive historical analysis of the evolution of tax systems, from feudal structures to the challenges of the digital age. The research offers a critical approach, identifying the challenges and opportunities of taxation in the era of globalization and digitalization. By analyzing the interaction between tax systems, globalization, digitalization, economic power, and human rights, the study provides subsidies for the formulation of public policies that promote tax justice, the protection of human rights, sustainable development, and digital constitutionalism.

REFERENCES

1. Abi-Sad, S. C. M. (1996). *A potência do dragão: A estratégia diplomática da China.* Brasília: Editora Universidade de Brasília.
2. Agência Senado. (2023, 21 de dezembro). Reforma tributária promulgada: principais mudanças dependem de novas leis. Disponível em: <https://www12.senado.leg.br/noticias/materias/2023/12/21/reforma-tributaria-promulgada-principais-mudancas-dependem-de-novas-leis>. Acesso em: 28 de março de 2024.
3. Alencastro, L. F. de. (2000). *O trato dos viventes: Formação do Brasil no Atlântico Sul.* São Paulo: Companhia das Letras.
4. Américo, J. (2024, 27 de junho). Nova guerra comercial entre China e EUA pode ser vantajosa para o Brasil, veja as ações que saem ganhando. *MoneyTimes.* Disponível em: <https://www.moneytimes.com.br/nova-guerra-comercial-entre-china-e-eua-poder-ser-vantajosa-para-o-brasil-veja-as-acoes-que-saem-ganhando-jals/>. Acesso em: 17 de outubro de 2024.
5. Appadurai, A. (1986). *The social life of things: Commodities in cultural perspective.* Cambridge: Cambridge University Press.
6. Arrighi, G. (2010). *The long twentieth century: Money, power, and the origins of our times.* London: Verso.
7. Arruda, J. J. de A. (1980). *O Brasil no comércio colonial.* São Paulo: Ática Editora.
8. Avi-Yonah, R. S. (2000). Globalization, tax competition, and the fiscal crisis of the welfare state. *Harvard Law School.* Disponível em: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=208748. Acesso em: 6 de junho de 2024.
9. Avi-Yonah, R. S. (2007). Globalization and tax competition: Implications for developing countries. *International Monetary Fund.* Disponível em: <https://repositorio.cepal.org/entities/publication/ac69db2b-8bed-4e97-b0ea-8315c4626a15>. Acesso em: 6 de junho de 2024.
10. Balaguer Callejón, F. (2022). *La constitución del algoritmo.* Zaragoza: Fundación Manuel Giménez Abad.
11. Belli, L. (2022). Structural power as a critical element of social media platforms' private sovereignty. In E. Celeste, A. Heldt, & C. Iglesias Keller (Eds.), *Constitutionalising social media.* Oxford: Hart Publishing.
12. Bird, R. M., & Zolt, E. M. (2003). The role of taxation in development: Tax policy for developing countries. *The World Bank.* Disponível em: <https://internationalbudget.org/wp-content/uploads/Introduction-to-Tax-Policy-Design-and-Development.pdf>. Acesso em: 6 de junho de 2024.
13. Bloch, M. (1961). *Feudal society* (Vol. 1). Chicago: University of Chicago Press.

14. Braudel, F. (1992). *Civilization and capitalism, 15th-18th century.* University of California Press.
15. Burke, P. (1994). *The fabrication of Louis XIV.* Yale University Press.
16. Carvalho, M. F. P., Azevedo, A. F. Z. de, & Massuquetti, A. (2019). O Brasil no contexto da guerra comercial entre EUA e China. *Associação Nacional dos Centros de Pós-Graduação em Economia – ANPECSUL.* Disponível em https://www.anpec.org.br/sul/2019/submissao/files_l/i5-0835cda12a9792564cef6a42fd641bda.pdf. Acesso em: 17 de outubro de 2024.
17. Celeste, E. (2022). Constitucionalismo digital: mapeando a resposta constitucional aos desafios da tecnologia digital. *Direitos Fundamentais & Justiça,* 15(45), 63-91. Disponível em: <https://doi.org/10.30899/dfj.v15i45.1219>. Acesso em: 18 de outubro de 2024.
18. Celeste, E. (2019). Terms of service and bills of rights: new mechanisms of constitutionalisation in the social media environment? *International Review of Law, Computers & Technology,* 33(2), 122-138.
19. Cohen, J. E. (2019). *Between truth and power: The legal constructions of informational capitalism.* Oxford University Press.
20. Crafts, N. F. R. (1985). *British economic growth during the industrial revolution.* Oxford University Press.
21. Crosby, A. W. (2003). *The Columbian exchange: Biological and cultural consequences of 1492.* Bloomsbury Academic.
22. Curtin, P. D. (2010). *Cross-cultural trade in world history.* Cambridge University Press.
23. Davis, R. (1973). *The rise of the Atlantic economies.* Cornell University Press.
24. Devereux, P., & Vella, J. (2014). Are we heading towards a corporate tax system fit for the 21st century? *Oxford University Centre for Business Taxation.* Disponível em: <https://www.jstor.org/stable/24440324>. Acesso em: 6 de junho de 2024.
25. Dijck, J. van, Nieborg, D., & Poell, T. (2019). Reframing platform power. *Internet Policy Review,* 8(2), 1-18.
26. Dourado, M. L. (2024, 21 de outubro). Prêmio de R\$ 5 milhões pago por Musk para eleitores de Trump é ilegal? *InfoMoney, Mundo, Eleições nos EUA.* Disponível em: <https://www.infomoney.com.br/mundo/premio-de-us-1-milhao-pago-por-musk-para-eleitores-de-trump-e-ilegal/>. Acesso em: 4 de novembro de 2024.
27. Duarte, L. (2018, 7 de julho). Como a guerra comercial entre EUA e China pode afetar o Brasil. *BBC News Brasil.* Disponível em: <https://www.bbc.com/portuguese/brasil-44745494>. Acesso em: 17 de outubro de 2024.
28. Elias, N. (2000). *Civilizing process: Sociogenetic and psychogenetic investigations.* Blackwell Publishing.



29. Elliott, J. H. (2007). **Empires of the Atlantic world: Britain and Spain in America 1492-1830.** Yale University Press.
30. Falcão, M. A. (2016). Anais do I Colóquio Internacional de Sociologia Fiscal. Em C. Rossini (Org.), **Humanismo e tributação** (pp. 142-172). Universidade Católica de Brasília – UCB.
31. Furtado, C. (2005). **Formação econômica do Brasil** (32ª ed.). Companhia Editora Nacional.
32. Gimpel, J. (1977). **A revolução industrial da Idade Média.** Zahar Editores.
33. Harvey, D. (1990). **The condition of postmodernity: An enquiry into the origins of cultural change.** Blackwell. Disponível em: <https://files.libcom.org/files/David%20Harvey%20-%20The%20Condition%20of%20Postmodernity.pdf>. Acesso em: 07 de junho de 2024.
34. Hoffmann-Riem, W. (2022). **Teoria geral do direito digital: desafios para o direito** (2ª ed.). Forense.
35. Freyre, G. (2003). **Casa-Grande & Senzala: Formação da família brasileira sob o regime da economia patriarcal.** Global Editora e Distribuidora Ltda. Disponível em: https://edisciplinas.usp.br/pluginfile.php/229395/mod_resource/content/1/Gilberto%20Freyre%20-%20Casa-Grande%20e%20Senzala%20%281%29.pdf. Acesso em: 05 de junho de 2024.
36. Heather, P. (2005). **The fall of the Roman Empire: A new history of Rome and the barbarians.** Oxford University Press.
37. Hilton, R., Hobsbawm, E., & Hill, C. (1976). **The transition from feudalism to capitalism.** Verso Books.
38. Hobsbawm, E. (1995). **The age of capital: 1848-1875.** Abacus. Disponível em: <https://profeemiliohistoria.wordpress.com/wp-content/uploads/2019/02/eric-hobsbawm-the-age-of-capital-1848-1875.pdf>. Acesso em: 30 de maio de 2024.
39. Hobsbawm, E. (1996). **The age of revolution: 1789-1848.** Vintage Books. Disponível em: <https://files.libcom.org/files/Eric%20Hobsbawm%20-%20Age%20Of%20Revolution%201789%20-1848.pdf>. Acesso em: 30 de maio de 2024.
40. Hobsbawm, E. (1999). **Industry and empire: The birth of the Industrial Revolution.** The New Press.
41. Huizinga, J. (2016). **Homo ludens: A study of the play-element in culture.** Angelico Press.
42. Irwin, D. A. (2015). **Free trade under fire.** Princeton University Press.
43. Jacquard, A. (1996). **Ensaio sobre a pobreza: A herança de Francisco de Assis.** Publicações Europa-América.
44. Kalout, H., & Costa, H. B. M. da. (2024). A rivalidade de China-EUA e os interesses estratégicos do Brasil. **Revista Centro Brasileira de Relações Internacionais – CEBRI,** 3(10). Disponível em: <https://cebri.org/revista/br/artigo/32/a-rivalidade-china-eua-e-os-interesses-estrategicos-do-brasil>. Acesso em: 17 de outubro de 2024.



45. Kinley, D. (2013). Encontrando a liberdade na China: direitos humanos na economia política. *Sur - Revista Internacional de Direitos Humanos, 10*(19), 149-161. Disponível em: <https://sur.conectas.org/wp-content/uploads/2017/11/sur19-port-completa.pdf>. Acesso em: 15 de outubro de 2024.
46. Landes, D. (2003). *The unbound Prometheus: Technological change and industrial development in Western Europe from 1750 to the present* (2ª ed.). Cambridge University Press.
47. Le Goff, J. (1991). *Mercadores e banqueiros da Idade Média.* WMF Martins Fontes.
48. Lopez, R. S. (1976). *The commercial revolution of the Middle Ages, 950-1350.* Cambridge University Press.
49. Marx, K. (2013). *O capital.* Boitempo Editorial.
50. Marx, K. (1992). *Capital: A critique of political economy.* Penguin Classics.
51. Mezzetti, F. (2000). *De Mao a Deng: a transformação da China* (S. Duarte, Trad.). Editora Universidade de Brasília.
52. Musgrave, R. A. (2000). *Public finance in a democratic society.* Edward Elgar Publishing.
53. Nunes, A. T. (2024). Caso Musk: a liberdade de expressão não é ilimitada. *Revista Eletrônica Congresso em Foco.* Disponível em: <https://congressoemfoco.uol.com.br/area/mundo-cat/caso-musk-a-liberdade-de-expressao-nao-e-ilimitada/amp/>. Acesso em: 17 de outubro de 2024.
54. OECD. (2013). *Action plan on base erosion and profit shifting.* OECD Publishing. Disponível em: https://read.oecd-ilibrary.org/taxation/action-plan-on-base-erosion-and-profit-shifting_9789264202719-en#page2. Acesso em: 01 de junho de 2024.
55. Pereira, J. R. G., & Keller, C. I. (2022). Constitucionalismo digital: contradições de um conceito impreciso. *Revista Direito e Praxis, 13*, 2648–2689.
56. Pirenne, H. (1963). *Economic and social history of medieval Europe.* Harvest Book/Harcourt Brace & Company.
57. Pirenne, H. (2014). *Medieval cities: Their origins and the revival of trade* (Edição revisada). Princeton University Press.
58. Polanyi, K. (2011). *A grande transformação: As origens de nossa época.* Elsevier.
59. Pollard, S. (1965). *The genesis of modern management: A study of the industrial revolution in Great Britain.* Harvard University Press.
60. Pomeranz, K. (2001). *The great divergence: China, Europe, and the making of the modern world economy.* Princeton University Press.
61. Popper, K. (1945). *The open society and its enemies* (Vol. 1). Routledge.
62. Postan, M. M. (2002). *Medieval trade and finance.* Cambridge University Press.




63. Postan, M. M. (1975). *The medieval economy and society: An economic history of Britain, 1100-1500.* University of California, Penguin.
64. Reale, G., & Antiseri, D. (2003). *História da filosofia - Volume 1 - Filosofia pagã antiga.* Paulus Editora.
65. Rodotà, S. (2010). Una costituzione per Internet? *Politica del diritto*, 41*(3), 337-351.
66. Schumpeter, J. A. (1964). *História da análise econômica* (3 vols.). Editora Fundo de Cultura.
67. Schwartz, S. B. (1986). *Sugar plantations in the formation of Brazilian society: Bahia, 1550-1835.* Cambridge University Press. <https://doi.org/10.1017/CBO9780511665271>
68. Slemrod, J. (2014). *Tax systems.* Oxford University Press, USA.
69. Smil, V. (2005). *Creating the twentieth century: Technical innovations of 1867-1914 and their lasting impact.* Oxford University Press.
70. Simmel, G. (2014). *The philosophy of money.* Routledge.
71. Sombart, W. (2014 [1916]). *Il capitalismo moderno* (A. Cavalli, Ed.). Ledizioni.
72. Temin, P. (2017). *The Roman market economy.* Princeton University Press.
73. Thompson, E. P. (1998). *Costumes em comum: Estudos sobre a cultura popular tradicional.* Companhia das Letras.
74. Tiley, J. (Ed.). (2004). *Studies in the history of tax law* (Vol. 1). Hart Publishing.
75. Tilly, C. (1993). *Coercion, capital, and European states, AD 990-1992.* Wiley-Blackwell.
76. Trevizan, K. (2019, agosto 16). Guerra comercial: entenda as tensões entre China e EUA e as incertezas para a economia mundial. *G1.* Disponível em: <https://g1.globo.com/economia/noticia/2019/08/16/guerra-comercial-entenda-a-piorada-das-tensoes-entre-china-e-eua-e-as-incertezas-para-a-economia-mundial.ghtml>. Acesso em: 17 de outubro de 2024.
77. Turner, R. (2009). *King John: England's evil king?* History Press.
78. Teubner, G. (2004). Societal constitutionalism; Alternatives to state-centred constitutional theory? In C. Joerges, I.-J. Sand, & G. Teubner (Eds.), *Transnational governance and constitutionalism* (pp. 3-28). Hart Publishing.
79. Wallerstein, I. (2011). *The modern world-system I: Capitalist agriculture and the origins of the European world-economy in the sixteenth century.* University of California Press.
80. Weber, M. (2004). *A ética protestante e o "espírito" do capitalismo.* Companhia das Letras.
81. Wickham, C. (2016). *Medieval Europe.* Yale University Press.



82. Yahuda, M. B. (1983). *Towards the end of isolationism: China's foreign policy after Mao* (China in Focus Series). Palgrave Macmillan.
83. Yilma, K. M. (2017). Digital privacy and virtues of multilateral digital constitutionalism – Preliminary thoughts. *International Journal of Law and Information Technology, 25*(2), 115-138.

**EDUCATIONAL RADIO AS A MEDIATOR BETWEEN COMMUNICATION,
HEALTH AND EDUCATION: REFLECTIONS FROM A REGIONAL EXPERIENCE**

 <https://doi.org/10.56238/sevened2024.029-052>

Ieda Cristina Borges¹

ABSTRACT

This article proposes a reflection on the role of the mass media (MCM), with a focus on educational radios, in the context of the Brazilian Health System. Social participation, one of the central pillars of the system, presupposes the involvement of society in the allocation of resources and definition of priorities in different spheres. Educational radios emerge as mediating tools between health services and the population, promoting education and the exercise of citizenship. The study explores the impact of new information and communication technologies on the reconfiguration of media spaces and their implications for public health. In addition, it highlights the importance of disseminating health information as a right guaranteed by the 1988 Constitution. Using the educational radio station Cultura FM 99.3 MHz as a case study, we analyzed how this station operates in Nova Alta Paulista-SP, promoting social integration and awareness. The intersection between Communication and Health, based on practices such as those of the Ottawa Charter, is approached as strategic to expand the frontiers of public health. The article concludes by emphasizing the need for a continuous dialogue between the fields of Communication and Public Health, aiming to strengthen educational actions and democratize access to quality information.

Keywords: Mass communication. Public health. Educational radios. Citizenship. Health education.

¹ Doctor in Sciences from the Faculty of Public Health of the University of São Paulo FSP/USP, professor of the Social Communication course – Qualification in Advertising and Propaganda at the University Center of Adamantina (FAI)
E-mail: iedaborgesunifai@fai.com.br



INTRODUCTION

Social participation is one of the central pillars of the Brazilian Health System, covering all its spheres of organization (municipal, regional, state and national). This participation presupposes the possibility of influencing decisions on the allocation of resources and the definition of priorities at each level of the System. In addition, it involves the recognition of the specific sociocultural characteristics of each locality or region, respecting its "glocal" particularities, according to the contemporary conception.

In this context, a reflection on the role of the mass media (MCM) is proposed, particularly regarding its possibilities to promote education and health for large populations. This work also considers the educational interfaces that are established between health services and the Brazilian population, using the radio medium as an object of analysis, with a focus on educational radios.

These stations act as mediation tools, contributing to the exercise of citizenship by helping communities to understand and interpret their social relations. After all, one of its functions is to help the community interpret its own social context.

Contemporary society, in the first decade of the twenty-first century, becomes increasingly dependent on communication systems and information technologies. Integrating these new perspectives into the field of public health is possibly the realization of the idea of health as a collective good, using communication to promote a healthier population.

The right to public information is guaranteed by the 1988 Constitution, in article 5, which establishes: "everyone has the right to receive from public bodies information of their private interest or of collective/general interest, under penalty of liability" (Brasil, 2001 a, p. 20).

Health promotion, incorporated after extensive debates in the conferences held by the World Health Organization, such as Alma-Ata (1977) and Ottawa (1986), still represents a challenge with regard to the operationalization of communication and health education actions, with emphasis on the interaction between health services and the community.

Educational radios play an important role as tools that help the community understand and interpret its social relationships. Taking advantage of the potential of this mass communication vehicle is crucial for the dissemination of information that can modify or transform urban spaces, promoting the awareness of well-informed citizens.

Another relevant aspect is the growing role attributed to organized civil society, which develops various activities aimed at different audiences with the objective of debating social issues and strengthening community actions.



BRIEF CONCEPTUAL RETROSPECTIVE

Although communication is an everyday activity, its precise definition remains a challenge. According to Bordenave (1986), "it is not an isolated act, or a series of disconnected individual acts, but a continuous flow, from many origins and directions, with constantly changing contents and forms". In this context, communication is seen as a dynamic and continuous process, in which its most basic function – the formation of personality – is often the least mentioned, according to the author.

This process justifies the advancement of human beings in the scientific and technological fields, since they communicate through codes (digital, analog) and perform social interaction through messages (signs, symbols). Although it is currently studied as a specific discipline, communication remains a field of interdisciplinary analysis.

Orozco (1997) argues that communication is simultaneously a phenomenon, a practice, a process and a result. He defines it as

"[...] it is at the same time a paradigm, interdisciplinary field, phenomenon, practice or set of practices, process and result, an essential part of culture and cultural innovation, symbolic and material support for social exchange, as a whole, an environment where power is generated, gained or lost, union and registration of agents, agencies and social movements, a tool for interlocution, a space of conflict, a set of images, sounds and meanings, language and logic of articulation of discourses, a device of representation, a tool of control at the service of the few and the exclusion of the majority from the benefits of development, a differentiating scope of social practices. All this and more is Communication. Understanding it in its complex dimension is a partially accessible and always unattainable goal." (Orozco, 1997, p.28).

FROM INTERPERSONAL RELATIONSHIPS TO MASS COMMUNICATION

From Aristotle, in the third century B.C., to studies on the processes of emission and reception in the model of Harold Lasswell, reviewed by scholars such as Raymond Nixon and Wilbur Schramm, the field of communication has been dedicated to understanding the effects of mass media on the public. In the Latin American scenario, thinkers such as Mario Kaplún, Luis Ramiro Beltrán and Jesús Martín-Barbero highlighted the importance of MCM in society, advocating communication with popular participation and encouraging a critical reading of the media.

Kaplún argued that, by overcoming a mechanistic view of information technologies, the communicator could transform both people and communities.

[...] he spoke of "Educational Communication" taking it as a process of knowledge construction based on dialectical reflection on the reality lived communally, [...] so that, overcoming a mechanistic view of information technologies, he would become a "communicator". A communicator focused on the transformation of the person and the community (Soares, 2006, p.178).



According to Orozco (1997), the critical reception of MCM messages allows for several interpretations, since two assumptions guide the analyses: the activity of the receiver and the polysemy of the messages.

THE EVOLUTION OF THE CONCEPTS OF COMMUNICATION AND HEALTH

The historical development of the interrelationship between Communication and Health dates back to the period between 1820 and 1840, with the studies of physicians William Alison, from Scotland, and Louis René Villermé, from France, who investigated the causal connections between diseases and the socioeconomic and cultural conditions of populations. This phase marked the beginning of a broader movement, such as the reform of medicine in Germany in 1848, based on the observations of the German pathologist Rudolf Virchow (1821–1902), who linked the typhoid epidemic in 1847 to the social conditions of the time.

Fast forward to 1940, the work of physician Henry E. Sigerist, recognized as one of the leading historians of medicine, consolidated the idea that health promotion is linked not only to biological factors, but also to living conditions, work, education, culture, and leisure. Sigerist, who was a mentor to George Rosen (1910–1977), another important name in the study of the origins and development of Public Health, based his ideas on the health reform movement of the English Liberal State of the nineteenth century.

Another prominent player in this field was Charles-Edward Amory Winslow (1877–1957), a world leader in public health, whose contributions spanned areas such as the practice of public health, health education, and its history.

According to Rosen (1994),

Health education is today one of the most important expressions of modern action in community health. And its value will increase when more is known about human nature and its capacity to change. It seems that the late C-E. Winslow struck at the heart of the matter when he said that health education was for us what the microbial theory of disease was for the sanitarians of forty years ago (Rosen, 1994, p. 292).

A LEAP TO 1974: THE LALONDE REPORT

In 1974, the Lalonde Report, entitled *A New Perspective on the Health of Canadians*, brought a new approach to public health. Marc Lalonde, then Canada's minister of health, presented the innovative concept that health also depended on individual behavior changes. This perspective was fundamental to identify inequalities in health and introduce the idea of health promotion through educational and recreational actions, pointing to communication as an essential strategy for changing the population's habits.



Soon after, the Declaration of Alma-Ata (1978) established new guidelines, with the holding of international conferences promoted by the World Health Organization (WHO). Based on these discussions, communication was defined as a strategic tool for public health policies, being seen not only as a human need, but also as a competence that health professionals must develop to better serve society.

In this sense, Beltrán (2001) observes that

By definition, health promotion must achieve its ends by persuasion, not by coercion, and for this reason communication is universally recognized as an essential instrument to materialize this policy. [...] Articulating this universal conversation for the improvement of health is the delicate commitment assumed by communicators at the service of promotion (Beltrán, 2001, p. 355).

COMMUNICATION AND HEALTH IN CONTEMPORARY TIMES

With the revolution of the means of communication and the arrival of new information technologies, there was a profound need to reconfigure media spaces. This movement has become a priority, especially in social interactions, covering several areas of knowledge and providing important subsidies to meet global interests.

During this period, the country structured sanitary practices in search of more effective care, with emphasis on the creation and regulation of the Unified Health System (SUS). According to Borges and Japur (2005), "since its legal conquest (Brasil, 1990), a profound reorganization has been taking place and aims to operationalize the guidelines and principles established for its full operation" (p. 508).

It is also important to recognize the growing role of organized civil society, which has been responsible for a series of initiatives aimed at different audiences. The objective of these actions is to debate social issues and strengthen community activities, in line with the five principles of the Ottawa Charter: healthy public policies, health-friendly environments, community action, personal skills, and reorientation of the health system.

COMMUNICATION, EDUCATION AND HEALTH: A NECESSARY DIALOGUE

It is understood, therefore, that many of the issues related to health are also issues of education and communication, which requires a deeper integration between these fields. This process of approximation is fundamental to expand the frontiers of theoretical and practical production in the area of Public Health. However, this dialogue still faces challenges. Donato and Gomes (2010) point out that "[...] the little presence, in the disciplinary studies of Health and Education, of the knowledge and practices of the field of Communication" is a gap that needs to be filled.

According to Marques de Melo (2005),



[...] There is a latent dichotomy, difficult to overcome. Health professionals want immediate answers, at the empirical level, to solve their communicability problems. Meanwhile, communication researchers still assume a theoretical stance more concerned with the political-ideological dimension of the issue than with the forwarding of concrete solutions to the difficulties in convincing peripheral populations (lacking formal education) to engage in health prevention projects".

REFLECTIONS ON COMMUNICATION PRACTICES IN HEALTH

Nowadays, the impact caused by the revolution of the means of communication, together with the introduction of new information technologies, has brought the need to reconfigure and redefine media spaces. It has become a priority to study these changes in the context of social interactions, expanding the various areas of knowledge and offering the necessary subsidies to meet global demands.

In Brazil, Public Health has been consolidated as a national policy since the twentieth century, a period in which there was the systematization of sanitary practices with the aim of providing effective care to the community. An important milestone in this process was the creation and regulation of the Unified Health System (SUS). As noted, "since its legal conquest (Brasil, 1990), a profound reorganization has been taking place and aims to operationalize the guidelines and principles established for its full operation" (Borges; Japur, 2005, p. 508).

Another relevant aspect is the increasingly active role of organized civil society, which has been involved in various activities aimed at different audiences, with the aim of discussing social issues and strengthening community actions. This movement is aligned with international health practices, based on the five principles of the Ottawa Charter: healthy public policies, health-friendly environments, community action, personal skills development, and the reorientation of the health system.

It is understood, therefore, that health-related issues can also be seen as issues of education and communication, allowing the expansion of the limits of the field and greater integration with the vast theoretical and practical production of Public Health.

This dialogue between the fields, however, faces constant challenges. As Donato and Gomes (2010) point out, [...] there is little presence, in the disciplinary studies of Health and Education, of the knowledge and practices specific to the field of Communication."

Marques de Melo (2005) also observes that the interaction between the fields of Communication and Health in Brazil has been slow:

There is a latent dichotomy, difficult to overcome. Health professionals want immediate answers, at the empirical level, to solve their communicability problems. Meanwhile, communication researchers still assume a theoretical stance more concerned with the political-ideological dimension of the issue than with the



forwarding of concrete solutions to the difficulties in convincing peripheral populations (lacking formal education) to engage in health prevention projects" (Marques de Melo, 2005).

Since the 1980s, numerous questions have arisen about communication practices in the field of health, becoming a theme of recurrent reflection. In Brazil, the 8th National Health Conference, held in 1986, already highlighted communication, along with education and information, as an essential prerequisite for the exercise of citizenship and the right to health.

Thus, it is evident that human beings have always shown interest and ability to understand what happens in their social relations. Informing and being informed is a fundamental requirement for sociability. As Cajueiro Santos (2006) points out, "thinking about communication, trying to understand it from the time in which we live is an arduous task, especially when it is driven by the empire of speed, constant technological renewal and the reinvention of ways of life and beliefs".

This interface between Communication and Public Health allows researchers to develop attitudes that move away from an ethnocentric view, when faced with the diversity of discourses and behaviors of other groups, often distant from the traditional practices analyzed by the communication field.

THE RADIO MEDIUM: A SPACE FOR CITIZENSHIP

Radio, as a means of mass communication, has unique characteristics that make it suitable for educational activities and the promotion of citizenship. Beltrão and Quirino (1986), in the discussions on the functions and performance of mass communication, contribute to the report prepared by Unesco on the development of the means of education, among them, the radio:

[...] the third generation, which begins at the end of the nineteenth century and extends to the middle of the current century, uses photographs, slides, fixed films, silent cinema, recordings (first on records and later on tapes), radio (from the 20s), sound cinema (30s) and educational television (in the 50s)". (Beltrão & Quirino, 1986, p. 158).

For this research proposal, among the various uses of educational technology, the one that involves a series of messages prepared according to the principles of programmed instruction is of interest and educational radio has the necessary characteristics for the analysis in question.

Educational radio broadcasts began in Europe in the 1920s, with the British Broadcasting Corporation (BBC) in 1924. Standing out for its new format, it gets the support



of pedagogical entities, federal public agencies and other associations with a differentiated educational program. It was the principle of using the media as opportunities to participate in the destiny of the community.

In the Brazilian case, broadcasters with educational programs emerged in the 1920s, arriving simultaneously with radio broadcasts,

Radio, in eight decades, has recorded significant achievements, marks its commitment to our culture, maintains a certain standard of the Portuguese language, informally passing on to listeners a cultured norm, without denying or despising the regional diversity in a continent country. It follows its vocation as a means that has the construction of citizenship as its main end. With educational proposals, it has already proven that it can be efficient, effective and democratic (BLOIS, 2003, p. 9).

In the Communication/Education approach, the precursors in the Latin American scenario were the educator Paulo Freire (1974) and the radio broadcaster Mario Kaplún (1978). They consider communication as fundamental in human relations and the interrelation of its elements to the communication process for educational purposes.

In this thought, the social function of radio should prioritize its audiences, respecting their cultures. "Radio can be useful for those who conceive it as an instrument of education, of popular culture and of the promotion of authentic development based on its social function." (Kaplun, 1978. p. 17).

The Brazilian legislation for educational radios dates from April 15, 1999, Interministerial Ordinance No. 651. Establishes criteria for granting concessions, permissions and authorizations for the execution of radio broadcasting services and sound and images, with an exclusively educational purpose, "Art.1 Educational-cultural programs are understood to be those that, in addition to acting jointly with education systems of any level or modality [...]".

Data revealed by the Panorama of Communication and Telecommunications (Castro, Marques de Melo & Castro, 2010), show that the number of radio stations in operation increased from 2001 to 2009 by around 44%, being the highest growth recorded until the middle of the first decade of this century.

The study also pointed out that the distribution of broadcasters by state following trends in print media, there is a greater number of channels operating in the Southeast region of the country, followed by the South and Northeast regions. "However, if the population density of the cities in these regions is considered, there is a greater balance with the number of radio stations." (Castro, Marques de Melo, Castro, 2010, p. 197).



It is noted that the radio vehicle is transversal to the entire population, regardless of social class, cultural level, gender or age. And it shows that the listener still prefers the old habit of listening to the radio at home, not neglecting the audiences in the car and at work.

According to the researcher Gomes (2007), in view of the population indicators released by the IBGE, with the still high rate of illiteracy in the country, they legitimize the radio as an even more important means of communication in the lives of Brazilians, especially for its educational performance.

However, this educational and citizen value attributed to the vehicle needs to be sculpted in the repertoire of the radio broadcasters themselves. Raising the level of knowledge and awareness of communicators so that they are also able to have more consistent conversations with their audience is to resignify radio for cooperative and concomitant action in the many educational spaces that it proposes at the service of democracy. It is to give back to the radio its ears, which have gradually become deafened, and to summon from its microphones other words, now muscled by its critical consciousness." (GOMES, 2007, p.174).

Thus, using the paradigms that guide an educational radio with regard to social participation, they can thus promote a dialogue with the paradigms of Health Education and can be used as a management tool in the area of Public Health.

The universe of radio media research occurs in the regional context of the Nova Alta Paulista area, in the Midwest region of the State of São Paulo, through the programming and audience of the educational radio, Cultura FM 99.3 Mhz, located in the city of Adamantina, in the state of São Paulo, Brazil.

The station has a transmission power of 1000 watts and an antenna of 60 meters, and its frequency reaches a radius of 100 km, serving Adamantina and the region. It is an educational station at the service of the community, and due to its educational characteristic, Cultura FM radio offers a different programming grid from other radios operating in the market.

According to data, available on the station's website, the priority is to broadcast Brazilian popular music (MPB), in addition to other musical styles, including: jazz, blues, instrumental music, rock, sertaneja, pop, among other rhythms. With the objective of transmitting informative, educational and cultural programs, always seeking social integration, the station also develops other activities, such as radio journalism and provision of services to the community.

The study population consists of directors, journalists, radio broadcasters (technicians and announcers) and interns of the educational radio station Cultura FM 99.3 Mhz, in the city of Adamantina, state of São Paulo, Brazil. Thus, it seeks to investigate the



theoretical assumptions that guide the meanings of the objects of investigation: the administration, the broadcaster, the programming.

COMMUNICATION, HEALTH, EDUCATION: A SPACE FOR DIALOGUE

Despite these initial considerations, the various health and health promotion conferences that highlight the role of the mass media (MCM) in promoting the education and health of large populations are justified (BRASIL, 2001 a).

In this way, they come to represent one of the interfaces of the educational relationship between health services and the population. For Penteado et al. (2002) "[...] Increasingly, the health areas make use of media communication resources as a support for the approach and dissemination of themes and actions of education and promotion of public and/or collective health" (p. 49).

Health Promotion in the conception of a "process of training the community to act in the improvement of its quality of life and health, including greater participation in the control of this process. [...] It is not the exclusive responsibility of the health sector, and goes beyond a healthy lifestyle, towards global well-being. (Brasil, 2001 b, p.19).

Therefore, it is necessary that actions and activities be carried out and guided by the perspective of community empowerment, participation and exercise of citizenship by the social actors involved in this thematic area of communication and health education.

The Brazilian educator Paulo Freire (2002), in the work - *Extensão ou Comunicação* -, reinforces the sense that "education is communication, it is dialogue, insofar as it is not the transfer of knowledge, but a meeting of interlocutors who seek the meaning of meanings".

The local media has the possibility of showing life in certain regions, municipalities, cities, towns, neighborhoods, rural areas, etc. better than any other [...]. People follow the events in a more direct way, through personal experience or presence, which makes it possible to confront the facts with their media version in a more natural way". (PERUZZO, 2005, p. 78).

According to Beltrão and Quirino (1986), the problems generated by mass communication can be reduced when the communicator deeply understands his function in society, has adequate technical knowledge, solid theoretical training and actively participates in social issues. These aspects allow him to better understand the demands of the audience to which he communicates his messages.

In today's society, especially in the first decade of the twenty-first century, there is a growing dependence on communication systems and information technologies. Applying these new approaches to the field of public health can represent the realization of the idea



of health as a common good, promoting a healthier population through the strategic use of communication for its dissemination and awareness.

After all, the right to public information is expressed in the 1988 Constitution (Brasil, 2001 b, p.20), in article 5: "everyone has the right to receive from public bodies information of their private interest or of collective/general interest, under penalty of liability".

FINAL CONSIDERATIONS

The mass media offer ample opportunities for action, both as mediation tools in the educational processes between health services and the population, as well as in the strengthening of citizenship. Given the involvement of Communication in all social processes, it is unthinkable to analyze the complexity of urban societies without considering the influence of the mass media. In this context, the role of the social communicator goes beyond the simple transmission of information, and it is crucial that he prioritizes the public interest and also has the responsibility of instructing the public on the topics under discussion.

In Brazil, Public Health has a history of significant achievements, consolidating itself as a national policy in the twentieth century, especially with the creation and regulation of the Unified Health System (SUS). From this institutionalization, the need for a deeper dialogue between Public Health and Communication emerged, since the dissemination of health information to the population, especially through the media, became essential for the promotion of health as a universal right.

This dialogue between the fields of knowledge reinforces the importance of the media in building a more conscious and healthy society. The historical bias of Public Health in Brazil, with its bases on collective well-being policies, combined with the technological transformations of communication, allows a reflection on the limitations and potentialities of democratic communication. Thus, understanding this intersection between Communication and Public Health is essential to continue advancing in the construction of an informed, participatory society in search of better living conditions for all.




REFERENCES

1. Beltrão, L., & Quirino, N. O. (1986). *Subsídios para uma Teoria da Comunicação de Massa*. São Paulo: Summus.
2. Beltrán, L. R. (2001). La importância de la comunicación em la promoción de la salud. In I. Esptein et al. *Mídia e Saúde* (pp. 355–368). Adamantina/SP: Unesco/Umesp/FAI.
3. Penteado, R. Z., Giannini, S. P. P., & Berlamino, C. G. (2002). A campanha da voz em dois jornais brasileiros de grande circulação. *Saúde e Sociedade*, 11(2), 49–64.
4. Blois, M. M. (2003). Rádio Educativo no Brasil: Uma História em Construção. In *XXVI Congresso Brasileiro de Ciências da Comunicação*, Belo Horizonte/MG, 2 a 6 set. 2003. Anais eletrônicos... Belo Horizonte. Disponível em <http://intercom.org.br/papers/nacionais/2003/www/pdf/2003_NP06_blois.pdf>
5. Bordenave, J. E. D. (1986). *Além dos meios e mensagens: introdução à comunicação como processo, tecnologia, sistema e ciência* (3ª ed.). Petrópolis/RJ: Vozes.
6. Borges, C. C., & Japur, M. (2005). Promover e recuperar saúde: sentidos produzidos em grupos comunitários no contexto do Programa de Saúde da Família. *Interface – Comunicação, Saúde, Educação*, 9(8), 507–518.
7. Brasil. (2001a). *Promoção da Saúde: Declaração de Alma-Ata, Carta de Ottawa, Declaração de Adelaide, Declaração de Sundsvall, Declaração de Santa Fé de Bogotá, Declaração de Jacarta, Rede de Megapaíses e Declaração do México*. Brasília: Ministério da Saúde.
8. Brasil. (2001b). *Constituição da República Federativa do Brasil: atualizada até a emenda constitucional nº 32* (3ª ed.). São Paulo: Iglu.
9. Bulik, L. (2001). *Comunicação e teatro*. São Paulo: Arte & Ciência.
10. Cajueiro Santos, T. (2006). Teoria da comunicação e suas interfaces com o corpo e cultura. *Comunicação Midiática*, 6, 113–126.
11. Castro, D., Marques de Melo, J., & Castro, C. (Orgs.). (2010). *Panorama da comunicação e das telecomunicações no Brasil* (Vol. 3). Brasília: Ipea.
12. Donato, A. F., & Gomes, A. Z. (2010). O estudo da comunicação na formação dos profissionais de saúde: algumas questões e aproximações. *Boletim do Instituto de Saúde – BIS. Comunicação e Saúde*, 12(1), 37–43.
13. Ferreira, G. M. (2001). As origens recentes: os meios de comunicação de massa pelo viés do paradigma da sociedade de massa. In A. Hohlfeldt et al. *Teorias da Comunicação de Massa: conceitos, escolas e tendências* (pp. 99–116). Petrópolis/RJ: Vozes.
14. Freire, P. (2002). *Extensão ou Comunicação?* (12ª ed.). São Paulo: Paz e Terra.
15. Geertz, C. (1989). *A Interpretação das Culturas*. Rio de Janeiro: Guanabara Koogan.



16. Gomes, A. L. Z. (2007). *Na boca do rádio – o radialista e as políticas públicas*. São Paulo: Aderaldo & Rothschild: Oboré.
17. Kaplún, M. (1978). *Producción de Programas de Radio. El guión. La realización*. Quito: CIESPAL, Colección Initiyán.
18. Marques de Melo, J. (2005). Grupo Comunicacional de São Bernardo: o diálogo interdisciplinar como estratégia para corresponder às demandas sociais. In J. Marques de Melo (Org.) et al. *Anais da VI Conferência Brasileira de Comunicação e Saúde: Mídia, Mediação e Medicalização* (pp. IX–XI). Brasília: Agência Nacional de Vigilância Sanitária.
19. Ministério da Saúde. (2001). *Promoção da saúde*. Brasília.
20. Orozco, G. (1997). *La investigación de la comunicación dentro y fuera de America Latina: tendencias, perspectivas y desafíos del estudio de los medios*. La Plata: Univ. Nacional del Plata.
21. Peruzzo, C. M. K. (2005). Mídia regional e local: aspectos conceituais e tendências. *Comunicação & Sociedade*, Universidade Metodista de São Paulo, 43(1º sem.).
22. Rosen, G. (1994). *Uma história da saúde pública* (M. F. S. Moreira, Trad., 2ª ed.). São Paulo: Hucitec: Editora da Universidade Estadual Paulista: Rio de Janeiro: Associação Brasileira de Pós-Graduação em Saúde Coletiva.
23. Soares, I. O. (2006). Educom.rádio, na trilha de Mário Kaplún. In J. Marques de Melo (Org.) et al. *Educomídia, alavanca da cidadania: o legado utópico de Mário Kaplún* (pp. 167–188). São Bernardo do Campo/SP: Cátedra UNESCO: Universidade Metodista de São Paulo.
24. Victoria, C. G. et al. (2011). Condições de saúde e inovações nas políticas de saúde no Brasil: o caminho a percorrer. *Revista Lancet - Saúde no Brasil*, Nova York, USA, 90–102.

THE PROGRESSION OF THE REGIME AFTER THE ENTRY INTO FORCE OF THE ANTI-CRIME PACKAGE – LAW NO. 13,964/2019, PROGRESSION OF THE SPECIAL REGIME AND ITS BENEFICIAL ASPECTS

 <https://doi.org/10.56238/sevened2024.029-053>

Lilian Frassinetti Correia Cananéa¹ and Peterson Rodrigues Macêdo Vilar²

ABSTRACT

The main proposal of the article is to analyze the change that the Anticrime Package, Law No. 13,964/2019, in force since 01.23.2020, brought in the scope of penal execution, with regard to regime progression, analyzing the beneficial aspect for re-educating inmates, from the interpretation of the Superior Courts, as well as the progression of the special regime, with regard to women, and the interpretation of the Federal Supreme Court in the use of analogy in *malam partem*. And in order to achieve the desired proposal, the following are specific objectives: to make a retrospective of the fractions applied in the progressions of the regime, in common crimes and heinous crimes, recidivist or not, highlighting the changes that have occurred, research in doctrines and jurisprudence.

Keywords: Regime Progression. Anti-Crime Package. Heinous crime. Common Crime. Stricter rules. Easing.

¹ Judge of the 1st Court of Santa Rita/PB
Coordinator of Prison Task Forces – GMF/PB
Postgraduate degree from the Legal Faculty in Public Law

² Master in Management in Learning Organization from the Federal University of Paraíba



INTRODUCTION

In December 2019, Brazil accompanied the approval of the Anticrime Package – Law No. 13,964/19, which was sanctioned on 12.24.2019 and entered into force on 01.23.2020. A broad reform in criminal law and criminal procedure, covering criminal execution, which was part of a set of measures, whose objective was to combat corruption and organized crime, in addition to responding to society with the advance of crime in the country.

With the publication of the aforementioned law, discussions were generated between indoctrinators and professionals in the criminal area due to the wording, considered by many to be flawed, with gaps that were reasons for debates and discussions in the courts, generating jurisprudence that, little by little, was interpreted in a beneficial way in favor of the re-educating, especially with regard to Penal Execution, in the part of Regime Progression, which was the one that underwent the greatest change.

In this sense, the following question arises: What are the impacts on the regime progression process after the entry into force of the anti-crime package – law no. 13,964/2019? In order to answer this question, the general objective is to analyze the impacts on the process of regime progression after the entry into force of the anti-crime package and, in order to achieve this objective, the following specific objectives are presented: to understand the operation of the increase in penalties, to reflect on the rights of the accused within the scope of precautionary measures and, Finally, analyze the implementation of the guarantee judge.

Therefore, the present research will adopt the methodology based on bibliographic review and data collection from official agencies, combined with the methods of descriptive and deductive procedure.

GENERAL ASPECTS OF THE PENAL EXECUTION LAW – LAW NO. 7,210/84 AND REGIME PROGRESSION

Starting the analysis of the LEP, it is important to reflect on the text expressed in its article 1:

Article 1 – The purpose of penal execution is to enforce the provisions of a criminal sentence or decision and to provide conditions for the harmonious social integration of the convicted and the interned." (Law No. 7,210/1984)

When observing the normative text of the provision above, it is understood as a description of the main objective that arises from a criminal decision. Thus, article 1 of the Penal Execution Law prescribes the concept of penal execution and its objectives. About the concept, Guilherme de Souza Nucci's notes are important:



This is the procedural phase in which the State asserts the enforceable claim of the penalty, making the punishment of the agent effective and seeking the concreteness of the purposes of the criminal sanction. There is no need for a new summons – except for the execution of the fine, as it is now collected as if it were an active debt of the Public Treasury – considering that the convicted person is already aware of the criminal action filed against him, as well as has been notified of the conviction, when he can exercise his right to the double degree of jurisdiction. In addition, the punitive claim of the State is cogent and unavailable. With the final and unappealable decision, the judgment becomes a judicial enforceable title, moving from the process of cognizance to the process of enforcement. Although this is a special process, with particularities that a typical executory process does not have (e.g. It has its beginning determined ex officio by the judge, in most cases) it is the phase of the criminal process in which the State asserts its punitive claim, broken down into an enforceable claim." (Penal Laws and Criminal Procedure Commented – Volume 2. 6th Edition, Editora RT, page 175).

It is then observed that the Penal Execution Law aims to dictate the rules that guide the execution of the sentence, through the Executive Branch, responsible for the prison system, with the effective participation of the Judiciary, very well described in the words of Ada Pellegrini Grinover:

"In fact, it is not unknown that criminal enforcement is a complex activity, which is developed, intertwined, in the jurisdictional and administrative spheres. Nor is it unknown that two state powers participate in this activity: the Judiciary and the Executive, through the intermediary, respectively, of the courts and penal establishments." (Penal Execution, Ada Peligrini Grinover, São Paulo: Max Limonad, 1987, p.110 in, Renato Brasileiro de Lima, Manual de Execução Penal, Single Volume, Editora JusPODIVM, 3rd Edition, 2024, p.34).

Having understood the introductory phase, we will focus on the main point of this study, namely, the progression of the regime, which can be defined as a gradual change of sentence regime, where the re-educating person leaves a more rigorous, closed, isolation regime, and gradually moves to the less rigorous, semi-open and open regimes, until obtaining conditional release, which is the last stage of serving the sentence, in appropriate cases, since the Anti-Crime Package restricted the granting of conditional release in relation to some crimes. It is the way that the re-educating person has to return to social life.

The progressive system of punishment serves as a thermometer, a meter of the recovery of the re-educating person who is serving his sentence, and so that he can obtain regime progression, it is necessary to comply with the requirements of the legal order.

Thus, from the time of imprisonment, that is, the entry of the re-educating person into the prison system, whether provisionally (arrest in flagrante delicto or temporary imprisonment), or in compliance with the conviction, the period for obtaining benefits from the penal execution begins, which, as we have already seen, is regulated by Law No. 7,210/84. And this article is not intended to exhaust the subject, but only to a more detailed analysis, based not only on the law, but on doctrine and jurisprudence, of the changes that



have occurred in the progression of the regime, whether in heinous or common, recidivist or primary crimes, since the entry into force of the Anti-Crime Package, Law No. 13,964/19, which came into force on January 23, 2020, also making a brief analysis of the special progression of the regime, provided for in Law No. 13,769/2018, in view of the repeal of paragraph 2, of article 2, of the Law of Heinous Crimes, by the aforementioned Anti-Crime Package.

In Brazil, the progressive system is defined both in the Penal Code, article 33, paragraph 2, which regulates: "custodial sentences must be executed progressively", as well as in article 112, of the Penal Execution Law, which provides that "the custodial sentence will be executed progressively with the transfer to a less rigorous regime...".

The regime of execution of the sentence is set by the prosecuting court which, when sentencing, must indicate the initial regime of execution of the sentence. And for the establishment of the regime, the judge must stick to the judicial circumstances provided for in article 59 of the Penal Code, analyzing culpability, antecedents, personality, motives, the consequences of the crime, and also the behavior of the victim. And after the sentence has been applied, according to the "quantum" set and the judicial circumstances analyzed, the regime will be fixed, which may be CLOSED, SEMI-OPEN or OPEN. Depending on the conviction of the open regime, if it is not a crime with violence and serious threat to the person, up to 04 years, it may be replaced by a restrictive sentence of law – article 44, of the Penal Code.

Once sentenced, the regime has been fixed, and has already been taken to prison, the re-educating person must meet the requirements provided for by law, in order to obtain regime progression. The execution of the sentence is based on the individualization of the sentence, where the requirement must initially be met by the objective criterion, which is the quantum that must be served of the sentence in the previous regime, and the merit, which is the subjective criterion, the prison behavior.

Article 112 of Law No. 7,210/84, which regulates the progression of the regime, underwent the greatest change in the Anti-Crime Package Law, which had its wording as follows:

"Article 112 – The custodial sentence shall be executed in a progressive manner, with the transfer to a less rigorous regime, to be determined by the judge, when the prisoner has served at least one sixth of the sentence in the previous regime and his merit indicates progression."

And with the amendment of Law No. 10,792, of 12.01.2003, it now reads as follows:



Article 112 – The custodial sentence shall be executed in a progressive manner with the transfer to a less rigorous regime, to be determined by the judge, when the prisoner has served at least one sixth of the sentence in the previous regime and shows good prison behavior, proven by the director of the establishment, respecting the rules that prohibit progression."

And currently, with the entry into force of the Anti-Crime Package, on 01.23.2020, it has the following wording:

"Article 112 - The custodial sentence shall be executed in a progressive manner with the transfer to a less rigorous regime, to be determined by the judge, when the prisoner has served at least:

- I - 16% (sixteen percent) of the penalty, if the offender is a primary offender and the crime has been committed without violence to the person or serious threat;
 - II - 20% (twenty percent) of the penalty, if the convict is a repeat offender in a crime committed without violence to the person or serious threat;
 - III - 25% (twenty-five percent) of the penalty, if the offender is a primary offender and the crime has been committed with violence to the person or serious threat;
 - IV - 30% (thirty percent) of the penalty, if the convict is a repeat offender in a crime committed with violence to the person or serious threat;
 - V - 40% (forty percent) of the penalty, if the convict is convicted of committing a heinous crime or equivalent, if it is a primary crime;
 - VI - 50% (fifty percent) of the penalty, if the convict is:
 - (a) convicted of the practice of a heinous or equivalent crime, resulting in death, if it is primary, conditional release is prohibited;
 - (b) convicted of exercising command, individually or collectively, of a criminal organization structured to commit a heinous or similar crime; or
 - c) convicted of the crime of constituting a private militia;
 - VII – 60% (sixty percent) of the penalty, if the convict is a repeat offender in the practice of a heinous or equivalent crime;
 - VIII – 70% (seventy percent) of the penalty, if the convict is a repeat offender in a heinous crime or equivalent resulting in death, conditional release is prohibited.
- (BRAZIL, 2020)

The deadlines set for each type of crime, with violence, without violence, common, heinous, recidivist or not, are regulated in that article. Until recently, before the entry into force of the Anti-Crime Package, the progression of the regime in relation to heinous and similar crimes was regulated by the Law of Heinous Crimes itself, Law No. 8,079, paragraph 2, of article 2, repealed by the law of the anti-crime package, providing that in heinous, primary crimes, the progression would occur after the completion of 2/5 of the sentence, and if a repeat offender, 3/5.

With the new law, new objective requirements were set and that must be met, as it is an objective, mandatory requirement. In relation to heinous crimes resulting in death, they now have the requirement of compliance with 50% for regime progression, and in relation to specific repeat offenders, resulting in death, 70%. Both, conditional release is prohibited. At this point there was a well-deserved aggravation of the penalty.

With the publication of the law, there was much debate about the need to comply with 60% of common and non-specific recidivists, that is, only in heinous crimes, since it



had been applied to all convictions, common and heinous. The understanding was pacified, and the Superior Court of Justice expressed itself in the following terms:

"The Fifth Panel, in line with what was already being judged by the Sixth Panel of this Eg. Superior Court, in the judgment of HCs No. 613,268/SP and No. 616,267/SP, came to understand that the entry into force of Law No. 13,964/19 (Anticrime Package), which amended article 112 of the Penal Execution Law, brought significant changes in the regime progression system, so that those convicted of a heinous or equivalent crime who are generic recidivists, by the use of the analogy in bonam partem, the percentage equivalent to that provided for the primary should apply, that is, 40% (forty percent) or 50% (fifty percent), in the form of article 112, items V and VI, paragraph a, of the LEP, depending on the case (whether or not there was a result of death)." (AgRg in REsp 1919672/MG, Rel. Minister Félix Fischer, 5th Panel, judged on 03.30.2021).

"In recent judgments of both Criminal Panels, the position was established according to which the amendment promoted by the Anticrime Package in article 112 of the LEP does not authorize the application of the percentage of 60% related to repeat offenders in heinous crime or equivalent, to non-specific repeat offenders. This is because, in view of the legislative omission, it is necessary to use the analogy in bonam partem, in order to apply in the hypothesis, item V of article 112, which provides for a time lapse of 40% for the primary and for the convicted of a heinous or equivalent crime." (AgRg no HC 640.014/AC, Rel. Minister RIBEIRO DANTAS, 6th PANEL, judged on 03.23.2021).

With the pacification of the jurisprudence, there was a benefit in relation to the re-inmates who were serving time for a heinous crime and were repeat offenders in common crime. The calculations were made at the rate of 3/5 because it was provided for in Law No. 8,079/90 (Law of Heinous Crimes), and in this way, the percentage of 40% percent or 50% percent in case of death was redone and applied, applying the most beneficial rule, which we can highlight that was a benefit for thousands of inmates in the prison system.

The fractions for regime progressions vary according to the crime, whether there is violence or not, recidivist or primary, heinous or simple. And for non-violent, primary crimes, which are the most common, crimes of theft, which are not aggravated, article 155, paragraphs 4, A, and following of the CP, introduced by Law No. 13,654, of 04.23.2018, illegal carrying or possession of firearms, reception, among others, the previous fraction was 1/6 and became 16%, that although the difference is small, it exists and the calculations are redone, considering that the law, in this case, retroacts to benefit.

A change that occurred in the anti-crime package and had a lot of repercussions on the prison system, was the transformation of the crime of robbery, with the use of firearms, which became considered a heinous crime. Before, only the crime of robbery, robbery followed by death, was considered heinous, and now in addition to robbery with the use of a firearm, robbery with restriction of the victim's freedom is also considered a heinous crime.

In relation to the crime of robbery in general, except only robbery followed by death, 1/6 was served for the progression of the regime, and now, the crimes of simple robbery



and with cause of increase, without being heinous, require the fulfillment of 25% because it is a crime with violence or threat, and the crime of robbery with the use of a firearm, As it is a heinous crime, he must comply with 40%.

Another discussion was that the rule that the law cannot retroact to aggravate in cases that were practiced prior to the entry into force of the law should be applied. And on this topic, which is very relevant, even when the sum of the penalties occurs, let us see the understanding of Prof. Renato Brasileiro de Lima:

The rule, therefore, is that the convict is only entitled to regime progression if these objective requirements are observed, and it is worth remembering that when adding up the penalties, the principle of legality requires that the differentiated calculation be observed for the purposes of regime progression (Statement n. 13 of the I Conference on Criminal Law and Criminal Procedure of the Center for Judicial Studies of the Federal Justice Council). (Manual of Penal Execution, single volume, 3rd edition, 2024, page 317).

A fair criterion, that if there is no compliance, the re-educating person will comply with the fraction of 40% for crimes with the use of firearms, committed before the entry into force of the Anti-Crime Package.

A brief comment is necessary in relation to the recent Law No. 14,843/2024, known as the Sergeant PM Dias Law, of 04.11.2024, which amended the Penal Execution Law, and among others, instituted the obligation of criminological examination in all regime progression. See:

"Article 112. Paragraph 1 - In all cases, the convict will only be entitled to regime progression if he or she displays good prison conduct, proven by the director of the establishment, and by the results of the criminological examination, respecting the rules that prohibit progression." (BRAZIL, 2024)

In spite of the good intention of the legislator to want to prevent the freedom of re-inmates considered to be highly dangerous, the Prisons are overcrowded, and the criminological examinations are carried out by psychiatrists, who previously carried out in Psychiatric Custody Hospitals, most of which have already been closed due to the Anti-Asylum Policy, and to carry out such an examination, which requires a specialized team, it is waited around 03 to 04 months, due to the deficiency of personnel qualified to carry out the examination, and it was in good time that the STJ decided that it only applies to cases after the law. For application to the previous cases, the decision must be motivated. See:

"APPEAL IN HABEAS CORPUS. REGIME PROGRESSION. CRIMINOLOGICAL EXAMINATION. LAW NO. 14,843/2024. NOVATIO LEGIS IN PEJUS. IMPOSSIBILITY OF RETROACTIVE APPLICATION. CASES COMMITTED UNDER THE AEGIS OF THE PREVIOUS LAW. PRECEDENTS.1. The requirement to carry out a criminological examination for any and all regime progression, under the terms



of Law No. 14/843/2024, constitutes novatio legis in pejus, as it increases the requirement, making it more difficult to achieve prison regimes that are less severe to freedom.² The retroactivity of this rule is unconstitutional, in view of article 5, XL, of the Federal Constitution, and illegal, under the terms of article 2 of the Penal Code.³ In this case, all the patient's convictions are prior to Law No. 14,843/2024, and the legal provision in question is not applicable retroactively.⁴ Appeal in habeas corpus granted to dismiss the application of paragraph 1 of article 112 of the Criminal Execution Law, as amended by Law No. 14,843/2024, determining the return of the case to the Execution Court so that it can proceed with the analysis of the request for regime progression. (RHC No. 200.670/GO, Rapporteur Justice Sebastião Reis Júnior, Sixth Panel, judged on 8/20/2024, DJe of 8/23/2024).

There are cases in which it is necessary to carry out a criminological examination, which will give the judge greater security in granting the benefit, but in the vast majority, the monitoring by the management of the prison unit, on a daily basis, can attest to good behavior, and be sufficient.

PROGRESSION OF THE SPECIAL REGIME

Although it was not included by the anti-crime package, but by Law No. 13,769/2018, it was impacted by the Anti-Crime Package that revoked paragraph 2, of article 2, of the Law of Heinous Crimes, and deals with regime progression, our theme.

It is necessary that we make a brief analysis of this benefit that was introduced by the aforementioned law, which is the progression of the special regime, provided for in article 112, paragraph 3, of Law No. 7,210/84. Intended for pregnant women, mothers or guardians of children or people with disabilities, who now have the right to a special regime progression. Benefit created in order to protect the family. See:

"Art. 112 -

.....

Paragraph 3 - In the case of a pregnant woman or a woman who is a mother or guardian of children or persons with disabilities, the requirements for regime progression are, cumulatively:

- I - not to have committed a crime with violence or serious threat to the person;
- II - not having committed the crime against his child or dependent;
- III - have served at least 1/8 (one eighth) of the sentence in the previous regime;
- IV - be primary and have good prison behavior, proven by the director of the establishment;
- V - not to have been part of a criminal organization." (BRAZIL, 1984)

The legislator was concerned with protecting the family, in the face of so many cases that occur, standing out from companions of inmates who are forced, or not, to take drugs to prison units, are often arrested and convicted, and end up penalizing the family, abandoning those who depend on them. These are not isolated cases, they occur frequently in prison units and when they are heard in the instruction, they report that most of the time they are threatened by their partners to take the drug.

Undoubtedly, it was an advance in favor of incarcerated women who find themselves in the situations mentioned in the law, which does not distinguish between common and



heinous crimes, which has generated discussions. Let us see the understanding of Prof.

Rafael de Souza Miranda:

"Law No. 13,769/18 now provides for the Penal Execution Law for a new hypothesis of regime progression, called special progression (LEP, art. 112, third paragraph). As it is a more beneficial criminal rule, it should be applied to crimes committed before its validity.

.....
"Even with the repeal of article 2 of the Law of Heinous Crimes operated by Law No. 13,964/19, the special progression continues to apply to heinous and similar crimes. And the reason is simple, when regulating the special progression, the law did not make any distinction between common, heinous and equivalent crimes. Thus, it is not up to the interpreter to read what has not been written. Here the maxim applies that what the law does not prohibit, the law allows." (Manual of Penal Execution, Theory and Practice, 7th edition, Editora JusPODIVM, pages 232, 236)."

There are several understandings, including those of the STJ – Superior Court of Justice – regarding the scope of the crime of criminal organization, understanding that association with drug trafficking also qualified as an impeding crime not to grant the benefit, but in a recent decision, the STF – Federal Supreme Court decided, clarifying the situation.

"In the specific case, therefore, the defendant is not entitled to the benefit of article 112, paragraph 3, of the Penal Execution Law, insofar as she was convicted of the crime of association for drug trafficking, provided for in article 35 of Law No. 11,343/2006. The Supreme Court has established jurisprudence in the sense that the extension of the expression "not having been part of a criminal organization", provided for as a requirement for the special progression of article 112, paragraph 3, of the Penal Execution Law, to cover convictions for the crimes of criminal association or association for trafficking constitutes an undue analogy to the detriment of the defendant, not admitted by Criminal Law, in honor of the principle of strict legality. This understanding is exemplified by HC 216.310 AgR, Justice Ricardo Lewandowski; HC 183.610 AgR, Minister Edson Fachin; and HC 210.667 AgR, Minister André Mendonça, from which I extract the following summary: INTERLOCUTORY APPEAL IN HABEAS CORPUS. PROGRESSION OF THE SENTENCE REGIME. ARTICLE 112, paragraph 3, item V, of the Penal Execution Law. CRIMINAL ORGANIZATION. PRINCIPLE OF STRICT LEGALITY. PROHIBITION OF ANALOGY IN MALAM PARTEM. 1. The jurisprudence of the Second Panel of the Federal Supreme Court has established that article 112, paragraph 3, item V, of the Criminal Execution Law covers only the criminal type of article 2 of Law No. 12,850, of 2013, and it is not appropriate to expand the scope of the rule, under the use of analogy in malam partem, to cover the crimes of criminal association (article 288 of the Criminal Code) or association for trafficking (article 35 of Law No. 11,343, of 2006), under penalty of violation of the principle of legality. Previous. 2. Interlocutory appeal dismissed. Thus, the Superior Court of Justice decided in disagreement with the point exposed. 3. In view of the foregoing, I deny the habeas corpus, but grant the ex officio order, to reinstate the judgment of the Court of Justice of the State of São Paulo. 4. Summons. Publish yourself. Communicate. Brasília, March 12, 2024 Minister NUNES MARQUES Rapporteur" (HC 235587).

Although the law refers only to women, there are already decisions that can also be extended to male prisoners, who fit the conditions provided for in the law, which is very fair, because the family is the main objective of the law.



PROGRESSION TO HEINOUS CRIME RESULTING IN DEATH

The analysis of the topic will start from article 112 of the LEP, mentioned above, but the focus will be on items VI and VIII, as provided.

VI - 50% (fifty percent) of the penalty, if the convict is:
(a) convicted of the practice of a heinous or equivalent crime, resulting in death, if it is primary, conditional release is prohibited;
VIII – 70% (seventy percent) of the penalty, if the convict is a repeat offender in a heinous crime or equivalent resulting in death, conditional release is prohibited.

These changes to the anti-crime package came with the purpose of tightening the rules for those convicted of heinous crimes resulting in death, making it difficult to progress the regime and prohibiting the granting of conditional release.

Regarding the progression of the regime for generic repeat offenders, in crimes of death, the STJ has already decided, through topic 1,196:

"The retroactive application of the percentage of 50% (fifty percent), for the purposes of regime progression, to a person convicted of a heinous crime, resulting in death, who is a generic recidivist, is valid, in accordance with the legal amendment promoted by Law No. 13,964/2019 in article 112, item VI, paragraph a, of Law No. 7,210/84 (Penal Execution Law), as well as the subsequent granting of conditional release, and may be formulated later based on article 83, item V, of the Penal Code, which does not constitute a combination of laws in the retroactive application of a more beneficial material criminal rule".

The decision was fair, considering that re-educating in this situation they were serving the fraction of 3/5 and drop to the level of 50%, and may also have the benefit of conditional release, which is prohibited for heinous crimes, resulting in death, committed after the entry into force of the anti-crime package.

FINAL CONSIDERATIONS


The study comprised the analysis of regime progressions in a broad way, with the changes to the Anti-Crime Package, which, despite having tightened the rules, benefited the re-educating in several aspects.

It is necessary, in view of the longer time they will spend incarcerated, that the State complies with the requirements provided for in the Penal Execution Law, providing the necessary means so that they can work, study, read, among other benefits, in the prison unit, so that they can, not only fill the time, but also and mainly, prepare themselves for the return to social life, with a profession, leaving better than when they entered the prison unit.



REFERENCES

1. Brasil – Nucci, G. de S. (2023). *Leis Penais e Processuais Penais Comentada* (Vol. 2, 6ª ed., p. 172). São Paulo: RT.
2. Brasil – Brasileiro, R. de L. (2024). *Manual de Execução Penal* (Vol. Único, 3ª ed., p. 34). Salvador: JusPODIVM.
3. Brasil – Superior Tribunal de Justiça (STJ). (2021). AgRg no Resp. n. 191967-72/MG, Rel. Ministro Félix Fischer, 5ª Turma, julgado em 30.03.2021.
4. Brasil – Superior Tribunal de Justiça (STJ). (2021). AgRg no HC 640.014/AC, Rel. Ministro Ribeiro Dantas, 6ª Turma, julgado em 23.05.2021.
5. Brasil – Brasileiro, R. de L. (2024). *Manual de Execução Penal* (Vol. Único, 3ª ed., p. 317). Salvador: JusPODIVM.
6. Brasil – Superior Tribunal de Justiça (STJ). (2024). RHC n. 200.670/GO, Rel. Ministro Sebastião Reis Júnior, julgado em 20.08.2024 e publicado em 23.08.2024.
7. Brasil – Miranda, R. de S. (2023). *Manual de Execução Penal: Teoria e Prática* (7ª ed., pp. 232 e 236). Salvador: JusPODIVM.
8. Brasil – Supremo Tribunal Federal (STF). (2024). HC 235585, Rel. Ministro Nunes Marques, julgado em 12.03.2024.

LABOR PROTECTION AND ITS IMPORTANCE FOR THE GENERATION OF BIOFUELS <https://doi.org/10.56238/sevened2024.029-054>**Fernando Ramos Bernardes Dias¹ and Alexandre Walmott Borges²****ABSTRACT**

This article studies the importance of Labor Law from the point of view of fundamental social rights, and how important it is for an adequate environmental policy and the energy matrix of biofuels. The national sustainable energy matrix is dependent on agricultural work, and this must be fair and adequate for energy generation to be truly sustainable. The research has the nature of strategic basic research presenting a possible solution in the regulation of work in the field. As it seeks to describe the labor regulatory system, but also to present a regulatory solution, it has a descriptive and exploratory character. The approach to the work is qualitative, seeking to express, in the end, the positive valuation for the correct respect for labor legislation and how important this is for the generation of clean energy. The research relied on bibliographic and documentary sources for its final draft.

Keywords: Biofuels. Employment contract. Seasonal agricultural crops. Social rights. Rural worker.

¹ Doctorate student in the Graduate Program in Biofuels at the Federal University of Uberlândia. Master's degree in Law from UEMG. Lawyer at Bernardes Advogados Associados, professor at Centro Universitário do Cerrado Patrocínio

E-mail: fernando@bernardesadv.com.br

² Doctor in Law from UFSC. He holds a PhD in history from UFU. He is a lead researcher at LAECC. Professor at UFU of the graduate program in law, UFU. He is a professor in the graduate program in biofuels, UFU and a visiting professor in the graduate program in law at UNESP.

E-mail: walmott@gmail.com



INTRODUCTION

LABOR LAW: CONSTITUTIONAL BASES FOR LABOR PROTECTION

The Brazilian Constitution of 1988 brought several provisions related to workers' rights. Numerous novelties came with the new Constitution, which reserved its own article (article 7) only for the expression of labor rights. It should be noted that in other articles of the CF/88 there are also express rights related to the worker. The words of Estefania Barbosa and others about CF 88:

By incorporating several benefit rights and so many goals and programs to be implemented by the State (such as ensuring full employment, the eradication of poverty and regional and social inequalities, among others), the Brazilian Constitution assumed a clearly guiding profile, determining in advance priority areas for the Government in the social and economic fields. (De Queiroz Barboza & Salomão Leite, 2022, p. 536)

Mallet's text is an example of how the principle of equality in labor law was built with the advent of the CLT. This passage serves to contrast with the equality contemplated in the constitution and that of the CLT, at the beginning of the twentieth century:

The precept that first draws attention in terms of equality in the labor field, and from which some rich and interesting considerations can be extracted, is article 5 of the CLT, introduced in the general part, with the clear objective of emphasizing the importance of the rule established. The provision states: "For work of equal value, equal pay shall correspond, without distinction of sex". Apart from the different implications of the rule, there are at least two points worth noting in it. On the one hand, the legislator's reference to equality only in terms of remuneration is significant. [...] On the other hand – this is the second point to note in article 5 of the CLT – the reference only to discrimination based on sex is significant, as if this were the only hypothesis of discrimination. (Mallet, 2008, pp. 244–245)

Starting from the principle of equality, one of the pillars of Labor Law, there is the principle of protection, a principle that is structural and governing labor relations, insofar as it reflects their purpose: the realization of social justice established by the Treaty of Versailles, in 1919. (Silva; Bersani, 2020).³ This principle can be conceptualized as follows:

The principle of protection is the main one of all the principles peculiar to labor law and all the others are inserted in it, since they are derived from this greater precept, which is the protection that labor law provides to the worker, considered the most vulnerable party in the labor relationship.

The principle of protection is based on this unfavorable position in which the worker places himself before the employer, since, when there is a shortage of employment in the labor market, the tendency is for the employee to abdicate rights in exchange

³ 'Delgado (2007, p. 88) states that labor law arose from the combination of three specific groups of factors: economic, social and political. The economic factors result from the increase in the productive process through industry, which fostered subordinate work and moved the class of workers and employers in the production of goods and services, generating wealth for the States. The social factors were the concentration of the proletariat in large industrial cities, and the professional identification of the workers around the enterprise. Finally, the political factors stem from the intervention of society and the State, in the sense of regulating labor relations and ensuring rights – and legal certainty, therefore – to employees and employers.' (Araújo & Petri, 2017, p. 147)

for employability. On the contrary, the economic power represented by the employer, when there is a surplus of labor, will also use this mismatch in the law of supply and demand to impose on the employee the waiver of rights in exchange for employment. Thus, and in view of this unfavorable structural framework in the capital/labor relationship, the need for state intervention in the economic and social order and in the labor market emerges to impose brakes on the impulses that lead to the exploitation of labor. (Araújo & Petri, 2017, p. 149)

The novelty of the Constitution was, in addition to expressly giving constitutionality to some labor rights, to give these status of fundamental rights. For this reason, such rights are endowed with the characteristic of immediate applicability, as expressly stated in paragraph 1 of article 5 of the 1988 Constitution. A good summary of this constitutional openness in the text by Estefania Barbosa:

In order to provide more protection to fundamental rights, the Constitution brought two extremely relevant precepts. The first consists of art. 5, paragraph 1, by which it is determined that the norms defining fundamental rights and guarantees have immediate application. As a consequence, state institutions, including the democratic legislator itself, are bound by fundamental rights and constitutional guidelines related to public and economic policies. Thus, both the actions of the Government that excessively restrict some fundamental right beyond the limits allowed by the Constitution, as well as the omissions that prevent or hinder its exercise, are subject to judicial control. The second precept concerns the wording of article 5, paragraph 2, by which the rights and guarantees expressed in the Constitution do not exclude others arising from the regime and principles adopted by it or from international treaties to which the Federative Republic of Brazil is a party. With this rule, an opening clause is established, making the catalog of fundamental rights (already quite extensive) not exhaustive. The Constitution, therefore, opens up to other normative sources, especially international human rights treaties and conventions, thus composing a robust block of constitutionality. (De Queiroz Barboza & Salomão Leite, 2022, p. 537)

In addition, it transformed labor rights into stony rights, since constitutional amendments tending to abolish such articles cannot even be deliberated by the National Congress, as expressly provided for in article 60, paragraph 4, IV of the Federal Constitution.

Fundamental rights, according to the aforementioned article of our Federal Constitution, cannot even have propositions of amendment deliberated by the national congress. They belong to the so-called rigid core of the Constitution. Some national authors, among them the renowned master José Afonso da Silva, call such clauses stony, given their rigidity. The fact is that legislators decided to ensure that such rights would only be changed if a new Constituent Assembly was convened, that is, fundamental rights would only be suppressed in the event of the promulgation of a new constitution (SILVA, 2022).

The words of João Pedro Vicente and others on labor and economic policy in the CF:

In the course of the redemocratization process, numerous social movements reorganized themselves in the last Constituent Assembly, with the aim of affirming social rights (today engraved in art. 6 of the FC/88). Finally, in 1988, a new legal

order, based on the Constitution, defines Brazil as a Democratic State of Law (art. 1, CF/88) and proclaims a series of social guarantees. In line with this, the economic and financial order established by the Magna Carta, under the terms of its article 170, arises on the basis of the valorization of human work and free enterprise, observing principles such as private property and free competition. At first glance, it can be seen that the model adopted by the country follows the liberal capitalist concept "Laissez Faire, Laissez Passer" (Let it be done, let it pass), represented by the Scotsman Adam Smith (1723 -1790), whose idea was sheltered in the notion of market freedom and reduction of state interventionism. However, a careful reading of the aforementioned constitutional provision makes it clear that national economic policies, based on the valorization of work, will aim to promote social justice, also observing the social function of property. Thus, despite the encouragement of the free exploitation of economic activity, it cannot be forgotten that the Major Law imposes social limits on business activity. (Vicente & Paixão, 2023, p. 113)

The principles of Labor Law constitute the starting point for the study and application of labor standards. In them we find the source of legitimacy, validity and the reason for the existence of labor laws, as they were constructed. (Silva; Bersani, 2020). The classification of the principles of labor law in Nilson de Araújo's text:

In the enumeration of the general principles of law applicable to labor law, the following can be identified: the principle of the dignity of the human person, contained in article 1, item III, of the Constitution; the principle of non-discrimination (articles 2, IV, and 5, *caput* and item I, of the Constitution); the principle of reasonableness and good faith; and the principle of irreversibility of social achievements and guarantees (SCHWARZ, 2011, p. 29-33). As for the specific or peculiar principles of labor law, there is a certain consensus about the principle of protection, which, for some scholars, is the only principle inherent to labor law, deriving from it other specificities that are called peculiarities of labor law. However, other principles are also mentioned in doctrine and jurisprudence, such as the principles of non-renounceability, the principle of continuity, the principle of the primacy of reality, the principle of reasonableness, the principle of good faith, the principle of the most favorable norm for the worker, the principle of maintenance of the most favorable condition for the worker, the principle of the imperativeness of labor standards, the principle of unavailability of rights. (Araújo & Petri, 2017, p. 148)

Such constitutional provisions, for example, end up generating new legal/labour norms. An example is the clear constitutional support for gender equality to be fruitful, as well as for the eradication of child labor. This can only happen due to the normative force given by the FC. Let's see what Paulo Rogério Marques Carvalho (Carvalho, 2020) says: ⁴

⁴ Another example of this production of norms. Another point is the right of young people to professionalization, work and income. From the prohibition of child labor, laws such as Law No. 12,852/2013 were enacted, which presents a viable alternative, within the lawful work of minors, even in rural activity: Art. 15. The action of the public authorities in the realization of the right of young people to professionalization, work and income includes the adoption of the following measures: (...) VI – support for young rural workers in the organization of family farming production and rural family enterprises, through the following actions: a) stimulation of production and diversification of products; b) promotion of sustainable production based on agroecology, family agro-industries, integration between crops, livestock and forestry, and sustainable extractivism; c) investment in research into appropriate technologies for family farming and rural family enterprises; d) encouragement of the direct commercialization of family farming production, rural family enterprises and the formation of cooperatives; e) guarantee of basic infrastructure projects for access and flow of production, prioritizing the improvement of roads and transportation; f) promotion of programs that favor access to credit, land and rural technical assistance; (BRAZIL, 2013). The benefits provided by technological development, according to the Education



"The World Economic Forum's 2015 Global Gender Gap Report informs that at the pace of progress we are at, world society will take 118 years to achieve economic gender parity, which demonstrates the fruitfulness of gender equality in the workplace."

ENVIRONMENTAL LABOR LAW

Environmental Labor Law aims to protect the work environment. Labor Law, in turn, deals with contractual legal relationships between employee and employer. Environmental Law, on the other hand, aims to protect the environment, linked to sustainability strategies. When thought of together, the benefits encompass both institutes, reducing the commute of employees, collaborating to reduce pollutants and environmental degradants, and also contributing to a more sociable and family life for those who waste less time commuting and gain flexibility in their schedules and more free time. (Martins; Paschoalino; Montal, 2019). About the object of environmental labor law:⁵

Manual for Sustainable Consumption, is the constant growth in energy consumption (SANTANA JUNIOR, 2016). In other words, a demonstration that work and energy generation (biofuels) are linked.

⁵ In this judgment there is a good illustration of the content: INTERLOCUTORY APPEAL. APPEAL ON A POINT OF LAW. PROCEEDING UNDER THE AEGIS OF LAW 13,015/2014 AND PRIOR TO LAW 13,467/2017. 1. COMPENSATION FOR MORAL DAMAGES. OCCUPATIONAL DISEASE. CAUSAL NEXUS. EMPLOYER'S CIVIL LIABILITY. Since it was demonstrated in the interlocutory appeal that the appeal on a point of law met the requirements of article 896 of the CLT, as to the subject matter in question, the interlocutory appeal is granted, for a better analysis of the allegation of violation of article 5, X, of the Federal Constitution, raised in the appeal on a point of law. Interlocutory appeal granted. B) APPEAL ON A POINT OF LAW. PROCEEDING UNDER THE AEGIS OF LAW 13,015/2014 AND PRIOR TO LAW 13,467/2017. 1. COMPENSATION FOR MORAL DAMAGES. OCCUPATIONAL DISEASE. CAUSAL NEXUS. EMPLOYER'S CIVIL LIABILITY. Compensation resulting from an occupational accident and/or occupational or occupational disease presupposes the presence of three requirements: a) occurrence of the event that triggers the damage or the damage itself, which is verified by the fact of the disease or accident, which, by themselves, attack the moral and emotional assets of the worker (in this sense, the moral damage, in such cases, is verified by the very circumstance of the occurrence of the physical or psychic harm); b) causal or concausal nexus, which is evidenced by the fact that the harm occurred in view of the working conditions; c) corporate fault, except in the cases of strict liability. Although fault cannot be presumed in several cases of moral damage - in which the fault must be proven by the plaintiff - in the case of an occupational or occupational disease or an occupational accident, this fault is presumed, because the employer has control and direction over the structure, dynamics, management and operation of the establishment in which the damage occurred. The Federal Constitution of 1988 ensures that everyone has the right to an ecologically balanced work environment, because it is essential to a healthy quality of life, which is why it is incumbent on the Government and the community, which includes the employer, the duty to defend and preserve it (articles 200, VII, and 225, caput). It is for no other reason that Raimundo Simão de Melo warns that the prevention of environmental risks and/or elimination of occupational risks, through the adoption of collective and individual measures, is essential for the employer to avoid damage to the work environment and the health of the worker. Occupational accidents and/or occupational or occupational diseases, in most cases, "are perfectly predictable and preventable events, since their causes are identifiable and can be neutralized or even eliminated; are, however, unforeseen as to the moment and degree of aggravation for the victim" (MELO, Raimundo Simão de. Environmental labor law and workers' health. 5.ed. São Paulo: Ltr, 2013, p. 316). Both the physical and mental health, including the emotional health, of the human being are fundamental assets of his life, private and public, of his intimacy, of his self-esteem and social affirmation and, to this extent, also of his honor. They are assets, therefore, unquestionably protected, as a general rule, by the Constitution (art. 5, V and X). Thus, when attacked in the face of labor circumstances, they deserve even stronger and more specific protection from the Constitution of the Republic, which is added to the previous generic one (art. 7, XXVIII, CF/88). It is the employer's responsibility, of course, for compensation for moral, material or aesthetic damages, resulting from injuries linked to work misfortune, without prejudice to the payment, by the INSS, of social security. In the case in question, the Court of origin, in spite of the possibility of concausality between the labor services and the disease that affects the Worker (bilateral plantar fasciitis),

Nevertheless, it is worth noting that the work environment, as the primary object of the Environmental Labor Law, was protected by the Constitutional Charter of 1988, expressly, in article 7, when it ensures, among the rights of urban and rural workers, the "reduction of risks inherent to work, through health, hygiene and safety standards" (item XXII), the additional remuneration for painful, unhealthy or dangerous activities, in accordance with the law" (item XXIII) and "insurance against occupational accidents, at the expense of the employer, without excluding the indemnity to which it is obliged, when it incurs intent or fault" (item XXVIII). It is also observed that the environment (Article 225) and the work environment in particular (Article 200, VIII) received specific constitutional protection in the context of the social order, which "is based on the primacy of work, and as its objective the well-being and social justice" (Article 193 of the Constitutional Charter of 1988). Aware that Environmental Labor Law is premised on the defense of a healthy, sustainable, balanced and safe work environment for workers in general, (Carvalho & Franco Rêgo, 2013, p. 228)

The principle of human dignity emphasizes that the environment and the work environment must be interconnected, cooperating for a higher quality and autonomy well-being. It is known that if there is an improvement in the quality of life of employees, they will have greater performance and satisfaction for the performance of their duties, and the main factor is a favorable climate for the creation and production of creative ideas, which flexible hours and increased hours for daily practices can benefit everyone, including the

ratified the sentence in the sense that the occupational nature of the disease was not configured and, consequently, maintained the rejection of the related claims - compensation for moral damage and provisional stability. However, the factual context outlined by the Court of origin allows this Court to proceed with a different legal framework of the issue. As extracted from the judgment under appeal, after the medical expert opinion, the expert reported that the Worker "was affected by bilateral Plantar Fasciitis, an inflammatory disease on the soles of the feet associated with the excessive use of this tissue, diagnosed during the agreement with the Defendant" and that "Excess body weight and orthostatism inherent to his work activity were the risk factors identified in this case, which is why we conclude by establishing the concausation". It is also appropriate to highlight that it was established in the regional judgment that, "With regard to the activities performed in favor of the defendant, during the expert evaluation, the plaintiff reported that 'he worked effectively, for 07 years at the defendant, standing. In front of the table, he welded exhaust parts. I used MIG' (fl. 436)". It is verified, therefore, that the expert stated, in a clear and consistent manner, the possibility that the work activity had acted as a concurrent element to the worsening and worsening of the symptoms, which evidences the occupational nature of the disease that affects the Worker. Since the enactment of Decree 7,036/44, the Brazilian legal system admits the theory of concausation, which is expressly provided for in the current legislation (article 21, I, of Law 8,213/91). In this view, based on the factual premises set out in the contested decision, if the working conditions to which the worker was subjected, although not the sole cause, contributed to the reduction or loss of his working capacity, or produced an injury that requires medical attention for his recovery, he must be assured compensation for the damages suffered. Once the occupational disease, the damage and the causal link are verified, and considering that the employer has control and direction over the structure, dynamics, management and operation of the establishment in which the damage occurred, the premise of the presumed fault of the Respondent emerges and, consequently, the configuration of the elements that give rise to civil liability (damage, causal link and corporate fault) and the duty to indemnify. It should be noted that, in relation to moral damage, the existence of an occupational disease or sequelae of a work accident, by itself, violates the dignity of the human being (limitation of his physical condition, even if temporary), generating indisputable intimate pain, discomfort and sadness. There is no need to prove concrete damage (in this sense, the moral damage, in such cases, is verified by the very circumstance of the occurrence of the physical or psychological harm), because the legal protection, in this case, focuses on an immaterial interest (article 1, III, of the FC). Appeal for review known and granted. ... (TST - RR: 15803920175120025, Rapporteur: Mauricio Godinho Delgado, Judgment Date: 09/09/2020, 3rd Panel, Publication Date: 09/11/2020)

environment. (Picarelli, 2003). Thus, the principle of environmental labor law is the full protection of the worker:⁶

The principle of *full protection of the worker* is based on the notion that whatever the work regime, such as formal jobs or atypical employment contracts, the entrepreneur (or service taker) has direct and immediate responsibility to implement preventive measures and protective measures of a collective matrix, to safeguard the healthiness of the work environments. Consequently, despite recognizing the essentially coercive and asymmetrical nature of labor relations, with the existence of differentiated processes of provision (outsourcing, quarterization, temporary and transitory contracts), workers must have full protection of their health, regardless of the form that the contract takes. In this regard, whatever the contractual form, the employer must be responsible for the health of its workers, whether they work in the production unit or even in the residential environment. (Rocha, 2002, p. 129)

In other words, it is indissoluble, therefore, to dissociate work from the environment. As will be seen later, the modern corporate world no longer dissociates the work environment from the sustainability strategy. In other words, a business only becomes sustainable and ethically accepted if not only environmental protection standards are observed, but also respect for human rights and workers' rights. The relationship between labor law and environmental law in the protection of workers' rights:

Now, authors such as Hubert Seillan (1994, p. 37) state that Labor Law and Environmental Law are the results of the failure of the liberal principle of *laissez faire*, which developed and were formed at different times and under different conditions. The two branches of Law arise due to the consequences produced, respectively, in the health and life of the human being and in nature. Furthermore, both Environmental Law and Labor Law, each in its own way, have legislated on the work environment. Rocha (2002, p. 274) states that each of these fields of legal knowledge, *by itself*, cannot understand the dimension of the work environment. And therefore, a specific legal field would be necessary, with its guiding principles and postular rules to deal with the healthy, safe and sustainable work environment. This field of Law translates into Environmental Labor Law. (Carvalho & Franco Rêgo, 2013, p. 226)

⁶ The evolution of environmental legislation in Brazil: '... c) In 1981, during the dictatorial regime and during the term of the last president-general, Federal Law No. 6,938, which brought the regulation of a "national environmental policy", was enacted. Therefore, despite the dictatorial lines, there was an absorption of the content of environmental discussions into the national normative space. d) The constituent process that developed and resulted in the 1988 Federal Constitution incorporated a broad list of fundamental rights, all the functional and material aspects of the Rule of Law and, as it could not be otherwise, the environmental issue in its content. It should be noted, in attention to the previous item, that in 1981 the dictatorial regime was already in decline and with the need to succeed the civil and democratic regime. e) Gradually, in the 1990s, the Brazilian State began to move towards the incorporation of various documents of international law, and adopted a posture of active change in its participation in international forums, and there was the reception of many treaties, conventions and other human rights documents. The significant milestone of this change was the holding of the ECO 92 conference in the city of Rio de Janeiro. It should be noted that this conference was preceded by a series of negative events. During the 1980s, some significant events brought the environmental issue to the center of political discussions in Brazil: the Cubatão tragedy, predatory practices in the Amazon rainforest, the predation of wild animals and the trafficking of the products of this predation, and the assassination of environmental leader Chico Mendes. f) Throughout the 1980s and early 1990s, several modifications and implementations were made to Law No. 6,938, the 'national environmental policy law'. New state environmental agencies were created, new administrative regulations and the national environmental policy law was supplemented by other environmental laws.' (A. B. de Oliveira et al., 2022, pp. 153–154)

The STF has final decisions establishing the relationship between work, free enterprise, and the transgenerational character of environmental protection. In ADI 6218 there is an example of this:

Free enterprise (FC, art. 1, IV and 170, caput) does not prove to be an end in itself, but a means to achieve the fundamental objectives of the Republic, including the protection and preservation of the environment for present and future generations (FC, art. 225). [ADI 6.218, rel. min. Nunes Marques, red. of Ac. Min. Rosa Weber, j. 3-7-2023, P, *DJE* of 21-8-2023.]

Another good example is ADI 3,540. In this judgment, there is a manifestation of the character that crosses generations and the imposition of a programmatic guideline of preservation for future generations:

The issue of national development (FC, art. 3, II) and the need to preserve the integrity of the environment (FC, art. 225): The principle of sustainable development as a factor for achieving the right balance between the demands of the economy and those of ecology. The principle of sustainable development, in addition to being impregnated with an eminently constitutional character, finds legitimizing support in international commitments assumed by the Brazilian State and represents a factor in obtaining the right balance between the demands of the economy and those of ecology, subordinating, however, the invocation of this postulate, when a situation of conflict between relevant constitutional values occurs, to an inescapable condition, whose observance does not compromise or empty the essential content of one of the most significant fundamental rights: the right to the preservation of the environment, which translates into a good for the common use of the generality of people, to be safeguarded in favor of present and future generations. [ADI 3.540 MC, rel. min. Celso de Mello, j. 1-9-2005, P, DJ of 3-2-2006.]

As a result of what was enshrined in the judgments above, the mention of the judgment on the nature and quality of environmental law. The decision defines the peculiar nature of environmental law, transversal and belonging to all:

Environment. Right to the preservation of its integrity (FC, art. 225). Prerogative qualified by its character of meta-individuality. Third-generation (or brand new) right that enshrines the postulate of solidarity. The need to prevent the transgression of this right from erupting intergenerational conflicts within the collectivity. Specially protected territorial spaces (FC, art. 225, § 1, III). Amendment and suppression of the legal regime pertinent to them. Measures subject to the constitutional principle of reservation of law. Suppression of vegetation in a permanent preservation area. Possibility for the public administration, in compliance with the legal requirements, to authorize, license or permit works and/or activities in the protected territorial spaces, provided that the integrity of the attributes justifying the special protection regime is respected. Relations between economy (FC, art. 3, II, c/c art. 170, VI) and ecology (FC, art. 225). Collision of fundamental rights. Criteria for overcoming this state of tension between relevant constitutional values. The basic rights of the human person and the successive generations (phases or dimensions) of rights (*RTJ* 164/158, 160-161). The question of the precedence of the right to the preservation of the environment: an explicit constitutional limitation to economic activity (FC, art. 170, VI). Decision not endorsed. Consequent rejection of the request for precautionary measure. The preservation of the integrity of the environment: constitutional expression of a fundamental right that assists the generality of people.

INDIVIDUAL LABOR LAW (ARTICLE 7 OF THE 1988 CONSTITUTION)

For the treatment of individual labor law, it is worth emphasizing, once again, the purpose of labor law:

"The purpose of Labor Law is to ensure better working conditions, but not only these situations, but also social conditions for the worker. Thus, Labor Law is based on improving the working conditions of workers and also their social situations, ensuring that workers can provide their services in a healthy environment, being able, through their salary, to have a dignified life so that they can play their role in society. Labor Law intends to correct the deficiencies found within the company, not only with regard to working conditions, but also to ensure decent remuneration so that the worker can meet the needs of his family in society. Labor Law aims to improve these conditions of the worker" (Silva, 2019, chap. 3)

With regard to labor rights themselves, that is, labor rights related to individual labor law, these are expressed in article 7 of the Constitution. With the suggestive name of social rights, the Constitution, as already mentioned, gives special emphasis to such rights. Basically, this article provides for the rights of the worker in relation to the employment contract.⁷

⁷ MOTION FOR CLARIFICATION GOVERNED BY LAW NO. 13,015/2014. PUBLIC CIVIL ACTION. ACTIVE LEGITIMACY OF THE LABOR PUBLIC PROSECUTOR'S OFFICE. REQUEST FOR PAYMENT OF OVERTIME AND REFLEXES. HOMOGENEOUS INDIVIDUAL RIGHT. This is a public civil action filed by the Labor Public Prosecutor's Office with a request for payment of overtime worked and its reflections on other titles, among others. The Panel recognized the legitimacy of the Parquet to file the lawsuit, on the grounds that it is a homogeneous individual right. It is known that the active legitimacy of the Parquet, on the occasion of the filing of a public civil action, in the search for the defense of collective interests lato sensu, is based on the defense of social and individual interests that are inalienable, under the terms provided for in article 127 of the Federal Constitution. It should be noted that the Federal Supreme Court has already settled the understanding that homogeneous interests are a kind of collective interests and this SbDI-1 has already settled the understanding regarding the legitimacy of the Public Prosecutor's Office to file a public civil action for the defense of homogeneous individual interests. In this case, the holder of the right is perfectly identifiable and the object is divisible and fissile, characterized, however, by its common origin (as a result of the same fact), which gives it the character of a collective right lato sensu. Therefore, it seeks the reparation of the rights of several employees due to the company's conduct, which did not comply with its labor obligations, a situation, therefore, uniform for all its employees. It should be noted that the homogeneity that characterizes the right is not in the individual consequences on the assets of each worker, arising from the recognition of this right, but in the single act and collective effects by the employer of non-compliance with the legal rule and in the damage caused to the category of employees, as a whole, who, in this case, no longer have the opportunity to realize the payment of overtime resulting from the non-compliance with the working hours provided for in the Federal Constitution and in the CLT. Thus, once the common origin of the right is configured, in such a way as to legitimize the action of the Parquet, the fact that individualization is necessary to determine the amount due to each employee does not detract from it, since homogeneity concerns the right, and not its quantification, because homogeneous individual rights are not identical individual rights. needing only that they result from a common harmful fact. Thus, verifying that the right whose protection was postulated in this public civil action has a common origin, as it arises from an irregularity practiced by the employer to a group formed by its employees, it is necessary to conclude that it is a homogeneous individual right, under the terms of article 81, sole paragraph, item III, of the CDC. Therefore, in the case of a homogeneous individual right protection, the active legitimacy of the Labor Public Prosecutor's Office to file this public civil action is patent, based on article 83, item III, of Complementary Law No. 75/93, under the terms decided by the Panel, which is why the embargoed decision must be maintained. Motions known and dismissed. (TST - E: 5417620105020042, Rapporteur: Jose Roberto Freire Pimenta, Judgment Date: 02/04/2021, Subsection I Specialized in Individual Disputes, Publication Date: 02/12/2021)

The rights of workers, in the form of article 7 of the CLT, are: the equality between urban and rural workers, the prohibition of arbitrary dismissal, unemployment insurance, the Guarantee Fund for Length of Service, the minimum wage, the wage floor, the irreducibility of wages, the guarantee of the minimum wage, the 13th salary, the night bonus, the prohibition of willful withholding of wages, profit sharing, family wage, 44-hour workweek, reduction of working hours through collective agreements, paid weekly rest, overtime bonus, vacations, maternity and paternity leave, protection of women, children and adolescents, prior notice, occupational safety and medicine, payment of additional for arduous activity, unhealthy and/or dangerous, retirement, collective bargaining agreements, occupational accident insurance, the prohibition of wage differences, the protection of the physically disabled and the extension of some labor rights to domestic workers.

The protective principle is in article 7 of the Federal Constitution, which establishes the improvement of the social condition: "These are the rights of urban and rural workers, in addition to others aimed at improving their social condition" (BRASIL, 1988), and consolidated the understanding that Labor Law deserves state protection. This principle is expressed in three distinct forms: the principle or rule of the most beneficial condition, the principle or rule of the norm most favorable to the worker, and the principle or rule in dubio pro-worker. (SILVA; BERSANI, 2020).⁸

Leite also states that there is a principle that is directly interconnected, the principle of protection of the work environment, which is presented in the CRFB, in article 225 and article 200, VIII. (LEITE, 2019).

⁸ APPEAL ON A POINT OF LAW. LAWS Nos. 13,015/2014 and 13,467/2017. FOOD ALLOWANCE. LEGAL NATURE. SUBSTANTIVE LAW. EMPLOYMENT CONTRACT IN FORCE AT THE TIME OF THE ENTRY INTO FORCE OF LAW NO. 13,467/17. INTERTEMPORAL LAW. POLITICAL TRANSCENDENCE RECOGNIZED. 1. The discussion of the case revolves around the application of the new wording given to paragraph 2 of article 457 of the CLT to employment contracts in force at the time of the entry into force of Law No. 13,467/2017. 2. It should be noted that the position of this Court is that the change in the legal nature of the food allowance, from salary to indemnity, does not reach employees who already habitually received the benefit, in view of the incorporation of this more beneficial condition into the worker's legal assets (Jurisprudential Guidance No. 413 of SBDI-1 of the TST). 3. It should be added that this Court, with regard to the basis for calculating the hazard pay for electricians, consolidated the understanding that no legislative change prevails for contracts in progress under the terms of item III of Precedent No. 191 of the TST. 3. Considering the institutional role of this Court in standardizing labor jurisprudence, as well as an in-depth analysis of the matter, in the light of intertemporal law, I understand that the amendment given to paragraph 2 of article 457 of the CLT by Law No. 13,467/2017 is inapplicable to employment contracts in progress at the time of its enactment, since the suppression or alteration of a right incorporated into the employee's legal assets, with a reduction in remuneration, it offends the perfect legal act, in accordance with the provisions of arts. 5, XXXVI, and 7, VI, of the Constitution of the Republic and 6 of the LINDB. Previous. 4. In the hypothesis, the Regional Court, by limiting the order to the payment of the food allowance to 11/10/2017, on the grounds that its legal nature became compensatory, in view of the changes given to paragraph 2 of article 457 of the CLT, by Law No. 13,467/2017, violated article 5, XXXVI, of the Constitution of the Republic. Appeal on a point of law that is known and granted. (TST - RR: 00110901120215150136, Rapporteur: Alberto Bastos Balazeiro, Judgment Date: 04/19/2023, 3rd Panel, Publication Date: 04/28/2023)

In article 7 of the CRFB, items XIII, XIV, XV, XVI and XVII can be extracted, which will deal with the principle of limitation of the duration of work. Item XXVII, principle of protection in the face of automation. Item XXII, principle of reduction of risks inherent to work. And, item XXVIII, which is divided into two, but both with the purpose of the principle of mandatory insurance against work accidents. The first part shows the principle of the employer's civil liability for moral and material damages suffered by the worker. The second part shows the principle of payment of additional remuneration for unhealthy, dangerous or painful activities, which is also found in item XXIII. (LEITE, 2019).

In a Constitutional context, the right to disconnect is treated as a fundamental right, as it reflects directly on the employee's private life and health, this is provided for in article 7, XIII and XV, of the CRFB:

Article 7 - The rights of urban and rural workers, in addition to others aimed at improving their social condition, are:
(...)
XIII – normal working hours not exceeding eight hours per day and forty-four hours per week, with the possibility of offsetting hours and reducing working hours, by means of a collective bargaining agreement or convention;
XV – Paid weekly rest, preferably on Sundays. (BRAZIL, 1988)

The Federal Constitution of 1988 also mentions that there must be no abuse or invasion of intimacy, mentioning the following: Article 5, X: "the intimacy, private life, honor and image of people are inviolable, ensuring the right to compensation for material or moral damage resulting from their violation;". The same CRFB/1988 provides as a worker's right (Art. 7, XXVII) the "protection against automation, in the form of the law." (BRAZIL, 1988).⁹

Article 7, XIII, of the CRFB, establishes that urban and rural workers are entitled to "working hours normally not exceeding eight hours per day and forty-four hours per week, with the possibility of compensating hours and reducing the working day, by means of a collective bargaining agreement or agreement". (BRAZIL, 1988).

It should also be noted that there are some items of the aforementioned article that are not, in general, fundamental rights of workers, but rather rules that govern the exercise

⁹ APPEAL ON A POINT OF LAW. COMPENSATION FOR MORAL DAMAGES. RESTRICTION OF BATHROOM USE. POLITICAL TRANSCENDENCE RECOGNIZED. 1. There is political transcendence when it is found in a preliminary examination that the respondent instance has disrespected the majority jurisprudence, predominant or prevailing in the TST. 2. According to the jurisprudence of this Court, the control exercised by the employer over the use of bathrooms by employees characterizes an unlawful act capable of giving rise to the payment of compensation for moral damages. Precedents of Subsection I Specialized in Individual Disputes - SBDI-I . 3. Pursuant to article 5, X, of the Federal Constitution, the intimacy, private life, honor and image of people are inviolable, and the right to compensation for material or moral damage resulting from their violation is ensured. 4. Therefore, if the elements that give rise to the conviction (damage, causal link and fault of the employer) are present, there is no way to reject the request made by the claimant. Appeal for review known and granted. (TST - RR: 00011132220185090021, Rapporteur: Jose Pedro De Camargo Rodrigues De Souza, Judgment Date: 04/26/2023, 6th Panel, Publication Date: 04/28/2023)

of these rights, such as the prescription of rights, the differentiation between manual and technical work and workers in the face of the automation of companies.

And, finally, citing article 7, XVI, of the CRFB, the jurisprudence prior to the labor reform already provided for the payment of overtime to teleworkers. Therefore, remote work in the execution system through technological resources, the inspection of the working day becomes indisputable and if there is overtime, overtime needs to be paid.

NORMATIVE FORCE OF CONSTITUTIONAL PROVISIONS RELATING TO LABOR

Since the birth of the 1988 Constitution, the normative force of the constitutional provisions on labor relations has afflicted scholars in the area, to the extent that many of them depend on full interpretation so that their effectiveness, effectiveness and efficiency can be guaranteed.

The normative force of constitutional provisions has long preoccupied jurists around the world, and more specifically, on April 16, 1862, Ferdinand Lassalle gave a lecture on the essence of the Constitution in which he stated that "constitutional questions are not legal questions, but political questions". Basically, Lassalle narrated that the Constitution of a country is treated as a simple piece of paper, and must be attentive to reality, and cannot be opposed to it. (HESSE, 1991)

Contrary to this idea, Konrad Hesse gave an inaugural lecture at the University of Freiburg-FRG in 1959, invoking the normative force of the legal constitution. Hesse (HESSE, 1991) rightly stated that:

"(...) The normative force of the Constitution does not reside only in the intelligent adaptation of a given reality. The juridical constitution itself succeeds in becoming an active force, which is based on the singular nature of the present (individuelle Beschaffenheit der Gegenwart). Although the constitution cannot, by itself, accomplish anything, it can impose tasks." (HESSE, 1991).

Therefore, Hesse opposed Lassalle's idea to the extent that the constitution should have full normative force, and it is not admissible to treat it as a simple piece of paper. Based on the authoritative opinions of Hesse and Lassalle, several jurists decided to propose a classification regarding the applicability of constitutional provisions. Paulo Rogério Marques de Carvalho (CARVALHO, 2020), clarifies that:

"The dialectics on the legal configuration of labor relations, which begin in the context of the debates on the draft of the German Civil Code of 1900, find in Anton Menger von Wolfensgrun (1841-1906) and Otto Friedrich von Gierke (1841-1921) criticisms of a legal-contractual modulation of labor relations based on Roman law and on an approximation of the treatment of labor relations with the sale and lease of things, which resulted in the provision of a duty of protection for the subordinate being provided for in the aforementioned German code and the starting point for the

different nuances on the nature of contractual labor relations developed by Heinz Pothof (1875-1945), Hugo Sinzheimer (1875-1945), Wolfgang Siebert (1905-1959), Arthur Nikish (1878-1968), Erich Molitor (1886-1963) and Phillip Lotmar (1850-1922), which integrate the theoretical bases of the regulation of labor phenomenology and the consolidation of its autonomy. It is important to emphasize that the emergence and development of these ideas in the Germanic doctrine were triggered by the Weimar Constitution, which required the standardization of labor regimes, recognized the State's duty of social protection to workers and protection of the collective agreement. Because of this rupture with the method, the labor lawyers were stigmatized as "sociologist jurists" who created a methodological syncretism." (Monebhurrin, 2020)

The Brazilian Constitution gives fundamental rights prerogatives to have immediate applicability, as can be seen from paragraph 1 of article 5 of the 1988 Constitution, due to which, it is presumed, they would have real effectiveness. The immediate applicability of fundamental rights - including the labor rights expressed in article 7 of the Constitution - is an intrinsic condition of fundamental rights, and it is certain that we would return to Lassalle's concept if we did not admit such immediate applicability. José Afonso da Silva, (Silva, 2022), one of the greatest names in national constitutionalism, classifies constitutional provisions by their effectiveness, which he conceptualizes as:¹⁰

"(...) Efficacy and applicability of constitutional norms constitute related phenomena, aspects perhaps of the same phenomenon, seen from different perspectives: the one with potentiality; this as realizability, practicality. If the norm does not have all the requirements for its applicability to concrete cases, it lacks effectiveness, it does not have applicability. This is thus revealed as a possibility of application."

Based on the definition of effectiveness, it proposes that the norms be classified as full effectiveness (which have produced practical legal effects since their entry into force), contained effectiveness (that the legislator restricts their effectiveness to restrictive action by the public power) and limited effectiveness (which depend on a specific law to achieve their full effectiveness). In this sense, in the words of José Afonso da Silva, the normative force of the Constitution is limited only to the effectiveness of constitutional norms.¹¹ (Silva, 2022)

¹⁰ Extradition and the need to observe the parameters of due process, the rule of law and respect for human rights. Constitution of Brazil, arts. 5, § 1, and 60, § 4. (...) Obligation of the STF to maintain and observe the parameters of due process, the rule of law and human rights. Information published in the media about the suspension of the appointment of ministers of the Supreme Court of Justice of Bolivia and possible interference by the Executive Branch in the Judiciary of that country. Need to ensure basic fundamental rights to the extradited person. Fundamental rights and guarantees must be immediately effective (cf. art. 5, § 1); the direct binding of state organs to these rights must oblige the State to observe them [Ext 986, rel. min. Eros Grau, j. 15-8-2007, P, *DJ* of 5-10-2007.] See Ext 1.428, rel. min. Gilmar Mendes, j. on 5-7-2019, 2nd T, *Dje* of 8-17-2020.

¹¹ TAX PRESCRIPTION AND DECAY. MATTERS RESERVED TO COMPLEMENTARY LAW. DISCIPLINE IN THE NATIONAL TAX CODE. TAX NATURE OF SOCIAL SECURITY CONTRIBUTIONS. UNCONSTITUTIONALITY OF ARTS. 45 AND 46 OF LAW 8.212/91 AND OF THE SOLE PARAGRAPH OF ART. 5 OF DECREE-LAW 1,569/77. EXTRAORDINARY APPEAL NOT GRANTED. MODULATION OF THE EFFECTS OF THE DECLARATION OF UNCONSTITUTIONALITY. I. TAX PRESCRIPTION AND DECAY.

Although there are some different classifications, Brazilian constitutionalism has basically adopted the teachings of José Afonso da Silva. However, the guarantor theory adopted by some Brazilian jurists, but which has its exponent in the Spanish author José Luiz Serrano, deserves a better appreciation. Unlike Silva, Serrano does not summarize the normative force of constitutional provisions as effectiveness, but rather in different concepts such as effectiveness of sanction and compliance, efficiency and effectiveness.¹²

Simple are the concepts brought by Serrano (1999), in which the effectiveness of the sanction would be the effectiveness of the norm that brings a sanction in the face of its non-compliance, and the effectiveness of compliance by which a norm would only be effective if its addressees comply with it. However, the concepts brought by Serrano that best deserve appreciation are the concepts of effectiveness and efficiency.¹³

RESERVATION OF COMPLEMENTARY LAW. The rules relating to tax prescription and decay have the nature of general rules of tax law, whose discipline is reserved to complementary law, both under the previous Constitution (article 18, paragraph 1, of the 1967/69 Federal Constitution) and under the current Constitution (article 146, b, III, of the 1988 Federal Constitution). An interpretation that preserves the normative force of the Constitution, which provides for homogeneous discipline, at the national level, of the statute of limitations, decay, tax obligations and credits. Allowing different regulation on these topics, by the various entities of the federation, would harm the prohibition of unequal treatment between taxpayers in an equivalent situation and legal certainty. II. DISCIPLINE PROVIDED FOR IN THE NATIONAL TAX CODE. The National Tax Code (Law 5,172/1966), enacted as an ordinary law and received as a complementary law by the Constitutions of 1967/69 and 1988, regulates the statute of limitations and tax decay. III. TAX NATURE OF THE CONTRIBUTIONS. Contributions, including social security contributions, are tax in nature and are subject to the legal-tax regime provided for in the Constitution. Interpretation of article 149 of the 1988 Federal Constitution. Previous. IV. EXTRAORDINARY APPEAL NOT GRANTED. Unconstitutionality of arts. 45 and 46 of Law 8,212/91, for violation of article 146, III, b, of the 1988 Constitution, and of the sole paragraph of article 5 of Decree-Law 1,569/77, in view of paragraph 1 of article 18 of the 1967/69 Constitution. V. MODULATION OF THE EFFECTS OF THE DECISION. LEGAL CERTAINTY. Payments made within the deadlines provided for in arts. 45 and 46 of Law 8.212/91 and not challenged before the date of conclusion of this trial. (STF - RE: 556664 RS, Rapporteur: Justice GILMAR MENDES, Judgment Date: 06/12/2008, Full Court, Publication Date: GENERAL REPERCUSSION - MERITS)

¹² "The interpreter of the Constitution is committed to carrying out his interpretative task (i) in order to avoid contradictions (antinomies, antagonisms) between the constitutional norms (principle of the unity of the Constitution); (ii) giving priority to criteria or points of view that favor political and social integration and the strengthening of political unity (principle of the integrating effect); (iii) attributing to the constitutional norm the meaning that gives it the greatest effectiveness (principle of maximum effectiveness); (iv) coordinating and combining the conflicting legal assets in order to avoid the total sacrifice of some in relation to others (principle of practical agreement or harmonisation) and, finally, (v) giving precedence to the points of view that, taking into account the assumptions of the (normative) constitution, contribute to the optimal effectiveness of the Fundamental Law (principle of the normative force of the constitution)." (Clève, 2015)

¹³ "To do so, it is necessary, first, to keep in mind that the constitutional text has normative force, radiating effectiveness and legislative command to all those who are under its jurisdiction. In this way, we have that item IV of article 8 of the Federal Constitution establishes that the general assembly of trade unions may set "the contribution that, in the case of a professional category, will be deducted from the payroll, to fund the confederation system of the respective union representation, regardless of the contribution provided for by law". See, then, that this constitutional provision contains two commands. By the first, the Constitution authorizes that trade unions, by resolution of their general assembly, may create a contribution to fund the confederation system. This contribution, as defined by the STF in its Precedent 666, can only be required from union members. Therefore, it is a revenue instituted by the interested party itself (union entity), through deliberation of its members. And, it should be said, for this purpose (adopting the prevailing understanding in the STF), this constitutional command was not even necessary, since any association can create a benefit to be paid by the member (monthly fee, extra fee, etc.), giving him the purpose he wishes (for his own use or for donation to a third party). And if the member does not agree with this provision, he is free to disaffiliate from the union entity, as well as any person in relation to the association of another nature to which he has joined. Either it pays the

A norm is said to be effective if a norm achieves the ends for which it is proposed. Efficiency, on the other hand, goes beyond the concept of effectiveness, and would be linked to the cost-benefit ratio of a standard. That is, if the norm achieves the ends it proposes through a reasonable cost. (SERRANO, 1999).

Through all the classifications proposed by the jurists exposed above, I have that the best is the one that can verify the normative force of a given constitutional norm, its effectiveness and efficiency, being certain that a norm can be efficient and effective, effective and inefficient, but never ineffective and efficient, since the concept of efficiency comes from the effectiveness of a norm.

Thus, for a constitutional rule, especially those related to labor provisions, to have real normative force, it is necessary that they be effective and efficient.

ON THE EFFECTIVENESS AND EFFICIENCY OF WORKERS' RIGHTS EXPRESSED IN THE CONSTITUTION

With regard to the normative force of the labor rights set forth above, it is first necessary to emphasize that the labor rights set forth in the 1988 Constitution are fundamental rights, in the sense that fundamental rights are considered "those rights of the human being recognized and affirmed in the sphere of the positive constitutional law of a given State". (SARLET, 2019)

For a consideration of ineffectiveness, see the excerpt below:

In Brazil, the main components of the Democratic Rule of Law, born from the 1986-1988 constituent process, are still awaiting its implementation. Old paradigms of law cause deviations in the understanding of the meaning of the Constitution and the role of constitutional jurisdiction. Old theories about the Constitution and legislation still populate the imagination of jurists, based on the division between "constitutional jurisdiction" and "ordinary jurisdiction", between "constitutionality" and "legality", as if they were distinct worlds, metaphysically separable. Such splits, as will be demonstrated throughout the work, stem from what in hermeneutic phenomenology we call the "forgetting of ontological difference." (Streck, 2014, item 1 – constitution and constitutionalism)

Thus, the condition of labor rights (so-called social) as a fundamental right is undeniable, since they are in positive norms recognized by our Constitution. It should be noted that the importance of knowing whether or not a norm is considered a norm of fundamental right lies in at least two facts: that they have immediate applicability and are stony clauses.

benefits provided for in the statutes or established by the members' assembly, or it withdraws from the entity or does not join it. And here the association and the individual act within the scope of their autonomy of will." (Meireles, 08/31/2018)

It is concluded, therefore, that constitutional provisions of a labor nature already have a great normative force, since they must have immediate applicability and cannot be subject to constitutional amendments that tend to abolish them, as explained in article 60, paragraph 4, IV of the Federal Constitution of 1988.

Interesting, in fact, is the thought of Ingo Wolfgang Sarlet (PEDRA, 2006) on the subject:

In fact, for Ingo Wolfgang Sarlet (2003b, p. 679), the stony clauses, which protect the set of constitutional goods essential to the preservation of the identity of the Constitution, necessarily include fundamental social rights, either by virtue of Article 60, §4, IV, of the CR, or in the condition of an implicit limit, since, for the purposes of recognizing their protection against possible amendment, especially by the Judiciary, the situations are virtually equivalent.

Just by the two issues raised above, the importance of this type of right can already be seen. However, for them to have full normative force, it is necessary that they enjoy effectiveness and efficiency. In this sense:

"Hence, the effectiveness of constitutional norms requires a redimensioning of the role of the jurist and the Judiciary (especially constitutional justice) in this complex game of forces, to the extent that the following paradox arises: a Constitution rich in rights (individual, collective and social) and a legal-judicial practice that, repeatedly, (only) denies the application of such rights, especially in terms of benefit rights and freedom rights.

Since the Brazilian Constitution, therefore, is a social, directing and binding Constitution – according to the concept that the (authentic) tradition has bequeathed to us – it is absolutely possible to affirm that its content is directed/directed to the rescue of the (unfulfilled) promises of modernity ("promises" understood as "rights engraved in democratically produced legal texts").

Hence, law, as a legacy of modernity – not least because we have (formally) a democratic Constitution – must be seen, today, as a necessary field of struggle for the implementation of modern promises (equality, social justice, respect for fundamental rights, etc.). Thus, taking into account the relevant circumstance that law acquires the age of majority in this period of history, it should immediately be clear that one cannot confuse positive law with positivism, legal dogmatics with dogmatism, and neither can one fall into the error of opposing criticism (or critical discourse) to legal dogmatics." (Streck, 2014, item 1 – constitution and constitutionalism)

As already mentioned, a norm is said to be effective when it meets the ends it proposes, and are efficient when such ends are achieved at a reasonable cost. It is known that there are many labor rights expressed in the Constitution that enjoy effectiveness, others efficiency, but there are others that are ineffective and, consequently, inefficient, and others that are inefficient, but effective. Let us exemplify them on a case-by-case basis.¹⁴

¹⁴ "The expression autonomy of law is not yet the object of a semantic agreement around which there are no controversies. Likewise, it is not the intention of the work to present a definitive theorization about the concept.

WORK AND SEASONALITY. APPLICATION TO THE REALITY OF SEASONAL CROPS AND ENERGY MATRIX

THE UNIVERSE OF WORK AND NATIONAL AGRICULTURAL PRODUCTION

The theme of the thesis fits into the broad discussion of bioeconomy. The theme of the very short-term contract is presented as the legal discussion of the regulation of human labor in the bioeconomy scenario:¹⁵

The bioeconomy has a broad concept and is defined by some authors as the fourth wave of technological revolution. The appropriate definition for this study is to relate the interaction between the bioeconomy and agriculture with the use of renewable resources, including economic growth driven by the development of biological resources and biotechnology for the production of sustainable products, employment and income. [...] The bioeconomy should play an increasing role in society, as rapid population growth creates possibilities for new markets for biotechnology, both in agriculture and industry. Thus, it will be necessary to set up research centers in developing countries to solve the problems of the population, including the growing need for low-carbon energy, clean water and the high yield of agricultural crops that can withstand environmental changes such as drought and heat. (K. C. de Oliveira & Zanin, 2015, pp. 23–24)

Therefore, dignified and environmentally appropriate work, in the thesis proposal, can be regulated by very short-term contracts. These contracts may be inserted into the universe of agrarian work in Brazil. It should be noted that agrarian work in Brazil is, percentage-wise, the sector of activity/work with the highest informality. For an initial idea about the universe of work in Brazil, the 2022 IBGE data. Here are the data for people over 14 years old according to the type of occupation:

By the autonomy of law we imagine the notion of Empire of Law or legal system. More precisely, a democratic environment in which legal discourse has autonomy and is functionally differentiated from politics, ethics, and morals, through the action of its institutions. In the autonomy of law, it is the normative dimension that gives validity to politics and not the other way around. Hence the notion of normative force of the Constitution." (Abboud, 2024)

¹⁵ The relationship of the energy matrix with the environment and climate justice: 'In this sense, the development of the ideas of Climate Justice and energy justice,¹ seem to be more appropriate to the necessary responses to the severity of the climate crisis experienced today, as they introduce means of jurisdictional coercive protection to the realization of GHG emission goals and policies used by civil society, in addition to reparations, against Governments and against Transnational Corporations, which are the ones who profit the most from out-of-control or underreported GHG emissions responsible for the climate crisis. Today, the energy transition presents itself as a turning point (Capra, 2012) or inflection point in human history and for its success, energies cannot only be renewable (sustainable), they need above all to be low CO₂ and GGE emission, with a low carbon footprint in their production chain, that is, in addition to being renewable, they need to be clean, with a low carbon footprint.' (Assis et al., 2024, p. 344)

Total	96 982 x 1000
Agricultural	8 507
Industry	12 327
Construction	7 253
Trade and repair	18 661
Public administration, education, health and service. Social	17 163
Transport, storage and mailing	5 227
Accommodation and food	5 287
Information, financial and other activities. Professionals	11 489
Domestic services	5 751
Other services	5 284

(IBGE, 2022)¹⁶

In addition to the data above, you can also see the characteristics of work in Brazil. It should be noted that informality is pronounced in the universe of work in Brazil and in Brazil of agricultural work. Along with construction, it is the sector with the highest informality of the workforce:¹⁷

		Formal	Informal
Total	96 982	59,1	40,9
Economic activity group (3)			
Agricultural	8 507	32,5	67,5
Industry	12 327	74,6	25,4
Construction	7 253	37,3	62,7
Trade and repair	18 661	63,3	36,7
Public administration, education, health and service. Social	17 163	76,2	23,8
Transport, storage and mailing	5 227	57,4	42,6
Accommodation and food	5 287	46,0	54,0
Information, financial and other activities. Professionals	11 489	75,7	24,3
Domestic services	5 751	25,4	74,6
Other services	5 284	40,7	59,3

(IBGE, 2022)

¹⁶ For direct access: <https://www.ibge.gov.br/estatisticas/sociais/trabalho/9221-sintese-de-indicadores-sociais.html>

¹⁷ According to Leite, Macedo, Dimenstein and Dantas (2013), the conditions related to poverty and misery are aggravated when the setting is the rural space. Socioeconomic indicators reveal that the Brazilian rural area has a considerable rate of illiteracy, food insecurity and infant mortality, difficulty in accessing public services and technical assistance, precarious working conditions and, consequently, dependence on federal government income transfer programs. ()The poor conditions of access to roads, poor quality of means of communication, few water resources, existence of environmental risks such as excessive pesticides, fires, drought, are situations that make the reality of rural workers difficult.

When we talk about rural populations, we are not only talking about an economic universe of production, but about a circuit of broader social relations. Important studies such as the Advanced Studies in Applied Economics (Cepea), in the third quarter of 2021, 8.818 million people were employed in rural activities and the Brazilian Institute of Economics (Ibre) of the Getúlio Vargas Foundation (FGV) point out that field workers represent 11.7% of the entire workforce in the country, studies are still scarce in this area. With this, this work arises with the purpose of questioning what has been scientifically produced about this worker? (Ferreira & Gonçalves de Freitas, 2023, p. 03)

This reality of informality can be contrasted with the data on work in the world of green energy:¹⁸

The sugar-energy chain stands out in the context of agribusiness and the Brazilian economy, having an important contribution to the generation of income and jobs. According to information from Cepea¹, 3.2% of the total number of persons employed in agribusiness in 2017 were in the activities of the sugar-energy chain (involved in the production of sugarcane, sugar and ethanol). The activity also has a high level of formalization within agribusiness, covering 8% of all jobs with a formal contract in the sector in the same year. As a comparison, while in the agricultural activity of sugarcane cultivation 80% of the employed persons are employed with a formal contract, for Brazilian agriculture in general this rate is only 17%. In the sugarcane agroindustry (sugar and ethanol mills), 95% of the employed are employed with a formal contract, while for the agroindustry in general this percentage is 58. In agribusiness as a whole, only 36% of the information compiled by Cepea based on microdata from PNAD-Continua and information from RAIS. occupied people have a formal contract. (Geraldo Sant'Ana de Camargo Barros, 2016 p. 03)

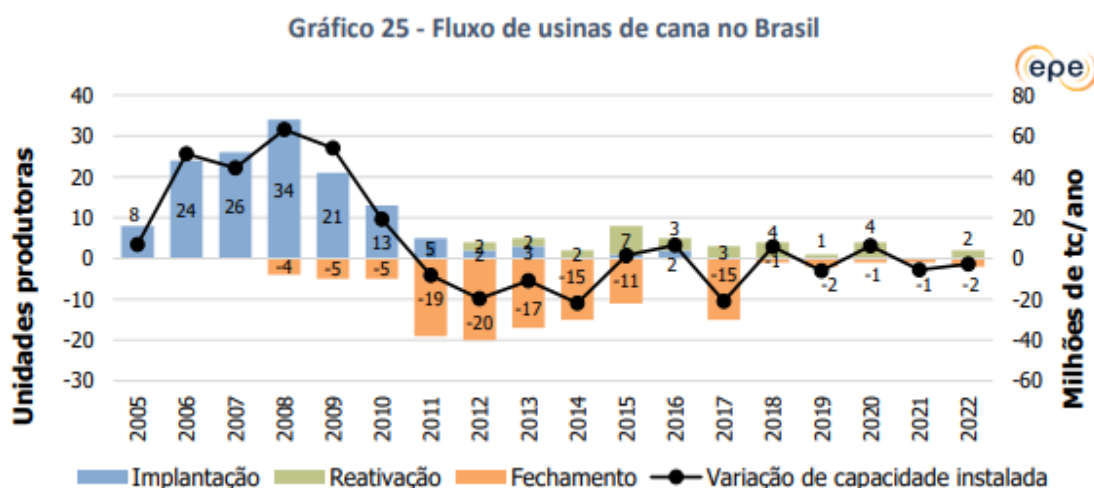
In the case of Brazil, and the production of biofuels, these workers are closely associated with the sugar-alcohol sector. Below the figure shows the design of production in this sector. The market had a period of installation and construction of plants followed, nowadays, by maintenance of structures and use of the capacity already installed:¹⁹



Figura 1. Evolução do número de empregos formais no Brasil e regiões de 2000 a 2016, no setor sucroenergético.

(GERALDO SANT'ANA DE CAMARGO BARROS, 2016, p. 05)

¹⁹ According to the ANP, in December 2022, 358 units were able to sell anhydrous and hydrous ethanol²⁷, whose production capacities were 136 thousand m³/day and 251 thousand m³/day, respectively. In addition, there were 21 requests²⁸ for the construction of new plants, which will add a capacity of 3.8 thousand m³/day of anhydrous and 6.1 thousand m³/day of hydrous. There were also 51 units with an indication of expansion of the production capacity of these biofuels. (EPE, 2022)



(EPE, 2022)

And the figure below shows the numbers of work in the crops that are a source of energy and biofuels, especially ethanol:

Tabela 1 - Evolução do número de trabalhadores formais no Brasil nas diferentes áreas do setor sucroenergético (quantidade e percentual de representatividade da atividade dentro do setor)
Fonte: Elaboração própria com base em dados da RAIS

	Indústria		Agrícola		Administrativo/outros	
	Quantidade	(%)	Quantidade	(%)	Quantidade	(%)
2000	64.454	10,0%	513.416	79,9%	64.978	10,1%
2004	88.807	9,9%	726.005	80,6%	85.956	9,5%
2008	132.923	10,4%	1.023.814	79,8%	126.521	9,9%
2012	146.125	13,4%	804.279	73,7%	141.171	12,9%
2016	126.172	15,9%	555.929	69,9%	112.810	14,2%

(Geraldo Sant'Ana de Camargo Barros, 2016 p. 06)

Another piece of information that deserves to be highlighted is that mechanization has impacted the sector. There is a reduction in the number of employees. There is also a change in the profile of employees in the sector:

In the second period analyzed (between 2008 and 2016), which includes the advance of mechanization and also the moment of crisis in the sector, the total number of jobs in the sector in Brazil decreased by 38%. This reduction was intense, especially for employees with up to 5 years of schooling, but it was also observed for the 6 to 9 years category. Contrary to this trend, the number of formal jobs grew 19% for workers with between 10 and 13 years of schooling and a significant 39% for workers with more than 13 years of schooling. In the same period, with the exception of the category of employees over 13 years of age, for all the others there were average real wage gains, with variations in the range of 20 to 31%. (Geraldo

RENEWABLE ENERGIES IN BRAZIL

Regarding renewable energies, Brazil stands out in the generation of solar energy, wind energy, using biomass, hydroelectric plants. A classification exploration is important to situate biomass energies and the relationship that these energies have with agricultural production.

A general point in common with all the energies and sources listed above is that they can be considered renewable energies, that is, they are energies that contrast with fossil fuels and the possibilities of neutralizing the effects of carbon release, or even methane, are quite palpable.

It should be clear that by using the possibilities of carbon neutralization, renewable energies are potentially capable of providing an 'environmentally friendly' energy matrix. However, such environmental capacity also depends on facing the socio-environmental impacts of these sources.

The discussion of this thesis, about a new bond, or new type of contract, seeks to meet the demand for socio-environmental balance, more focused on biomass. The benefits and even trade-offs of using renewable energy must be shared. There is talk of compensation because many of the renewable energy matrices do have an environmental impact.

It should be noted that agricultural production, for example, and as was sustained in the topics on environmental labor law, must be done with the consideration of the national environmental policy, with the water legislation, with the forest code and, as is the objective of this thesis, with respect for fundamental social rights. Renewable energies lose their power of affection for the environment if there is no respect for fair work and environmental standards.

Another element is the sustainability aspect. Although it may seem, at first glance, something unequivocal when talking about renewable energies in sustainability, see, as an example, the various situations of hydroelectric plants that do not have production conditions, today, or carry out production in an inconstant way, or even carry out production in such a way as to account for various environmental problems.

In the case of solar energy, territorial and social challenges must be taken into account. The installation, although there is a real possibility of production distributed by homes, industries and others, generation involves the occupation of large areas of land. This can lead to competition with animals, traditional communities, and ways of life. Large areas of solar energy generation impact the ecosystem. And solar panels have a lifespan of

less than 1/2 century. There is also the limiter of partial generation, at certain times, dependent on insolation, or, with future development, storage outside insolation hours.

Wind energy also has territorial and ecosystem impacts that cannot be disregarded. Obedience to good fundamental planning is necessary for the sustainability and ambientness of this generation.

Hydroelectric plants also have environmental challenges. Today, they are still the source of almost 3/5 of the country's electricity. The first factor that becomes crucial in hydroelectric plants is good water management. Climate change has been considerably relevant in this generation.²⁰ The large dam projects are installed and were built before the new environmental legislation was taken. This means a great impact on the territory, on water resources, on communities and, paradoxically, in some cases, the generation of greenhouse gases (by the decomposition of flooded vegetation cover. River, lake and stream ecosystems are affected.

Generation from biomass includes the use of solid waste, sanitary sewage, crop residues, and the production itself derived from crops - as seen, ethanol, biodiesel, etc. In a different way from the previous ones, sustainable agricultural production can generate less competition for territories. The agricultural area that is now consolidated is sufficient for production. More than that, agrosilvopastoral production can be a factor in the recovery of degraded soils and the recovery of biodiversity.

Some policies must be implemented, such as the combination and perhaps even the limitation of monocultures. The use of national species such as macaúba, buriti, babassu has the potential to generate wealth and the preservation and sustainable exploitation of biomes. Another necessary point is that agricultural production focused on biomass, biofuels, is compatible with the use of water resources.

BIOFUELS: SPECIFICITIES AND SEASONAL CROPS

Initially, it is important to describe what can be understood by agricultural seasonality. Among agricultural crops, it is important to differentiate between those crops considered permanent or perennial and those considered temporary. Seasonality, regardless of whether the crop is permanent or temporary.

Below, the production data, in tons, by the main agricultural products – for the year 2024:

²⁰ In twenty years, from the beginning of the century, the country suffered 3 severe droughts with restrictions on hydroelectric power generation: 2001, 2015, 2021.

Rice	Corn (1st Crop)	Corn (2nd Crop)	Soy	Arabica coffee	Sugar cane
10.282.517	27.738.515	103.346.496	151.963.045	2.367.777	713.293.700

(IBGE, 2024)²¹

With the table above, it can be seen that the main products have the possibility of being used as an energy matrix, as biomass, with emphasis on sugarcane cultivation. Other crops also take advantage of energy production.

Permanent agricultural crops are those in which the planting is of plant species with a long vegetative cycle. Thus, successive harvests are extracted from the same plant, without the need for new planting at each harvest. That is, the harvest is made, but the plant continues to produce for a new future harvest. Harvest cycles in permanent crops can even be longer than 12 months. Coffee, apple, pear, grape, orange and other cultivars can be cited as an example.

Temporary agricultural crops, on the other hand, are those in which the vegetative cycle is short or medium. With each harvest, a new cycle begins after a new planting of the crop. Normally, the vegetative cycle is less than 12 months, and in most cases they last a few months. We can cite as an example of temporary crop the cultivation of sugarcane, corn, soybeans, sorghum, castor beans, among others. Brazil produces a variety of crops, but with special attention to temporary crops, including emphasis on the production of biofuels.

What can be observed, therefore, is that the temporary crop dominates agricultural production in Brazil. This comes from the productive yield of the temporary crop. In turn, the permanent crop has a higher added value, that is, normally, the ton of permanent crop production has a value several times higher than the ton of temporary crop production.

Seasonality, on the other hand, does not necessarily come from perennality or non-culture. In fact, every agricultural culture presupposes seasonality in its most varied stages, from planting to harvesting.

Generically, the entire productive period of the crop is called harvest. Thus, the harvest period would be the period in which there are ideal conditions for cultivation, with the off-season being the idle period, that is, when it is not planted or even the plant does not require intense care. (Bento & Teles, 2013).

²¹ The world's largest corn producers: 1. USA: 389.69 million tons; 2. China: 288.84 million tons; 3. Brazil: 122 million tons; 4. European Union: 61.45 million tons; 5. Argentina: 50 million tons; 6. India: 37.5 million tons; 7. Ukraine: 32.5 million tons; 8. Mexico: 22.7 million tons; 9. Russia: 16.6 million tons; 10. Canada: 15.42 million tons. (AGROSUSTENTAR, 2024)

The harvest and off-season period is what is usually called the "agricultural year". The agricultural period varies from one crop to another and even depends on the water potential of the rural property, or even if there are irrigation systems that allow, for example, several plantings during the same year.

For example, in Brazil, in crops such as soybeans, corn and beans, the harvest varies from October to March. In coffee growing, the harvest period is from May to September. All this depends on the culture and location of agricultural production. The harvest and off-season scenario is what causes seasonality in agricultural production in the country.

According to Santos (BENTO & TELES, 2013), seasonality is caused by several reasons and has several consequences in the agricultural environment:

- the variation in climatic patterns that occurs over the course of a year in any region of the world (more marked in temperate regions and less in tropical regions) means that most agricultural production is markedly seasonal, producing in each season of the year the products that best take advantage of the climatic characteristics that prevail in that period;
- Advances in production technologies, in the fields of irrigation, drainage, greenhouses, the emergence of varieties tolerant or resistant to certain phenomena (translated into changes in the respective production functions), which increase the farmer's control over some of the climate and soil variables, have made it possible to reduce some of this seasonality. It is also this seasonality that makes the opportunity cost of many technical operations very high, which often conditions the option for certain investments.

There are several strategies of rural producers and the agroindustry itself to adapt to agricultural seasonality. Many of them involve investment in technology, mechanization and the qualification of the workforce. However, it is exactly the seasonality in the use of labor that makes the proposal of this thesis important. Thus, a better study of the seasonality of agricultural crops required for the production of biofuels is necessary. The concept of biofuels can be summarized in the excerpt below from Viegas:

In general, biofuels encompass fuels produced through biological processes, such as agriculture and anaerobic digestion, rather than produced from geological processes, such as those required for the formation of fossil fuels. This includes biodiesel (produced from organic oils and fats) and bioethanol (alcohol produced through microbial fermentation of sugars, followed by distillation and dehydration), which will be the main focus of this article. Two major advantages are presented as motivators for the use of biofuels: unlimited sources of renewable raw materials, unlike fossil fuels, which depend on existing geological reserves; In addition, for the production of these biofuels, the raw material mostly comes from agriculture and waste, making its carbon footprint neutral (the carbon dioxide released during its combustion is equal to the amount assimilated during photosynthesis). (2018, p. 02)



There are several agricultural crops that can be biofuel generators. In addition to the one usually used, several others have been developed for this purpose. The use of these crops must be seen within two universes, renewable energies and biofuels:²²

... Renewable energy will not only address the constraints associated with current energy consumption patterns and provide the much-needed modernization of the energy sector, but will also promote sustainable development goals. In this sense, it is understood that the search for the rational and multifunctional use of natural resources is one of the main motivations for the approximation between the agribusiness, energy and chemical sectors, opening new possibilities for the development of renewable wealth and promoting the formation of networks between all sectors involved (K. C. de Oliveira & Zanin, 2015, p. 25)

Regarding biofuels, it is possible to establish a differentiation between the different types. This differentiation also helps to understand the importance for environmental policy:

Low-carbon transport fuels are one of the fastest alternatives to reduce the emissions intensity of the transport sector, before the fleet, infrastructure and technology change more comprehensively. Ethanol, for example, is an immediately applicable solution and is a type of agroenergy that uses products derived from biomass produced in agricultural activities to generate transport, electricity and heat, depending on three main factors: availability of land, water, nutrients; plant suitable for climatic conditions; and a lot of solar energy, it's practically liquid sun. Like all biofuels, ethanol is produced from renewable sources, which in the case of Brazil, has been sugarcane, and emit fewer greenhouse gases than fossil fuels. It is estimated that the emissions of these gases when ethanol is used are approximately a quarter of those that would be if petroleum products were used⁶ ⁷. They also generate fewer toxic gases that are residual from combustion, in terms of quantity and harm to health⁸. In addition, the mixture of ethanol with gasoline can replace the use of additives that are highly toxic, such as lead-tetraethyl and MTBE (methyl-terciobyl-ester), which cause serious lung and environmental problems, including acid rain and contamination of aquifers (Denny, 2020, p. 02)

The cultivation of biomass for biofuels is not just a choice between matrices. It means transformation and commitment to an environmental pact:

²² As stated initially, Pró-Alcool was created to stimulate ethanol production and mainly to reduce Brazil's dependence on oil. Today, the reasons for adopting ethanol go beyond this dependence. There is a worldwide search for conscious consumption, resource use reduction, and greenhouse gas emission reduction. These concerns lead to global events to discuss these issues. One of them was the COP 21 that occurred in December 2015. COP 21 (21st Conference of the Parties) is a Framework Convention on Climate Change, which seeks to understand and find solutions to climate change. The Conference of the Parties is the principal decision-making body of the United Nations Framework Convention on Climate Change (UNFCCC). During the event, 195 participating countries signed agreements (iNDC - Intended Nationally Determined Contribution), where each country committed themselves reducing greenhouse gases and setting clear targets for this reduction. In this regard, Brazil has also reached an agreement, in which it proposes to reduce greenhouse gas emissions, mainly by increasing the share of renewable energy and bioenergy in its energy matrix. The commitments made by Brazil at COP 21 to increase the share of renewable energy will imply an increase in the demand for sustainable electricity and biofuels. In this scenario, the sugar-energy sector is placed as an important pillar of this growth since it offers ethanol, which is the biofuel produced from sugarcane, and bioelectricity generated in the industrial units using by-products of sugar and ethanol production. The challenges of reducing dependence on oil use in the 1970s, coupled with the current challenges of sustainable production and clean energy, and the Brazilian commitment made at COP21, once again bring the focus to the sugarcane industry and, consequently, sugarcane growers of Brazil. (RAFAEL BORDONAL KALAKI, 2021, p. 179)

For this reason, at the limit, the energy transition must be thought of as a societal transition, restructuring the forms of relationship between man and man and man with nature, that is, how humanity integrates and how it relates to each other and to nature, and fundamentally, to understand itself as part of nature in the great ecosystem that makes existence on this planet possible. Thus, there is a criticism of Cartesian science and its analytical and fragmentary view of society and the disconnection between areas of knowledge in the face of the necessary hyperspecialization developed by scientific understanding, which makes it impossible to see the general picture, the whole, which is lost in the hyperfragmentation of objects, being the systemic, holistic reading of the problem in the totality of its determinations, fundamental for an adequate response from a scientific point of view, from a technical point of view, or from a political point of view (Capra, 2012).

And in this sense, the energy transition, carried out only as a transition of the energy matrix, from fossil energy to electricity, does not change the way we relate to nature and to each other, but rather maintains a predatory form of relationship with nature, with the maintenance of the same economic structure of relationship, and it is noteworthy that in this sense, this transition model will not be able to meet the GHG emissions targets, with the reductions in water and soil pollution levels, that is, with a real confrontation of climate change.

In this way, thinking and reflecting on the energy transition is also a reflection on the relationship of the human in its singular context, but also in a framework of totality, because collective and individual actions must be guided by an understanding that either the problem is faced in its radical causes or humanity will be doomed to self-destruction. (Assis et al., 2024, p. 345)

The production of biofuels in Brazil has a good supply of biomass. Agricultural production, or even extractivism, has a good number of options for the production of green fuels.²³ Below, a summary report of what is possible to use and produce taking biodiesel as an example:²⁴

According to Câmara (2006), there are many raw materials of potential use for biodiesel production in Brazil, which can be divided by classes of renewable sources: a) Vegetable oils: liquids at room temperature, such as soybean, cotton, peanut, babassu, canola, palm oil, sunflower, castor oil; b) Animal fats: pasty or solid at room temperature, such as beef tallow, fish oil, lard, mocotó oil; c) Residual oils and fats: raw materials related to the urban environment, such as residual oils originating from domestic and industrial kitchens (frying oil); sewage supernatant fat (scum); waste oils from industrial processing. Due to its vast territorial extension, Brazil has a great diversity of raw materials of plant origin for the production of biodiesel. However, the viability of each raw material will depend on its technical properties, its economic competitiveness and its socio-environmental benefits, including aspects such as: oil content; agricultural productivity. (Sallet & Alvim, 2011, p. 04)

²³ As for biogas, this edition brings a more detailed analysis. Its installed capacity in distributed generation reached 105 MW, of which 22 MW was added in 2022, using agro-industrial, animal and urban waste as input. In addition, its share in the domestic energy supply reached 438 thousand toe (0.14%), with an increase of 18% p.a. in the last five years. With regard to biomethane, there is an increase in operation and construction registrations at the ANP, in addition to greater participation in RenovaBio. The initiatives at the federal level instituted in 2022 are registered, including biomethane in REIDI and instituting the Federal Strategy to Encourage the Sustainable Use of Biogas and Biomethane. (EPE, 2022)

²⁴ 'Pro-álcool was not the only attempt by the Brazilian government to develop renewable fuels, these efforts began in the 20s and were boosted during World War II due to the risk of interruption in oil imports. In 1975 the government created the Plan for the Production of Vegetable Oils for Energy Purposes which was transformed in 1983 into the National Program of Vegetable Oils for Energy Production, also known as Pro-oleo. This program had as its main objective the development of biodiesel from cotton, babassu, canola, sunflower, castor bean, fodder turnip among others, to mix it with petroleum diesel'. (Sallet & Alvim, 2011, p. 26)

Specifically, ethanol (for a long time commercially called ethyl alcohol) is an organic compound belonging to the chemical function of alcohol, which is colorless and highly flammable. Precisely because of such flammable power that it is widely used as an automotive fuel, and, because it is derived from vegetable sources, it is considered a biofuel and a renewable energy source. (Lima, 2024).²⁵

Ethanol is a biofuel and has many advantages as a substitute for fossil fuels, such as gasoline. Ethanol emits less polluting and greenhouse gases compared to fuels from non-renewable sources. In Brazil, due to the high supply of sugarcane, the cost of generating ethanol is considered relatively low compared to the steps involved in the production of other petroleum-derived fuels. (Lima, 2024)²⁶

Despite common sense, today, the biofuel Ethanol is not only linked to corn or sugarcane, but to other crops that are not so traditional.²⁷ This comes from technological development that seeks to generate ethanol by other methods. Basically, scholars have classified the generation of Ethanol by two generations, that is, First Generation Ethanol and Second Generation Ethanol. (Pacheco, 2011)²⁸element. Below is an illustration of the production of ethanol from sugarcane and corn:²⁹

²⁵ 'Another tool created to increase the competitiveness of renewables are the various laws requiring the blending of anhydrous ethanol in gasoline, which are currently present in 64 countries (see Annex IV) 25 that have adopted these policies both to reduce their emissions and also to protect the health of their population with better air quality. Brazil wins with whatever the blending mandate is and if any country starts to adopt or commit to increasing its blend. We can sell anhydrous ethanol directly, or we can sell, for example, corn if the country uses its grains to produce fuels. Therefore, renewables in Brazil, in addition to being an environmental agenda, also generate jobs and income in various agricultural activities. But for that you need laws, policies, standards and practices to ensure that production is sustainable'. (Denny, 2020, p. 04)

²⁶ 'In addition to bringing benefits for being renewable energy, and generating economic development, ethanol can be used for carbon sequestration. A recent study 26 showed that using degraded land for sugarcane plantations increases soil quality and carbon absorption. Undoubtedly, this cannot be done in routed areas, only where and as the law allows, following the good practices that have already been used by most Brazilian producers: harvesting without burning, reduced soil preparation, rational management of sugarcane straw, good fertilization practices and use of organic residues (such as vinasse for fertigation)'. (Denny, 2020, p. 05) (EPE, 2022)

²⁸ The emissions avoided by the use of first-generation ethanol from sugarcane and corn, biodiesel, and bioelectricity from sugarcane in 2022 were 52.8 MtCO₂eq, 18.3 MtCO₂eq, and 1.4 MtCO₂eq, respectively, adding up to 71.1 MtCO₂eq. (EPE, 2022)

²⁹ In general, the production process of ethanol from corn brings some differences from ethanol from sugarcane, because the molecule predominantly present in corn is starch, a long-chain polysaccharide. On the other hand, sugarcane is mostly made up of sucrose-type disaccharides. In this way, the ethanol in sugarcane is produced as a byproduct of fermentation, while that in corn needs to be hydrolyzed beforehand. Unlike the production process, the final product – ethanol – does not present any difference in either of the two processes, because it does not depend on the source, since the physicochemical properties of ethanol remain the same. Another passage: In 11 harvests, corn ethanol production in the Center-South jumped from 37 million liters to 6.27 billion liters. In the 23/24 cycle, grain biofuel accounted for 18.7% of the total ethanol volume against 17% in the 22/23 harvest. With a production focus on the states of Mato Grosso (72%), Mato Grosso do Sul (16%) and Goiás (11%), states that increase the competitiveness of ethanol where this scenario was previously unthinkable. Like sugarcane, the corn ethanol production process is part of a circular economic chain, where the entire potential of the grain is transformed into bioenergy and food. For the production of biofuel, only starch is used, so at the end of the industrial cycle, proteins and fibers are transformed into DDG (intended for animal nutrition) and oil. Encouraging the development of other rural activities, such as feedlot livestock and poultry breeding. Another link driven by corn ethanol is the production of biomass, such as eucalyptus forests, used to generate electricity

Gráfico 7 - Produção brasileira de etanol de milho

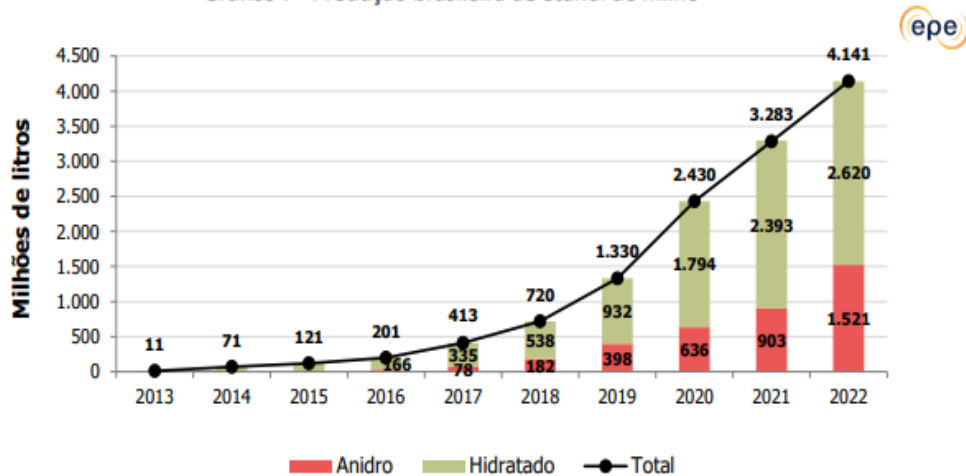
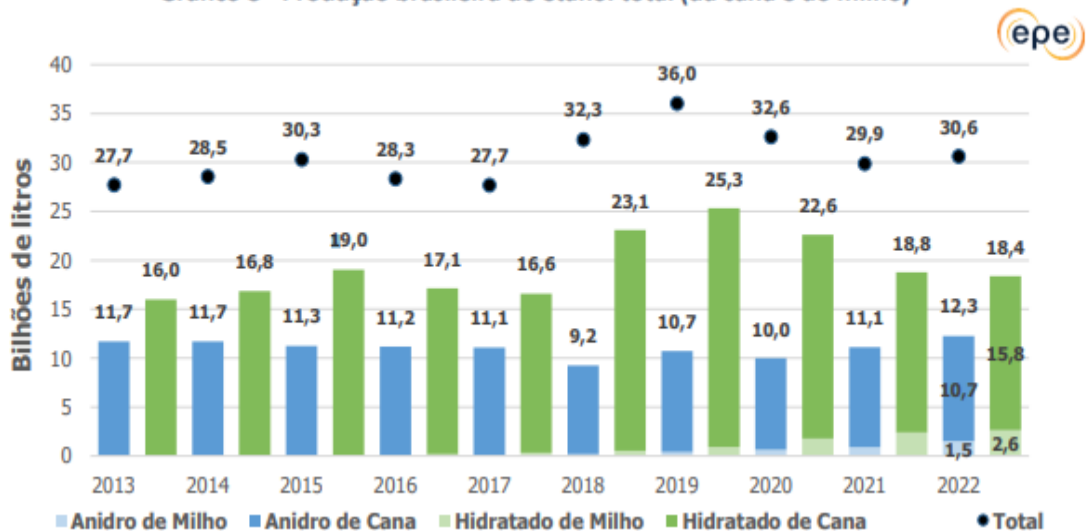


Gráfico 8 - Produção brasileira de etanol total (da cana e do milho)



(EPE, 2022)

First Generation Ethanol is an Ethanol produced from sucrose, a process that, despite being very well developed worldwide, still requires investments for better production efficiency. It is estimated that the production of ethanol from sugarcane requires less than 1% of Brazil's arable land, which could lead to the conclusion that it can easily be expanded without representing competition with food production. (Pacheco, 2011). About ethanol and sugarcane cultivation:³⁰

consumed by the unit. In Brazil, the production of corn ethanol differs from other countries by the use of second crop corn. The grain is cultivated after the production, mainly, of soybeans. In this way, there is no competition between biofuels and food. Brazil is the third largest producer of corn in the world, with more than 150 million tons. (PROPEQ, 2021) (UNICA, 2024)

(EPE, 2022)

The total of processed sugarcane reached 595 million tons in 2022, 2.4% higher than in 2021. Sugar production grew 3.4%, totaling 36.3 million tons (12.5% lower than the historical record of 2020) and its export was 28.3 million tons. Regarding sugarcane ethanol, 26.5 billion liters were produced, which added to the share of biofuel from corn of 4.1 billion liters (growth of 26%), reached 30.6 billion liters (2.5% higher than 2021). The allocation of the mix to ethanol decreased 1.3%, with anhydrous gaining share in the total. The country increased the positive balance in the international trade of ethanol (net export of 2.2 billion liters), raising export levels and reducing import levels. (EPE, 2022)

Thus, in First Generation Ethanol, only the sucrose obtained by grinding the agricultural product is used, discarding the milling residue for the generation of Ethanol. Such waste is usually reused for other purposes such as bioelectricity generation and animal nutrition.³¹

Second Generation Ethanol represents an alternative for the energy use of biomass, generating Ethanol from lignocellulose, present in waste of vegetable origin. Thus, Brazil would have competitive advantages in relation to other countries also in second-generation ethanol due to the large amount of raw material, especially in view of the possibility of using sugarcane bagasse and straw in these new processes. The estimate is that the use of bagasse and part of the straw and tips of sugarcane will increase the production of alcohol by 30 to 40%, for the same planted area. (Pacheco, 2011)³²

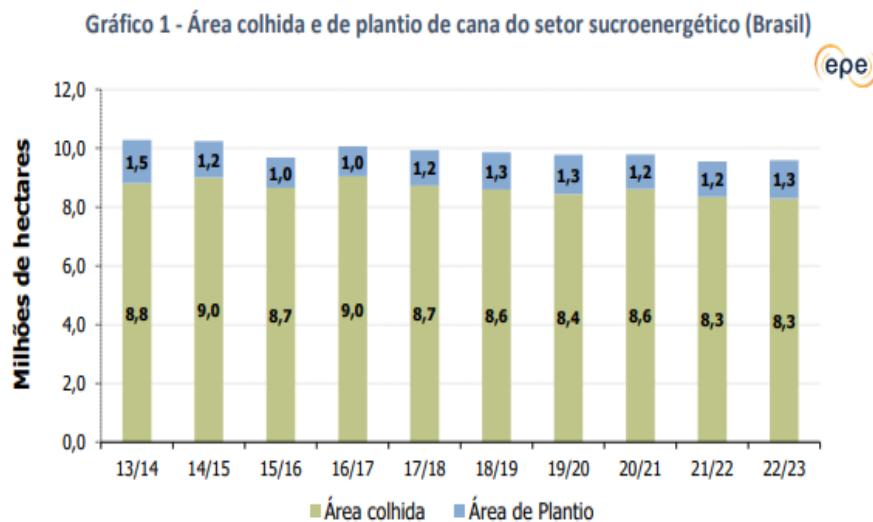
In other words, in Second Generation Ethanol, the idea is to use sugars produced with biomass, which goes through a process called cellulose hydrolysis. That is, by Second Generation Ethanol, the waste discarded for the generation of First Generation Ethanol would be used to generate biofuels. The great advantage would be the reduction of the environmental impact and the logistical gain (the product is already in the mill).

In other words, there is no chemical differentiation of the ethanol produced, but only and only in its form of production. In addition, the industry highlights the low carbon footprint of Ethanol in the Second Round. The "carbon footprint" would be the "measure that

³¹ The differences between anhydrous ethanol and hydrous ethanol: HYDROUS ETHANOL. This type of fuel takes its name because it contains up to 7.5% water in its composition. It is the biofuel sold at the fuel pumps. Compared to gasoline, hydrous ethanol emits up to 90% less CO₂. In addition to the environmental benefits, running on ethanol improves power and keeps the engine cleaner and closer to the new throughout the life cycle. ANHYDROUS ETHANOL. Pure or absolute ethanol, anhydrous ethanol has only 0.7% water in its composition. Since 2015, Brazilian legislation has provided for a 27% blend in type C gasoline. Biofuel improves the octane rating of gasoline, reducing emissions of polluting gases – this level of blending reduces CO₂ emissions by 15% per kilometer driven, reducing pollution and contributing to the fight against climate change. (UNICA, 2024)

³² Second-generation ethanol, or cellulosic ethanol, is generated from the by-products of ethanol and sugar production (straw and bagasse) and enables an increase in biofuel production, without increasing the cultivated area. In the conventional process, only one third of the sucrose found in sugarcane, concentrated in the juice and molasses, is used. The rest is retained in bagasse and straw. Thus, with the development of new technologies, it has become possible to use this energy to produce ethanol. The biofuel resulting from this process is known as 2G or cellulosic ethanol. With the expansion of production, cellulosic ethanol has the potential to increase the volume of biofuel produced on the same amount of land by up to 50%. (PROPEQ, 2021)

evaluates how much carbon (CO₂) or other equivalent gas an equivalent emits into the atmosphere a production process." Thus, second-generation ethanol would have a 30% lower carbon footprint when compared to first-generation ethanol, and up to 80% lower when compared to fossil fuels, such as gasoline.³³



Another point that deserves to be considered is that Second Generation Ethanol would use exactly the same planted area already used for the generation of First Generation Ethanol, since it uses the residue for its generation. In other words, there would be no increase in planted area, generating only an increase in production.

Elephant grass, brachiaria, panicuns and fast-growing trees can also be used as raw material for the generation of Second Generation Ethanol.

CONCLUSION

The whole scenario presented shows that the Brazilian biomass energy matrix is dependent on agricultural production. In turn, these crops have been impacted by automation and the use of labor in harvesting becomes more limited in time, for a short period of harvesting. Thus, the intensive use of labor in the field has decreased and is restricted to a few processes and in a short period of time.

The work for the production of this clean, green, sustainable energy matrix is one of the components of environmental correction. Only dignified, fair work, in suitable conditions

³³Among the new biofuels, HVO (Hydrotreated Vegetable Oil) and Sustainable Aviation Fuels (SAF) deserve to be highlighted, with unit projects being envisioned in the medium term. In the case of HVO, the characteristics that can influence the penetration of the Brazilian fuel market are presented. As for the SAF, the industrial and economic challenges are pointed out so that it can be competitive against aviation kerosene of fossil origin, in Brazil and in the world. Hydrogen is a future bet, with several projects being launched around the world, in a consortium of energy companies.' (EPE, 2022)



can make a fuel environmentally adequate. The proposal of the very short-term contract has the intention of protecting work in dignified conditions linked to sustainability.

REFERENCES


1. Abboud, G. (2024). Parte I. Paradigma da Degeneração. In G. Abboud, *Direito Constitucional Pós-Moderno - Ed. 2024*. São Paulo, SP: Editora Revista dos Tribunais. Disponível em: <https://www.jusbrasil.com.br/doutrina/direito-constitucional-pos-moderno-ed-2024/2485203886>. Acesso em: 22 de outubro de 2024.
2. Bastos, B., & Cioffi, L. (2019). A efetividade do direito fundamental de negociação coletiva de trabalho e o problema do critério da prevalência da negociação individual. *Revista de Direito do Trabalho*, 09/2019. Disponível em: <https://www.jusbrasil.com.br/doutrina/revista-de-direito-do-trabalho-09-2019/1188256676>. Acesso em: 22 de outubro de 2024.
3. Batista, H. (2021). *Direito do Trabalho Aplicado: Teoria Geral de Direito do Trabalho e do Direito Sindical*. São Paulo, SP: Editora Revista dos Tribunais. Disponível em: <https://www.jusbrasil.com.br/doutrina/direito-do-trabalho-aplicado-teoria-geral-de-direito-do-trabalho-e-do-direito-sindical/1394701247>. Acesso em: 1 de outubro de 2024.
4. Benatto, P. (2019). A internet nos contratos de trabalho e no teletrabalho. *Revista de Direito do Trabalho*, 08/2019. Disponível em: <https://www.jusbrasil.com.br/doutrina/revista-de-direito-do-trabalho-08-2019/1188255844>. Acesso em: 22 de outubro de 2024.
5. Brasil. (1988). *Constituição da República Federativa do Brasil de 1988*. Disponível em: http://www.planalto.gov.br/ccivil_03/constituicao/constituicaocompilado.htm. Acesso em: julho de 2021.
6. Cassar, V. B. (2020). *Direito do trabalho: de acordo com a reforma trabalhista* (17ª ed.). Rio de Janeiro: Forense; São Paulo: Método.
7. Cassar, V. B. (2020). O sistema único de assistência social no combate ao trabalho escravo e ao tráfico de pessoas. Ministério da Cidadania, Brasília, DF. Disponível em: http://blog.mds.gov.br/redesuas/wp-content/uploads/2020/06/Combate_Trabalho_Escravo_01.06.pdf. Acesso em: fevereiro de 2022.
8. Clève, C. (2015). Força normativa da Constituição. In C. Clève, *Direito constitucional: ações constitucionais*. São Paulo, SP: Editora Revista dos Tribunais. Disponível em: <https://www.jusbrasil.com.br/doutrina/direito-constitucional-acoes-constitucionais/1341523885>. Acesso em: 22 de outubro de 2024.
9. Frediani, Y. (2018). A subordinação estrutural nos contratos de trabalho: A experiência brasileira. *Revista de Direito do Trabalho*, 06/2018. Disponível em: <https://www.jusbrasil.com.br/doutrina/revista-de-direito-do-trabalho-06-2018/1188258216>. Acesso em: 22 de outubro de 2024.
10. Gradwohl, M. A. B. L. (2018). A norma implícita de orçamento impositivo na concretização de direitos fundamentais sociais. *Revista Controle*, 16(1), Fortaleza. Disponível em: <https://revistacontrole.tce.ce.gov.br/index.php/RCDA/article/view/387>. Acesso em: setembro de 2021.

11. Luz, M. (2020). O contrato de trabalho entre ideologia e existencialidade. *Revista de Direito do Trabalho*, 08/2020. Disponível em: <https://www.jusbrasil.com.br/doutrina/revista-de-direito-do-trabalho-08-2020/1188256819>. Acesso em: 22 de outubro de 2024.
12. Meireles, E. (2018). Contribuição sindical e a força normativa da Constituição: Inconstitucionalidade da lei que cria uma situação de inconstitucionalidade por omissão superveniente. *Revista de Direito do Trabalho*. Disponível em: <https://www.jusbrasil.com.br/doutrina/revista-de-direito-do-trabalho-08-2018/1188258447>. Acesso em: 22 de outubro de 2024.
13. Melo, H. N. M. C. (2009). *A redução de trabalhadores à condição análoga à de escravos como fator de descumprimento da função social da propriedade rural* (Dissertação de mestrado). Universidade Federal do Pará, Belém.
14. Molina, A. A. (2015). Dano existencial por jornada de trabalho excessiva: critérios objetivos (horizontais e verticais) de configuração. *Revista de Direito do Trabalho*, 164.
15. Nascimento, A. M., & Nascimento, S. M. (2014). *Curso de direito do trabalho: História e teoria geral do direito do trabalho: Relações individuais e coletivas do trabalho* (29ª ed.). São Paulo: Saraiva.
16. Rizzardo, A. (2015). 1 - O trabalho rural e incidência do estatuto. In A. Rizzardo, *Curso de direito agrário*. São Paulo: Editora Revista dos Tribunais. Disponível em: <https://www.jusbrasil.com.br/doutrina/curso-de-direito-agrario/1302633425>. Acesso em: 22 de outubro de 2024.
17. Rodrigues, D. (2021). Informalidade volta a subir; país tem 38 mi de trabalhadores sem vínculos. *Poder 360*. Disponível em: <https://www.poder360.com.br/economia/informalidade-volta-a-subir-pais-tem-38-mi-de-trabalhadores-sem-vinculos/>. Acesso em: dezembro de 2022.
18. Santana Junior, H. (2016). *O consumo na estratégia de desenvolvimento sustentável brasileira* (Dissertação de mestrado). Universidade de Brasília, DF.
19. Sarlet, I. W. (2004). *A eficácia dos direitos fundamentais* (4ª ed.). Porto Alegre: Livraria do Advogado.
20. Serrano, J. L. (1999). *Validez y vigencia*. Madrid: Trotta.
21. Silva, J. A., & Bersani, H. (2020). A essência do direito do trabalho e a Lei nº 13.467/2017: uma análise histórico-jurídica em resistência ao retrocesso social. *Revista da Escola Judicial do TRT4*, 2(4), 149-172. Disponível em: <https://rejtrt4.emnuvens.com.br/revistaejud4/article/view/95/69>. Acesso em: julho de 2021.
22. Silva, J. A. (1998). *Aplicabilidade das normas constitucionais* (3ª ed.). São Paulo: Malheiros.
23. Silva, V., Carlos, V., & Prata, G. (2019). Capítulo 3. Conceito de direito do trabalho. In V. Silva, V. Carlos, & G. Prata, *Guia prático de direito do trabalho - Ed. 2019*. São Paulo: Editora Revista dos Tribunais. Disponível em:

<https://www.jusbrasil.com.br/doutrina/guia-pratico-de-direito-do-trabalho-ed-2019/1672937236>. Acesso em: 1 de outubro de 2024.

24. Araújo, N. F. de, & Petri, M. C. (2017). Os princípios jurídicos no estado democrático de direito e o princípio trabalhista da proteção: uma análise das funções informativa, normativa e interpretativa do princípio da proteção. *Revista do Direito do Trabalho e Meio Ambiente do Trabalho*, 2(2). <https://doi.org/10.21902/2525-9857/2016.v2i2.1237>
25. Assis, N. dos S. de, Borges, A. W., & Squeff, T. de A. F. R. C. (2024). Biofuels and energy transition policy in Brazil: Contributions, limits and possibilities given the need for climate justice in the Capitalocene. *Concilium*, 24(2). <https://doi.org/10.53660/clm-2792-24b42>
26. Borges, A. W., & Macedo, L. C. M. (2020). A concretização dos direitos sociais do trabalho no campo na vigência da constituição de 1946. *Revista Brasileira de História do Direito*, 6(1). <https://doi.org/10.26668/indexlawjournals/2526-009x/2020.v6i1.6626>
27. Borges, A. W., Romeu, L. C., & Rocha, A. P. da. (2012). Análise da jurisprudência do STF sobre a forma de incorporação dos documentos de direito internacional. *Revista de Direito Brasileira*, 3(2). <https://doi.org/10.5585/rdb.v3i2.30>
28. Carvalho, I. G. S., & Franco Rêgo, R. de C. (2013). Direito ambiental do trabalho e a saúde dos trabalhadores da pesca artesanal: Estudo de caso. *Cadernos Ibero-Americanos de Direito Sanitário*, 2(2). <https://doi.org/10.17566/ciads.v2i2.79>
29. De Queiroz Barboza, E. M., & Salomão Leite, G. (2022). Entre o entusiasmo e o mal-estar constitucional. *Revista Brasileira de Direitos Fundamentais & Justiça*, 15(45). <https://doi.org/10.30899/dfj.v15i45.1042>
30. De Souza Oppelt, Â. L., Castro Souza, C. B., & César Villatore, M. A. (2019). A elevação dos riscos financeiros no processo judicial trabalhista pela Lei 13.467/2017: Uma análise econômica da

FAMILY HOLDING COMPANY: SUCCESSION PLANNING AND REDUCTION OF THE TAX BURDEN

 <https://doi.org/10.56238/sevened2024.029-055>

Ricardo Denck¹

ABSTRACT

The objective of this work is to present the advantages of the constitution of the family holding company as a succession planning tool, compared to traditional methods. Through the study of the corporate, financial, tax and social aspects of this instrument, it is considered how the creation of a family holding company can be an effective tool in succession planning and tax savings. It is evaluated how the family holding company can help the patriarch organize and protect the assets, anticipating the succession and reducing the financial and emotional impact of probate processes. It should be noted that the holding company facilitates the management of family assets, preventing conflicts between heirs and reducing costs such as inheritance taxes and property transfers. In addition, it allows for centralized management of assets and greater protection against legal disputes and creditors. However, it is demonstrated that the asset shielding through the holding company needs to follow legal rules, as the attempt to hide assets or defraud creditors can lead to the piercing of the corporate veil. Another point addressed is tax avoidance, a practice that allows the tax burden to be reduced legally, taking advantage of incentives and loopholes in the legislation. With the support of specialists, the holding company enables advantages such as the simplification of sharing, continuity of family businesses and tax savings. It is concluded that the family holding company is a viable and advantageous alternative for business families, although its effectiveness depends on specialized advice for careful planning and alignment with family and succession objectives.

Keywords: Asset shielding. Tax avoidance. Succession planning.

¹ Law Scholar
Unicesumar – Campus Ponta Grossa

INTRODUCTION

With succession planning carried out through a mechanism called family holding, it is sought to avoid emotional and financial wear at the time of distribution, where the donor will previously determine the future of his assets. Thus, the present work aims to demonstrate the benefits of using a family holding company as an effective succession planning tool and whether this tool guarantees tax savings.

Through the present study, we seek to identify an efficient and legitimate alternative to the traditional succession process, which is less onerous for the family, minimizing any conflicts inherent to succession, and still preserving its assets. The possibility of reducing the financial cost of the succession process in a lawful manner is examined, using the legal system itself as a tool, through tax avoidance.

Thus, through an analysis of traditional succession methods, it seeks to demonstrate the advantages of using the tool in succession planning, highlighting the asset shielding, as well as the financial and tax aspects of the family holding company, benefits of its constitution in relation to tax management and also the tax elements in kind involved in the process of its constitution, aiming to respond to the problem: What are the advantages of the family holding company in succession planning?

The expression holding originates from the English verb "to hold", which translates as "to hold", "to detain", "to sustain". Holding also translates as "domain". Law No. 6,404, of December 15, 1976, which provides for Corporations, presents the concept of holding company in its article 2, paragraph 3:

Article 2 - Any for-profit company may be an object of the company, not contrary to the law, public order and good customs.

Paragraph 3 - The company may have as its object to participate in other companies; Although not provided for in the bylaws, participation is allowed as a means of carrying out the corporate purpose, or to benefit from tax incentives.

In Brazil, the family holding company is still little used, although it is very common in other countries, such as the United States and many European countries, because inheritance taxes are very high, generating the need for planning that makes taxation more lenient. Here the challenges faced by entrepreneurs are numerous, from the complex tax legislation to the hostile environment for business.

For Valentin (2021, p. 110) "Holding companies have been used as a way of structuring family assets, ensuring, in theory, professionalization and rationality in the administration of assets". In this way, the concern of entrepreneurs with succession and protection of assets is extremely relevant, as Silva and Rossi (2023, p. 4) warn, who say that in the Family Holding Company "the intention is based on ensuring the maintenance of

the assets earned by its members, including the success of any companies belonging to the family".

According to Machado (2024, p. 392) succession "can bring negative consequences to people, either due to the complexity of the assets or difficulties in the equal sharing of assets". Thus, the Family Holding Company emerges as an interesting way to conduct and manage the family's assets and business activities. But it is necessary to be careful, because as Peixoto (2023, p. 61) points out, "setting up a holding company to be free of all its debts, hiding its assets, that is, a patrimonial shield, may constitute civil fraud and crime".

The need to expand studies in this segment is evident, as the Brazilian population is unaware of the tools of succession and most are not concerned with what will happen at the time of their death. It is at the time of the opening of the succession that the heirs begin to be aware of the bureaucracy and expenses involved with this type of process, expenses that may be even greater if there is any disagreement regarding the division of assets.

For the development of this work, exploratory research will be used where the themes will be addressed, using the technical procedures of bibliographic research and documentary research, through books and scientific articles.

As for the method of approach, the deductive method will be used, seeking in the Federal Constitution, Civil Code, specific legislation and doctrine, solutions to the needs studied.

INSTRUMENTS OF SUCCESSION PLANNING

Succession Law in Brazil is the branch of civil law that regulates the transfer of assets from a deceased person to their heirs and successors. It covers the rules that determine who is entitled to inherit, how the division of assets takes place and what are the legal procedures involved.

Succession can occur in two main ways: legitimate succession, which follows the order of kinship established by law, and testamentary succession, which occurs when the deceased leaves a will, respecting the limits imposed by legislation, especially with regard to the reservation of a part of the assets for the necessary heirs, such as descendants, ascendants, and spouses.

Thus, article 1829 of the Civil Code describes the hereditary order of legitimate succession:

Article 1,829. Legitimate succession is granted in the following order: (See Extraordinary Appeal No. 646,721) (See Extraordinary Appeal No. 878,694)
I - to the descendants, in competition with the surviving spouse, unless the latter is married to the deceased under the regime of universal communion, or under the

regime of mandatory separation of property (article 1,640, sole paragraph); or if, under the regime of partial communion, the deceased has not left private assets;
II - to ascendants, in competition with the spouse;
III - to the surviving spouse;
IV - collaterals.

The Civil Code of 2002 is the main source of regulation of Succession Law, providing for the provisions on inheritance, the right of necessary heirs, the role of probate and the rules for the administration and division of the deceased's assets. The probate process is mandatory to formalize the transmission of the inheritance, and can be carried out judicially or extrajudicially, depending on the existence of a will or conflicts between the heirs.

According to Gagliano and Pamplona Filho (2022, p. 1533), the Law of Succession refers to the set of legal mechanisms that regulate the transfer of assets, values, and debts from a deceased person to their heirs. In other words, it involves the transfer of assets (assets) and obligations (liabilities) to the heirs, either through probate and division of assets, carried out judicially or extrajudicially.

In the legal field, succession implies the entry of an individual into the ownership of a legal relationship that is transmitted to him by another person. This change is manifested in the succession as a result of death, as the content and object of the legal relationship in question remain unchanged.

For Silva and Rossi (2023, p. 40), Succession Law also deals with issues such as the renunciation of inheritance, the right of spouse or partner to share, and the rights of minor and incapable heirs. In addition, there is a concern to ensure the protection of heirs and the preservation of the interests of those who, by legal determination, have a portion of the inheritance reserved, such as children and spouse.

Thus, Succession Law in Brazil seeks to balance the will of the deceased, when expressed in a will, with the rights of the heirs provided for by law, ensuring a fair and orderly distribution of the estate.

Hence the importance of succession planning, which, according to Peixoto (2023, p. 173) "will be carried out in life, being fundamental for those who want the realization of their will after their death". It also consists of an instrument of family asset protection, aiming to prepare entrepreneurs and their successors to preserve the assets conquered and ensure the continuity of success, also obtaining tax benefits and advantages (Machado, 2024, p. 134).

Dias (2022, p. 544) points out that:

Estate planning is a permanent asset organization. It is integrated by several areas of activity, such as fiscal and tax planning, with a view to also reducing heavy tax impacts on asset management. Succession planning is now called the adoption of a

series of measures aimed at preserving the autonomy of the will and preventing future conflicts.

Succession planning is a key step in creating a Family Holding Company, as it allows for more effective strategic management of family assets. Silva and Rossi (2023, p. 17) teach us that:

Succession planning is one of the pillars that involve the constitution of a family holding company because it enables the prior and careful organization of the transfer of assets to the heirs and, especially, provides an effective succession of the business of any company that is part of the set of assets, reserving to the patriarchs the responsibility of determining the destination of the assets during their lifetime. This planning is also fundamental in the protection of family assets to ensure their perpetuity, as it allows the patriarchs the means to protect the assets from unforeseen events, such as divorces and even the passing of heirs, which often end up compromising the family entity due to the dispute over assets.

It is worth noting that one of the main challenges faced by family businesses arises during the succession process. This is a sensitive period for the family and often generates conflicts between the heirs. In addition, a probate process can extend for many years, even decades, due to disagreements between the successors regarding the assets left by the deceased.

In this way, succession planning becomes indispensable for those who want to avoid problems in the management of the family business, in addition to avoiding high costs associated with succession.

On this point, de Silva and Rossi (2023, p. 19) point out that:

Another inconvenience related to the probate process refers to the costs that are inherent to it. Although succession planning based on the constitution of a family holding company also entails costs of legal advice and ITCMD fees, in probate there is a need to pay legal costs, in addition to the aforementioned tax, inherent to any type of transfer.

In view of so many aspects that can negatively interfere in the succession process, Silva and Rossi (2023, p. 21) point out the advantages of succession planning:

For all these problems, succession planning seems fundamental to us. From it, the patriarchs plan the future of the family patrimony, and the continuity of the business, with the following advantages: protection of the patrimony against the interference of third parties; choosing the most qualified heir to continue the management of the family business; absence of conflicts at the time of succession, especially that resulting from the death of one of the patriarchs, and the costs arising from the probate process; planning of the payment of taxes arising from succession, and the non-need to carry out condominium of assets and disposal of a family asset for payment of taxes and procedural costs.

Therefore, according to Peixoto (2023, p. 176), succession planning will guarantee advantages such as avoiding litigation, as it will respect the legal limits of the freedom of the author of the inheritance and the legitimate part of the succession; reduce the payment of taxes, which is one of the main points of planning, aiming at tax savings within legal limits; guarantee autonomy and respect for the will of the author of the inheritance.

INVENTORY AND PARTITION

When the death of a natural person with assets to be shared occurs, the period for opening the succession begins. From then on, there is a period of 2 (two) months to start the survey of the deceased's assets, which must be completed in a maximum of 12 (twelve) months, as provided for in article 611 of the Code of Civil Procedure:

Article 611. The probate and partition process must be initiated within two (2) months from the opening of the succession, ending in the following twelve (12) months, and the judge may extend these deadlines, ex officio or at the request of a party.

For Dias (2022, p.741) "the inventory consists of an individualized and clear description of the assets of the inheritance", and can be processed in a judicial or extrajudicial manner.

Therefore, the inventory is the legal procedure that aims to identify and evaluate the assets left by the deceased, including movable and immovable property, rights and debts. This process aims to organize the patrimonial collection and establish the exact amount that will be transmitted to the heirs, respecting the will of the deceased (will, if any) and the legal rules of succession.

The inventory may be judicial or extrajudicial. The judicial is carried out in the Judiciary, and is mandatory when there are minor heirs, incapacitated or when there is litigation between the heirs Dias (2022, p. 742). This procedure tends to be more time-consuming and complex, due to the need for judicial intervention at each stage. Also, according to the aforementioned author, in the judicial inventory, the following phases are followed:

- Opening of the Inventory: generally must occur within 60 days of death, under penalty of a fine in some states;
- Appointment of the Executor: an executor is appointed, responsible for managing the estate and conducting the process;
- Listing of Assets and Debts: phase in which all assets and debts are raised, presenting the complete list to the judge;

- Calculation and Payment of Taxes: generally, the ITCMD (Tax on Causa Mortis Transmission and Donation) is due and needs to be paid before the conclusion of the distribution;
- Distribution: after the payment of debts and tax, the assets are divided among the heirs.

Extrajudicial inventory, on the other hand, according to Machado (2024, p. 44), is carried out in a notary's office, without the need for judicial intervention, and is allowed only in cases where all heirs are of age and capable, there is no litigation and everyone agrees on the division of assets. The presence of a lawyer is mandatory, and he signs the deed together with the heirs. This procedure is faster and less costly, allowing the immediate transfer of assets.

Partition, in turn, is the phase in which the inventoried estate is effectively divided among the heirs, following the rules of succession law. According to Silva and Rossi (2023, p. 40), this division must observe both the reserved portion — the part reserved for the necessary heirs (descendants, ascendants, and spouse) — and the testator's available portion, if any.

The legitimate part corresponds to 50% of the estate and must be allocated to the necessary heirs. The testator may dispose of the remaining part (50%) to whomever he wishes, including for the purposes of legacies, donations or other destinations during life or by will.

Silva and Rossi (2023, p. 42) teach us that:

[...] The estate is divided into an available part and a legitimate part, and either by donations or even by the disposition of a last will through a will, the legitimate part cannot be affected.

The heirs and legatees are the beneficiaries of the inventory and distribution. For Dias (2022, p. 522) heirs are those who receive the inheritance by virtue of the law or will, while legatees are those who receive only certain assets or amounts expressed in a will.

Also, the probate and partition process involves the payment of the ITCMD, a state tax, which must be paid before the completion of the inventory. According to Dias (2022, p. 896), "the tax is levied on the entire inheritance collection, the entirety of the deceased's assets". In this way, although the debts are also transmitted to the heirs, they will not make up the tax calculation basis, leaving only the positive balance of the estate.

The process is completed after the division is carried out and the payment of the expenses and taxes due. Dias (2022, p. 904) describes that in the case of judicial inventory, the judgment approving the division is issued by the judge, and the heirs can register the

division of assets. In the case of extrajudicial inventory, the deed drawn up at the notary's office has immediate effect.

The inventory is essential for legal certainty, as it formalizes the transfer of assets, ensuring that each heir receives his or her share according to the law or the will.

SUCCESSION PLANNING

Succession planning is undoubtedly a valuable tool, as it not only offers legal and financial security, but also protects the assets of family members.

Silva and Rossi (2023, p. 19) clearly and objectively summarize the importance of succession planning, clarifying that the family assets, as well as the family's business businesses, have the opportunity to be preserved and to avoid the interference of third parties outside the family nucleus.

The authors also point out that such planning allows the patriarchs to choose the most qualified heir to manage the company and, finally, has the advantage of avoiding typical succession conflicts and minimizing the costs arising from the probate process through the planning of the payment of taxes, avoiding the eventual sale of an asset to settle procedural costs and taxes.

In the same sense, Mamede and Mamede (2024, p. 103) state that it is necessary to train successors, and that the absence of a succession plan and the unpreparedness of an organization for succession can constitute a "cursed legacy", which is left to successors, who in family businesses are loved ones. There are countless examples of family businesses that go bankrupt or face serious crises, due to an abrupt succession between generations.

In this way, the importance of succession planning is perceived, in order to ensure the protection of assets, absence and reduction of conflicts, continuity of companies, as well as the planning of the payment of taxes arising from succession. Among the main strategies used in succession planning, Valentin (2021, p. 48) highlights the will, donation, usufruct, holding, among others.

WILL

Testamentary succession is provided for in articles 1,857 to 1,939 of the Civil Code. Dias (2022, p. 463) teaches us that the will "is an act of last will by which testamentary succession occurs".

A will is a legal document in which a person (testator) expresses his or her will about the destination of his or her assets after his or her death. According to Peixoto (2023, p.

236) the will is a "relevant and traditional succession planning mechanism, making it one of the most efficient". Through the will, the individual can define how his or her estate will be divided among heirs or third parties, respecting the rules of the legitimate party.

Gagliano and Pamplona Filho (2020, p. 1.656) point out that the will is a very personal and unilateral act, with no participation of other subjects in the manifestation of will; revocable, because by virtue of private autonomy the testator is allowed to rewrite the terms of his will as much as he wishes; solemn, since it is covered with formalities that ensure the freedom of the testator and the veracity of its provisions; and finally free, insofar as the beneficiary is not required to pay consideration.

Thus, it is of full importance for the validity of the existing will to prove the manifestation of free will and good faith, the capacity of the agent, the possibility, lawfulness, and determinability of the object, and the appropriate form provided for by law (Gagliano and Pamplona Filho, 2022, p. 1.659).

DONATION AND USUFRUCT

Donation, defined by Peixoto (2023, p. 363), is the act by which a person transfers, out of liberality, part of his or her assets, assets, or advantages to another. It can be done during life, being an important instrument for anticipating succession and reducing inventory costs. The donation can be made with usufruct reservation, allowing the donor to continue enjoying the asset as long as he is alive. In addition, the donation in life allows for greater control over the destination of assets and can avoid possible disputes between heirs in the future.

Silva and Rossi (2023, p. 43) teach us that:

One of the strategies used in succession planning is the constitution of a family holding company by the patriarchs and, as a continuous act, the donation of shares of the company created to the heirs.

In this way, it is sought to avoid that the division of assets occurs only with the death of the patriarchs and the inconveniences arising from the probate process.

Usufruct, on the other hand, is a right that allows a person (usufructuary) to use and enjoy an asset belonging to another person (bare-owner), without the transfer of ownership. This mechanism is widely used in cases of donation of assets to heirs, in which the donor maintains the right to use the asset while alive. It is, therefore, as defined by Valentin (2021, p. 55) a temporary real right that separates the right of use from property.

HOLDING

The holding company, as defined by Peixoto (2023, p.19) is a company incorporated with the purpose of maintaining participation in other companies. It is an interesting form of strategy for conducting and managing business activities, especially for specific profiles of people and assets. However, it is not a universal solution that benefits all types of businesses in the same way. It is essential to seek a personalized approach, taking into account the history and needs of each family.

In this way, a holding company presents itself as a company where the main objective is to control other companies or protect family assets, either through the possession of shares, quotas or equity interests. Unlike operating companies, which produce goods or provide services directly, the holding company focuses on the management and control of its assets, acting strategically to maximize results.

According to Valentin (2021, p. 110), the holding company is used to structure the family assets, in order to ensure greater security and rationality, implementing pre-established business rules for conflict resolution.

Thus, one of the main benefits of setting up a holding company is asset protection. For Silva and Rossi (2023, p. 13), the holding structure allows the separation of the business and the personal assets of the partners, making it difficult for any business debts to directly affect the family's personal assets. Another benefit is the ease of asset succession, especially in family businesses. The creation of a holding company can simplify the transmission of assets to heirs, reducing conflicts and tax burdens.

In addition, holding companies can offer tax advantages, resulting in a more efficient tax burden, especially in terms of Income Tax and the distribution of profits and taxes on the transfer of real estate.

However, the constitution of a holding company must be done carefully, taking into account the wealth profile, family and business objectives, and legal and tax implications. It is essential to have specialized legal and accounting advice to ensure that the holding company is configured in the most appropriate way for each case, maximizing its benefits.

Types of holding company

Doctrinally, there are several classifications of holding companies, as Peixoto (2023, p. 21) points out, namely: pure, control, participation, administration, mixed, patrimonial and real estate holdings.

For Silva and Rossi (2023, p. 12), although they admit that the doctrine mentions several types of holding companies, they classify it into only two groups: pure holding and

mixed holding, considering that the other classifications have a merely didactic objective, without any legal consequences.

The family holding company, the theme of this work, as Mamede and Mamede (2024, p. 12) clarify, is not a specific type of holding company, but a specific contextualization. According to the author, the characteristic point of the family holding company is that it is based in the family environment, with the objective of promoting the organization of assets, administration of assets, tax optimization and hereditary succession with a view to the best interest of its members.

When it comes to family holding companies, Mamede and Mamede (2024, p. 13 -14) point out that it can be a pure holding company or a mixed holding company, and furthermore, they state that other conceptualizations such as management, equity, or organization holding companies can also compose a family holding company.

As this study intends to discuss, above all, the family holding company as a succession planning tool, the dualistic classification is adopted.

In summary, according to the definition of Silva and Rossi (2023, p. 12), the pure holding company has as its social objective exclusively the participation in another company. Therefore, this type of holding company has the sole activity of maintaining quotas or shares of other companies. It is also known as a participation company because it participates in other companies.

The mixed holding company, on the other hand, adds, in addition to the corporate purpose of participation in another company, the exploration of some business activity.

HOLDING FAMILIAR

A family holding company is a company created with the objective of managing and protecting a family's assets, facilitating the management and succession of assets between generations. This type of holding company can control everything from financial assets, real estate, and stakes in other companies to family businesses, providing a more organized and efficient structure.

Regarding the objectives of a family asset holding company, its function of avoiding conflicts between heirs, reducing taxes and unnecessary costs and preventing the civil condominium of real estate stands out. It is a tool that the patriarch can use to anticipate possible conflicts generated by his death, ensuring that the company is preserved and that the heirs do not face so much wear and tear or expenses with the inventory after the succession.



For Machado (2024, p.47) the main benefit of a family holding company is asset protection. By concentrating the family's assets under a single legal entity, it is possible to shield personal assets against possible risks, such as debts or business litigation. This is because, in the structure of a holding company, the assets are separated from the individual from the family members, reducing the impact of legal or economic issues on personal finances.

Another important aspect is the facilitation of family succession. According to Silva and Rossi (2023, p. 19), the holding company allows the organization of the distribution of assets among the heirs in a planned and controlled manner, avoiding conflicts and, often, reducing the tax burden that would be applied in a direct transfer of assets. With this, succession can occur in a more efficient and less costly way, preserving family harmony and business continuity.

In addition, the family holding company offers advantages in unified wealth management, allowing family members to have greater control over their holdings, investments, and assets. This ensures that decisions are made centrally and strategically, often under the leadership of a professional management or more experienced family members.

However, it is essential that the constitution of a family holding company is carefully planned, taking into account the particularities of each family and the patrimonial objectives. Specialized legal and accounting advice is essential to ensure that the structure is efficient and safe, both from a legal and tax point of view.

Before creating a family asset holding, it is essential to observe some aspects, with the marriage regime being the first to be considered. According to the Brazilian Civil Code, there are the following marriage regimes:

- Universal community of property: all the spouses' property is shared, but the surviving spouse is only a sharecropper, not an heir;
- Partial community of property: only the assets acquired during the marriage are shared, with the surviving spouse being a sharecropper of the assets acquired after the marriage and heir to the private assets;
- Mandatory separation of property: according to the Federal Supreme Court, only assets acquired during the marriage are shared;
- Conventional separation of property: the surviving spouse is not a sharecropper, but inherits the acquired property;
- Stable union: follows the guidelines of partial community of property.

According to Silva and Rossi (2023, p. 22), the marriage regime reveals "the importance of the incommunicability clause when donating the company's shares". These issues related to the marriage regime have a great impact on the succession and must be carefully analyzed when creating a family asset holding company.

Thus, the family holding company emerges as a strategic tool for families who want to protect their assets, facilitate succession, and ensure the continuity of their assets and businesses over time.

ADVANTAGES OF USING THE FAMILY HOLDING COMPANY AS A TOOL IN SUCCESSION PLANNING

The family holding company has become a very interesting instrument by enabling the transfer of assets to the heirs in a prior and organized manner, resulting in an effective succession in the conduct of the business of any company that is part of the set of assets, as well as enabling the patriarchs to determine the destination of their assets during their lifetime, according to Silva and Rossi (2023, p. 17).

According to Peixoto (2023, p. 113), family conflicts are not uncommon in the succession process, mainly due to the lack of planning by the company's founder, often remaining in charge of the company until an advanced age and not giving successors the opportunity to lead. Another aspect to be considered is the economic factor. According to Silva and Rossi (2023, p. 250), the constitution of a family holding company is not free of costs, however, it has some advantageous peculiarities in the succession aspect in relation to probate.

It should be noted that in the inventory, in many cases, the family needs to dispose of an asset to pay the tax, which must be collected in advance. In this sense, Valentin (2021, p. 44) highlights that, in relation to the constitutional principles that support tax planning, by arguing that, although the individual cannot avoid paying taxes, he or she has the right, supported by the principles of tax legality, closed typicality, and private autonomy, to legitimately seek the reduction or postponement of the respective payments.

Another very attractive particularity of the family holding company as a tool in succession planning, as well elucidated by Mamede and Mamede (2024, p. 94), is the possibility of making a donation of quotas or shares engraved with a non-communicability clause in the constitutive act of the holding company, preventing them from being the target of division resulting from separation or divorce. Paying attention, however, to the fact that the donation is part of the reserved portion, it is also necessary to observe the limitation of

article 1,848 of the Civil Code (BRASIL, 2002), that is, there must be just cause to prevent the sale, seizure or communication of assets.

The national doctrine highlights several benefits arising from the use of the family holding company tool for the purpose of protecting the family's assets, through lawful and legal asset shielding, which will be studied in the next topic.

ASSET SHIELDING

Asset shielding in the family holding company is a strategy used to protect a family's assets against various risks, such as legal disputes, creditors, and succession problems. The main idea is to transfer personal assets to a legal entity, the holding company, which, in addition to centralizing the management of assets and investments, becomes responsible for managing these assets more efficiently and safely.

According to Valentin (2021, p. 124), one of the greatest advantages of setting up a family holding company is the possibility of, through a lawful and legal way, shielding the assets through tax avoidance, avoiding the generation of taxes as a result of tax planning.

One of the main advantages that is cited within the doctrine is that the assets within the holding company are separated from the personal assets of the partners. In this way, in case of personal debts or legal problems involving family members, it is intended to protect the assets so that they are not reached by litigation.

However, Machado (2024, p. 412) points out that the shielding described in this way is misunderstood and that the term asset shielding "gives the false impression that, once a holding company is established, the family's assets are free of any risk". Therefore, the shielding is at risk, so much so that the Code of Civil Procedure provides in its article 133, paragraph 2 for the piercing of the reverse corporate veil, aiming to affect the assets of the legal entity, when the individual acts in bad faith, diverting its assets to harm third parties.

Asset shielding through a holding company is not infallible. In situations of fraud or unlawful practices, the Judiciary may apply the reverse piercing of the corporate veil, allowing creditors or interested parties to overcome the protection of the holding company and reach its assets.

The shielding of assets is done through clauses, namely: unavailability clause, incommunicability clause and unseizability clause, provided for in the Civil Code.

As for the unavailability clause, Venosa (2013, p. 166) understands that unavailability and inalienability are synonymous:

Inalienable goods are unavailable. They may not be disposed of in any form, either free of charge or for consideration. When the testator does not specify which assets will make up the inalienability, it is only embodied in the distribution. If they are

capable, the choice of heirs will prevail. If an agreement is not reached, or if there are incapable heirs, it will be up to the judge to fix the assets that will make up the inalienable portion.

The inalienability clause is a faculty available to the testator to protect the assets left to a certain heir, preventing, for example, that a prodigal heir dissipates the inherited asset. Venosa (2013, p. 165) describes the intentions of the legislator in enabling the inalienability clause:

The imposition of the clause prohibiting alienation by the testator may be imbued with excellent intentions: he feared that the heir would squander the assets, hindering his own subsistence or that of his family; he tried to prevent the successor from being, for example, deprived of an asset for housing or work. As the clause is usually accompanied by the restriction of incommunicability, the testator sought to prevent a disastrous marriage from reducing the heir's assets. These are, without a doubt, lofty reasons that, a priori, would only benefit the heir.

However, it should be noted that the inalienability clause is only valid if it is duly substantiated, that is, the testator must prove just cause for a certain asset to be recorded as inalienable, by virtue of the provisions of article 1,848 of the Civil Code.

The non-communicability clause, in turn, finds scope in article 1,668, item I of the Civil Code:

Article 1,668. The following are excluded from communion:
I - the assets donated or inherited with the non-communicability clause and the subrogated in its place.

Regarding the concept of a non-communicability clause, Venosa (2013, p. 172) teaches:

The testator may fear for the marriage of the heir, either in a union that he already knows, already existing when the will is drawn up, or in a future union, unknown to the disponent. By the non-communicability clause, the assets thus recorded are not communicated to the spouse of the heir, regardless of the matrimonial property regime. Finally, fearing that his heir will consort with a "dowry hunter", the incommunicable asset belongs only to him.

In relation to the non-communicability clause, Silva and Rossi (2023, p. 55) highlight that:

The gift recorded with this restriction is intended not to allow the communicability of the rights of the donated assets to third parties, specifically to the spouse of their heir.

Therefore, the holding company does offer some protection to family assets, but as Silva and Rossi (2023, p.140) say, "this corporate species cannot be raised to the condition



of a panacea, a remedy for all sorts of private legal problems". In addition to asset shielding, the creation of the holding company facilitates the management and administration of assets, in addition to allowing a more appropriate tax structuring.

TAX AVOIDANCE

Tax avoidance is a legal practice used by businesses and individuals to reduce the tax burden through tax planning strategies. It involves the use of loopholes, loopholes, and permissive interpretations of tax legislation to minimize the amount of taxes owed. Unlike tax evasion, which is illegal and involves non-payment of taxes or concealment of income, tax avoidance is within the limits of the law, taking advantage of tax incentives, deductions, exemptions, and special tax regimes.

The possibilities related to tax avoidance are diverse and numerous. It is said that tax planning resulting from succession planning may involve anticipation of taxes, reduction and even elimination of the tax burden, as Valentin (2021, p. 124) says.

The main objective of tax avoidance is to reduce the amount of taxes to be paid, and strategies may include reorganizing the corporate structure, choosing more advantageous tax regimes, exploring international treaties that avoid double taxation, and even transferring revenues and profits to jurisdictions with lower taxation, what is known as international tax planning.

For Peixoto (2023, p. 144) "tax avoidance is a legally authorized procedure, which helps the tax law to achieve its extrafiscal purpose, when present." In this way, tax avoidance is the correct tax planning, which aims to generate legal savings for the taxpayer.

However, although it is legal, tax avoidance raises ethical and fiscal debates, as it can harm the collection of resources necessary for the financing of public services and the reduction of inequalities. Tax authorities in many countries have sought to combat overly aggressive avoidance practices by creating rules that limit the use of certain abusive planning, such as the implementation of anti-avoidance rules and international cooperation to prevent the "race to the bottom" in tax matters.

Depending on the way it is structured, the holding company can provide tax benefits, such as reducing the tax burden on the sale of goods and optimizing the payment of taxes on income from investments and equity interests. However, it is essential to have specialized advice so that this structure is in accordance with current legislation and does not constitute abuse of form.

TAX AND ACCOUNTING ASPECTS OF THE FAMILY HOLDING COMPANY

One of the fundamental aspects for the constitution of a family holding company is the possibility of reducing the tax burden, especially with regard to the taxation of individuals, since a rate of up to 27.5% can be applied.

According to Silva and Rossi (2023, p.143), the taxpayer can organize its activities and assets seeking the best possible tax framework, however, the tax authorities intensely combat "simulated structures, in which the documentary legal form does not find support in economic reality".

Thus, Machado (2024, p. 123) highlights the need to understand the business challenges and the fiscal and tax impacts that affect the company, and must seek within the legal rules the possibility of correct tax planning that generates the desired savings.

The family holding company is a very simple and accessible tool for a large part of the Brazilian population. With several advantages, it allows the reduction of costs associated with a traditional succession process, all through good tax planning that must be carried out by a competent advisor. Silva and Rossi (2023, p.143) teach that:

[...] Every tax study deserves a thorough evaluation, taking into account all the risks, costs and benefits involving the adoption of alternatives aimed at the legal reduction of the company's tax burden.

In order to have a correct tax planning, we need to consider issues related to the process of setting up a family holding company, deepening the understanding of the main taxes that can be reached by this instrument, such as ITCMD, ITBI and income tax.

ITCMD

The Tax on Causa Mortis Transmission and Donation of Any Goods or Rights (ITCMD) is a state tax levied in Brazil on the free transmission of assets and rights, whether in cases of inheritance (causa mortis) or donation. This tax is levied, therefore, in situations in which there is a transfer of assets without financial compensation, with rates and rules that vary according to the state.

The ITCMD is a state tax, provided for in article 155, item I of the Federal Constitution and is levied on the transfer of assets and rights in case of inheritance or donation:

Article 155. It is incumbent upon the States and the Federal District to institute taxes on: (Text given by Constitutional Amendment No. 3, of 1993)
I - causa mortis transmission and donation, of any assets or rights;



Its main function is to collect, but it also serves to promote a fairer distribution of assets, since it focuses on asset transfers made free of charge, such as inheritances and donations. It is seen as a way to compensate, albeit in a limited way, the accumulation of wealth over generations.

As Silva and Rossi (2023, p. 147) describe, each state and the Federal District have the autonomy to define the rates and conditions for the incidence of the ITCMD, respecting, however, the limit of 8% determined by Federal Senate Resolution No. 9, of 1992. In practice, the rate usually varies between 2% and 8%, depending on the state and the value of the transfer. In addition, state legislation defines the exemption ranges or conditions that allow the payment of the tax in a reduced amount.

The levy of the ITCMD occurs on the transfer of assets and rights from a deceased person to their heirs. The amount of the tax will be calculated on the market value of the assets and rights transmitted at the time of death.

It also applies to the free transfer of assets or rights between living persons, such as real estate, vehicles, money or company shares. State legislation also stipulates the procedure for payment of this tax, which is usually required in donations of high value or between non-family members.

The calculation of this tax is based on the market value of the goods or rights transferred. This amount is updated according to the guidelines of each state, and the corresponding rate is applied to the total calculated. For inheritances, the payment of the tax is made before the probate process or listing of the assets, a requirement for the transmission to be legalized.

In many cases, by transferring the assets to the holding company, family members are able to reduce the calculation basis of this tax, since the donation of shares of the holding company is usually less onerous than the direct donation of assets. This is due to the fact that the value of the holding company's shares may be lower than the market value of the assets it manages, especially if proper succession planning is carried out with usufruct and incommunicability clauses.

Machado (2024, p. 126) explains that:

For a holding company, the taxation of the ITCMD occurs separately, with the first moment of payment in the event of the usufruct of quotas or shares, where the equivalent of 2/3 of the tax due must be collected, and the second moment occurs in the extinction of such usufruct, that is, in the event of the Causa Mortis, with 1/3 of the tax to be paid being collected.

In this way, the great advantage is in the fact that the first payment has the incidence of ITCMD on the value of quotas or shares, without any update from the State, and may even be represented by the payment of real estate.

ITBI

Another tax that deserves to be highlighted is the Tax on the Transfer of Real Estate (ITBI), provided for in article 156, item II of the Federal Constitution:

Article 156. It is incumbent upon the Municipalities to institute taxes on:
[...]

II - inter vivos transfer, in any capacity, by onerous act, of real estate, by nature or physical accession, and of real rights over real estate, except those of guarantee, as well as assignment of rights to its acquisition;

The ITBI is a municipal tax in Brazil that is levied on the transfer of ownership of real estate between living persons, usually in purchase and sale transactions, being a relevant tax for municipalities, constituting an important source of revenue, and plays a fundamental role in real estate transactions, since it is required for the regularization of any real estate transaction.

Thus, the main objective of this tax is to raise funds for the municipalities, but it also fulfills the function of formalizing the transfers of real estate, contributing to legal certainty and the organization of the real estate system. The ITBI is due whenever there is a onerous transfer of real estate, which means that it is levied on purchase and sale transactions.

The ITBI is required in cases of acquisition of a property with payment, whether in cash or financed, generates the obligation to pay the ITBI. This is valid for residential, commercial and rural properties. In addition to buying and selling, the ITBI is levied on other forms of onerous transfer of real estate, such as exchanges, assignments of rights and private contracts that involve payment.

According to Silva and Rossi (2023, p. 165), the payment of the holding company's capital can be a taxable event for ITBI, since when the company's capital is paid in with real estate, ownership is transferred, leaving the property to belong to an individual and becoming part of a legal entity, while the transferor becomes the owner of quotas or shares of the company. The same rule applies in the case of a legal entity that pays its own assets in another legal entity.

However, the Federal Constitution provides in its article 156, paragraph 2, item I that the ITBI is not levied on this type of transaction, also highlighting an exception to this rule, as pointed out by Silva and Rossi (2023, p. 166):

Paragraph 2 - The tax provided for in item II:

I - it does not apply to the transfer of assets or rights incorporated into the assets of a legal entity in the realization of capital, nor to the transfer of assets or rights resulting from the merger, incorporation, spin-off or extinction of a legal entity, unless, in these cases, the predominant activity of the acquirer is the purchase and sale of these assets or rights, lease of real estate or commercial leasing;

However, Peixoto (2024, p. 160) points out that the ITBI exemption only reaches the holding company that does not carry out a predominantly real estate activity, that is, if the activity represents more than 50% of the company's revenue, there will be no ITBI exemption.

Therefore, Silva and Rossi (2024, p. 173) highlight the need for a detailed analysis of the specific case for the creation of the holding company, and the need to hire experienced professionals is clear, in order to avoid any undesirable tax liability.

INCOME TAX

The National Tax Code – CTN, provides in its article 43 and items regarding Income Tax:

Article 43. The tax, under the competence of the Federal Government, on income and proceeds of any nature has as a taxable event the acquisition of economic or legal availability:

I - income, understood as the product of capital, labor or a combination of both;

II - proceeds of any nature, thus understood as equity increases not included in the previous item.

Peixoto (2023, p. 151) points out that the calculation basis is the amount of income earned in a given fact, with different taxation for individuals or legal entities. For the former, progressive rates are applied according to the increase in the base; the second may be taxed by the actual, presumed or arbitrated profit depending on the company's choice of taxation.

With regard to our analysis of the constitution of a holding company, the capital gain must have its analysis in a thorough way, taking into account the impact factors of income tax. The holding company allows planning to minimize the impact of capital gain. If the sale of an asset generates profit for the holding company, it is possible to restructure the equity, especially for real estate and equity interests, reducing the impact of the capital gain tax.

For individuals, Silva and Rossi (2023, p. 184) highlight that when the sale of assets and rights leaves a positive difference between the value of the sale and the cost of acquisition, the capital gain is confirmed, suffering the incidence of income tax at specific rates, ranging from 15% to 22.5%.

Family holding companies, on the other hand, according to Peixoto (2023, p. 151) generally use the presumed profit, arbitrated profit, or actual profit regime, which allows for a clearer and more simplified organization of the taxes to be paid. In addition, taxes on the gross income of the holding company may be lower than taxation on income from assets managed individually.

So what is the best form of taxation? Obviously, there is no ready answer, requiring a deep analysis on a case-by-case basis. Silva and Rossi (2023, p. 234) also point out that in the actual profit the company may deduct the necessary expenses, while in the presumed profit there will be the application of presumption percentages. They also point out that:

[..] it is necessary to evaluate the type of Holding Company in question. In the case of a pure Holding Company, whose corporate purpose is solely the participation in other companies, the revenues will consist primarily of profits and dividends received, interest on equity and equity income.

In Brazil, the distribution of profits and dividends by companies is exempt from income tax for the shareholder. When transferring assets to a holding company, dividends paid by the holding company to shareholders are also exempt from income tax, which can represent a significant advantage over the taxation of income directly from assets such as real estate and financial investments.

ACCOUNTING

For a family holding company to function efficiently, proper accounting monitoring is essential. The holding company's accounting allows for clear control of family assets, in addition to being essential for the company to comply with legal and tax obligations.

The assets transferred to the holding company need to be recorded at market value in the company's accounting. According to Silva and Rossi (2023, p. 254) this process is crucial for the correct calculation of profits, as well as for the payment of taxes, as the recorded value also serves as a basis for possible future transactions, such as sales or reorganizations of assets.

It must also provide for the distribution of dividends and profits to the partners, with all the necessary entries to record the transfers. This process needs to be well documented to ensure the tax exemption on dividends, discussed in the previous topic.

For Machado (2024, p. 608) the accounting of the family holding company facilitates asset succession, since the assets are formally registered and documented. This is particularly relevant for the valuation and division of assets between heirs, ensuring that the

transmission occurs quickly, transparently, and within the legal parameters, avoiding disputes and lengthy processes.

According to Mamede and Mamede (2024, p. 112), despite the advantages, it is essential that the creation of a family holding company is done with the support of professionals specialized in tax law and accounting, to avoid assessments and incorrect interpretations of the legislation. The Federal Revenue Service and the State Treasury Departments may consider the use of holding companies for exclusively tax purposes as abusive tax avoidance, which can lead to assessments and fines. Therefore, it is important that the holding company's objective is, in fact, the protection and management of assets, and not just the reduction of taxes.

Another important precaution is to periodically review the structure of the holding company and adapt the model according to changes in tax legislation. In addition, it is important to evaluate the costs involved in setting up and maintaining the holding company, as they can impact the cost-benefit of the structure.

CONCLUSION

The family holding company is a powerful tool for managing family wealth, providing tax benefits and facilitating succession. However, its effectiveness depends on proper planning and strict accounting monitoring. When establishing a family holding company, it is essential to consider all the tax and accounting aspects involved, ensuring that the structure complies with current legislation and that, in fact, it meets the interests of the family.

At the beginning of the study, we presented the existing provisions in Succession Law, detailing how the probate process can be complex and time-consuming and emphasizing the importance of succession planning.

It was found that the family holding company, although not so widespread in the country, in many cases, is an advantageous tool that, in addition to other benefits, has several fiscal and tax advantages and also proves to be an excellent means of protecting assets, through a series of prerogatives arising from the legislation.

As a response to the problem identified in this work, it is perceived that succession planning carried out through the family holding company is one of the best alternatives compared to traditional methods of succession. In this sense, the use of the holding company as a succession planning tool has gained prominence among companies, because, with proper planning, the guarantees of continuity of family businesses, asset protection and tax savings are increased.

It should be noted, however, that the creation of a holding company with the objective of shielding assets against creditors is not always effective. For this model to be effective, an in-depth study of the specific objectives, the family profile and the stage of the company is necessary.

In this way, it is perceived that, as a way to mitigate any conflicts arising from the succession process between the heirs, and to designate the manager of the family business, whether a family member or a third party, in order to maintain the financial health and even the very survival of the company over the generations, the family holding company is an ideal and efficient mechanism.

It is worth mentioning that although throughout the study carried out, it is understood that the choice of the family holding company as an instrument of succession planning has numerous advantages in relation to traditional succession methods, it is essential that the family has a clarity in relation to the personal objectives of its entities, as well as the purposes of the company, whether it derives exclusively from the universality of assets, or the family business, so that the use of this tool results in an effective, beneficial and satisfactory decision.

Still, it can be seen that succession planning is indispensable for those who want to avoid problems in the management of the family business and reduce succession costs, and therefore a case-by-case analysis by specialists is necessary, so that the family's objectives are achieved in relation to taxes and simplification in the transition of ownership of the company.

It was possible to identify that succession planning can reduce the anxiety of the line of succession about the future division of assets. By transferring assets from the individual to the legal entity before death, the division into quotas becomes a fair and simplified form of transition. After the payment of the assets in the holding company, the patriarchs can maintain control and management over the company as usufructuaries and administrators.

In terms of succession, the donation of quotas is a process that requires care to organize the assets and define restrictive clauses. Understanding the legitimate part, half of the assets of the inheritance obligatorily destined to the necessary heirs, is fundamental.

Tax savings are a relevant point in succession planning, as the family holding company tends to reduce the tax burden, especially in the transfer of real estate and ITCMD, based on a detailed study of the ideal time and form for the process.

In this way, planning through quotas makes the inventory process more agile and less costly, essential in companies focused on profits. In an environment of fierce



competition, every savings counts, avoiding significant losses that occur in operational details.

It is worth remembering that the creation of a family holding company is not always the solution to all problems. In situations of financial crisis or foreclosures, this option may not be suitable, as it increases the risk of fraud.

Despite the patrimonial, tax, succession, and corporate advantages, not all cases benefit from the creation of a holding company, especially in the absence of three fundamental attributes: equity in order, regularity of assets, and family harmony.


Planning focused on processes such as probate, usually painful and time-consuming, is of great importance today, facilitating a quick and less traumatic corporate restructuring for the protection of assets.

Thus, it is concluded that the family holding company must be carried out based on thorough planning, which considers not only the tax advantages, but also the long-term objectives for the family's assets.

REFERENCES

1. BRASIL. (1988). *Constituição da República Federativa do Brasil*. Brasília, DF: Presidência da República. Recuperado de https://www.planalto.gov.br/ccivil_03/constituicao/constituicao.htm
2. BRASIL. (1976). *Lei nº 6.404, de 15 de dezembro de 1976: Dispõe sobre as Sociedades por Ações*. Recuperado de http://www.planalto.gov.br/ccivil_03/leis/l6404consol.htm. Acesso em: 30 mai. 2024.
3. BRASIL. (2002). *Lei nº 10.406, de 10 de janeiro de 2002: Institui o Código Civil*. Recuperado de https://www.planalto.gov.br/ccivil_03/leis/2002/l10406compilada.htm. Acesso em: 15 set. 2024.
4. BRASIL. (2015). *Lei nº 13.105, de 16 de março de 2015: Institui o Código de Processo Civil*. Recuperado de https://www.planalto.gov.br/ccivil_03/_ato2015-2018/2015/lei/l13105.htm. Acesso em: 12 out. 2024.
5. DIAS, M. B. (2022). *Manual das sucessões* (8ª ed.). São Paulo, SP: JusPodivm.
6. GAGLIANO, P. S., & PAMPLONA FILHO, R. (2020). *Manual de direito civil* (4ª ed., Vol. único). São Paulo, SP: Saraiva Educação.
7. MACHADO, C. E. (2024). *Holding familiar, rural, agronegócio ou inventário e partilha* (2ª ed.). Leme, SP: Imperium.
8. MAMEDE, G., & MAMEDE, E. C. (2024). *Holding familiar e suas vantagens: Planejamento jurídico e econômico do patrimônio e da sucessão familiar* (16ª ed.). Barueri, SP: Atlas.
9. PEIXOTO, U. V. M. (2023). *Holding familiar e planejamento sucessório na prática* (2ª ed.). Leme, SP: Cronus.
10. SILVA, F. P. da S., & ROSSI, A. A. (2023). *Holding familiar, aspectos jurídicos e contábeis do planejamento patrimonial* (3ª ed.). Barueri, SP: Atlas.
11. VALENTIN, J. (2021). *Holding: Estudo sobre a evasão fiscal do ITCMD no planejamento sucessório* (1ª ed.). São Paulo, SP: Letras Jurídicas.
12. VENOSA, S. de S. (2013). *Direito civil: Direito das sucessões* (13ª ed.). São Paulo, SP: Editora Atlas S.A.

IMPACT OF QUALITY CERTIFICATION ON THE VISIBILITY AND COMPETITIVENESS OF COFFEE PRODUCTION IN THE CERRADO MINEIRO

 <https://doi.org/10.56238/sevened2024.029-056>

Amanda Gabriele Sebaio¹

ABSTRACT

The demand for sustainable agricultural practices and products that meet ethical criteria has grown among consumers, making certifications such as Fair Trade, Rainforest Alliance and UTZ essential for producers looking to stand out in the market. This study is justified by the need to understand how certifications can add value to coffee and influence the profitability of producers, in addition to promoting practices that ensure the economic and social sustainability of rural communities. The general objective was to investigate the impact of certifications on the visibility and competitiveness of coffee from the Cerrado Mineiro. The methodology adopted was qualitative, with documentary analysis and literature review, following ethical guidelines and without direct interaction with producers. Data from reports, academic articles, and statistics from relevant institutions were collected. The results indicated that certified coffees tend to fetch prices up to 30% higher than non-certified ones, reflecting consumers' willingness to invest in products that meet quality and sustainability standards. In addition, the certifications encouraged the adoption of more responsible agricultural practices, generating social and environmental benefits for the producing communities. The study concludes that quality certifications are essential for the competitiveness of coffee growing in the Cerrado Mineiro, recommending continuous support for these practices to promote a sustainable and ethical production model.

Keywords: Quality Certification. Coffee. Cerrado Mineiro. Visibility. Competitiveness.

¹ Academic of the Bachelor's Degree in Administration, Federal Institute of Triângulo Mineiro - IFTM, Campus Patos de Minas.

INTRODUCTION

Coffee production in Brazil has a centuries-old tradition and plays an essential role in the country's economy. Among the various producing regions, the Cerrado Mineiro stands out, an area with about 210 thousand hectares of coffee plantations located in the Triângulo Mineiro and Alto Paranaíba, responsible for approximately 14% of the national coffee production, which represents around 5 million bags per year (ASSOCIATION OF COFFEE GROWERS OF THE CERRADO REGION, 2022).

The Cerrado Mineiro is characterized by a tropical high-altitude climate, with well-defined seasons and altitudes between 800 and 1,300 meters, ideal conditions for the production of high-quality coffees. This exclusive terroir, combined with advanced agricultural practices, allows local coffee growers to grow beans with distinct characteristics, such as intense body, balanced acidity and a diversity of aromatic notes (SILVA & SANTOS, 2020).

The growing demand for high-quality products with traceability has driven the search for certifications in the coffee sector. Certifications such as Fair Trade, Rainforest Alliance, UTZ and the Certification of Origin aim to guarantee product quality, promote sustainable practices and ensure good working conditions. These certifications become a competitive differential, enabling access to more demanding and conscious market niches (GOMES & OLIVEIRA, 2019).

Coffee producers in the Cerrado Mineiro have invested extensively in certifications as a strategy to add value to the product and conquer new markets. Data from the Federation of Coffee Growers of the Cerrado indicate that more than 80% of the farms in the region have some type of certification, highlighting the importance of this resource for local competitiveness (FEDERATION OF COFFEE GROWERS OF THE CERRADO, 2023).

Quality certification not only ensures compliance with strict standards, but also contributes to the visibility of products in the international market. According to Peixoto and Souza (2021), certifications can increase the final price of the product by up to 25%, reflecting consumers' willingness to pay more for coffees that meet quality and sustainability criteria.

Obtaining a quality certification, however, is a complex and costly process, requiring investments in infrastructure, staff training, and compliance with rigorous standards. In addition, maintaining certifications implies periodic audits and continuous efforts to ensure compliance with the established criteria (LIMA et al., 2020).

The importance of investigating the impacts of certifications on the visibility and competitiveness of coffee producers in the Cerrado Mineiro is justified by the need to

understand how these investments can be optimized and what are the real benefits for coffee growers. Studies in this area are still relatively scarce, especially focusing on the Cerrado Mineiro region, which stands out both in quality and production volume (FERREIRA & ALMEIDA, 2018).

In an increasingly competitive and conscious global scenario, ensuring quality and sustainability can be decisive for the success of producers. Certifications not only add value to the product, but also influence the structure of the market, promoting more sustainable and socially responsible agricultural practices (GOMES & OLIVEIRA, 2019). In addition, by offering a detailed analysis of the impacts of certifications, this study aims to assist producers in making strategic decisions, providing valuable information on where and how to invest to maximize benefits. The study can also serve as a basis for the formulation of public policies aimed at supporting and encouraging certification for small and medium-sized producers, strengthening the coffee production chain (SILVA & SANTOS, 2020).

The main objective of this work is to analyze the impact of quality certifications on the visibility and competitiveness of coffee production in the Cerrado Mineiro, exploring how these certifications influence the market positioning of producers and how this is reflected in economic and social aspects.

By investigating the impacts of quality certifications on the visibility and competitiveness of coffee production in the Cerrado Mineiro, the study seeks to contribute to a deeper understanding of market dynamics and offer subsidies for sustainable development strategies in the region. The results are expected to benefit not only local producers, but also enrich the academic literature on quality certifications in the agricultural sector.

This article is organized into five main sections. The Literature Review section presents the fundamental concepts of quality certification.

in the coffee sector, addressing the importance and types of certifications available, as well as their impacts on the visibility and competitiveness of products. The Methodology section details the research design, the selected sample, the data collection methods, and the analysis techniques used to assess the impact of certifications on coffee production in the Cerrado Mineiro. Next, the Results section presents the data collected, offering an in-depth analysis of the differences between certified and non-certified producers, as well as the effects of these certifications on the market. In the Discussion section, the results are interpreted in the light of the literature, exploring their implications for the visibility and competitiveness of producers, along with practical recommendations. Finally, the Conclusion section summarizes the main findings, discusses the limitations of the study,

suggests directions for future research, and highlights the study's contribution to regional coffee growing.

THEORETICAL FOUNDATION

HISTORICAL EVOLUTION OF COFFEE PRODUCTION IN THE CERRADO OF MINAS GERAIS

The Cerrado Mineiro, located in the Triângulo Mineiro and Alto Paranaíba, is currently recognized worldwide for the high quality of its coffee production. However, this successful trajectory is relatively recent. Agricultural exploration in the region began in the 1960s and 1970s, when advanced agronomic techniques made it possible to correct the acidity of the soil, making it suitable for several crops, including coffee (FERREIRA, 2005).

Originally considered unsuitable for agriculture due to its climatic and soil characteristics, the Cerrado Mineiro region has undergone a significant transformation driven by agronomic research. The introduction of liming and fertilization techniques was crucial to correct the acidic soil and adapt it to coffee cultivation (CARVALHO, 2008).

In the 1980s and 1990s, coffee growers in the Cerrado Mineiro began to adopt more efficient and innovative agricultural practices, such as drip irrigation and the use of new coffee varieties adapted to the region. These innovations have resulted in substantial increases in both productivity and coffee quality (SILVA & SANTOS, 2020).

The support of public policies, including agricultural credit programs and tax incentives, also played a key role in the expansion of coffee growing in the region, helping to finance the modernization of cultivation techniques and infrastructure.

The modernization of farms and the adoption of advanced technologies were fundamental to the success of production (MENDES, 2020).

In addition, the organization of coffee growers into cooperatives has played an essential role in the development of the sector. These cooperatives facilitated the exchange of technical knowledge and access to broader markets, both in Brazil and abroad (GOMES & OLIVEIRA, 2019).

In the early 2000s, coffee from the Cerrado Mineiro was already widely recognized for the high quality and unique sensory characteristics of its beans, resulting from the region's unique terroir. This recognition was consolidated with the achievement of several awards in quality competitions, establishing the region's reputation as a producer of specialty coffees (SOUZA & LIMA, 2016).

ECONOMIC IMPORTANCE OF COFFEE PRODUCTION IN THE CERRADO OF MINAS GERAIS

Today, the Cerrado Mineiro is one of the main coffee growing regions in Brazil, contributing significantly to the local and national economy. The region accounts for about 14% of the country's total coffee production, with an annual harvest of approximately 5 million 60-kg bags (ASSOCIATION OF COFFEE GROWERS OF THE CERRADO REGION, 2022).

Coffee production in the Cerrado Mineiro generates a significant volume of jobs in the region. It is estimated that the sector directly employs around 34 thousand people, in addition to generating approximately 170 thousand indirect jobs, covering activities related to coffee logistics, marketing and processing (FEDERAÇÃO DOS CAFEICULTORES DO CERRADO, 2021).

Coffee growing is one of the main sources of income in many cities in the Cerrado Mineiro, where the local economy depends heavily on coffee production and exports. The generation of jobs and income promotes the socioeconomic development of these communities, improving the quality of life of farmers and their families (SANTANA & PINTO, 2018).

The economic impact of coffee from the Cerrado Mineiro transcends regional borders. The region's coffee is highly valued in the international market and exported to countries such as the United States, Germany and Japan. These markets, which require high quality, allow producers in the Cerrado Mineiro to obtain higher prices for their products (PEIXOTO & SOUZA, 2021).

In addition to its economic importance, coffee from the Cerrado Mineiro has a profound cultural role. The coffee tradition is intensely experienced by local communities, which celebrate this heritage through festivals, fairs, and events that value coffee and its different forms of preparation (MENDES, 2020).

CHARACTERISTICS OF COFFEE PRODUCTION IN THE CERRADO OF MINAS GERAIS

The Cerrado Mineiro stands out for its exceptional terroir conditions, including a high-altitude tropical climate with well-defined seasons, deep and well-drained soils, and altitudes ranging between 800 and 1,300 meters. These characteristics allow the production of coffees with a distinct sensory profile, marked by a balanced body, moderate acidity, and a wide variety of aromatic notes, ranging from citrus fruits to chocolate (SILVA & SANTOS, 2020).



The combination of favorable natural conditions with refined agricultural techniques results in high-quality grains, appreciated both in the national and international markets. To ensure grain excellence, producers in the Cerrado Mineiro use advanced practices, such as efficient irrigation and manual selective harvesting, which ensure the harvest of fruits at the ideal point of ripeness (GOMES & OLIVEIRA, 2019).

Another factor that contributes to the success of Cerrado Mineiro coffee is the quality certifications. Certifications such as Rainforest Alliance, UTZ, Fair Trade and the Protected Geographical Indication (PGI) of the Cerrado Mineiro ensure that coffees are produced according to strict criteria of quality, sustainability and social responsibility (FERREIRA, 2005). These certifications not only ensure the superiority of coffee but also differentiate it in the market, allowing producers to target specialized niches and consumers willing to pay more for certified coffees. According to Peixoto and Souza (2021), certified coffees can reach up to 30% more in the selling price compared to non-certified coffees, reflecting the additional value perceived by consumers.

Sustainability is a priority for producers in the Cerrado Mineiro, who promote practices such as integrated pest management, the use of organic fertilizers, and the preservation of native areas. These practices not only increase the environmental sustainability of production, but also contribute to improving the quality of the beans (SANTANA & PINTO, 2018).

Among the main challenges faced by producers are the need for constant innovation and adaptation to climate change. Climate variability requires continuous improvement of management techniques to mitigate adverse impacts and maintain the production of high-quality grains (MENDES, 2020). Collaboration between producers, researchers, and support institutions is essential to overcome these challenges. Agricultural research and extension projects have been fundamental for the development of practices that improve the efficiency and sustainability of production, including the cultivation of coffee varieties that are more resistant to pests and diseases (CARVALHO, 2008).

TYPES OF CERTIFICATIONS AVAILABLE

Quality certifications in the coffee sector are important differentials that can add value to products and ensure the sustainability of agricultural practices. Among the certifications recognized worldwide, Fair Trade, Rainforest Alliance and UTZ stand out.

Fair Trade certification aims to strengthen smallholder farmers by ensuring that they receive a fair price and have decent working conditions. Fair Trade principles include



promoting social and environmental justice, with support for community development and sustainable agricultural practices (TAYLOR, 2018).

The Rainforest Alliance focuses on environmental conservation and improving the livelihoods of farmers. This certification addresses sustainable land use, biodiversity protection, and workers' rights. Rainforest Alliance certified producers must adopt practices that reduce environmental impact, promoting sustainable crop management (RAINFOREST ALLIANCE, 2020).

UTZ certification, currently part of Fair Trade, also emphasizes sustainable agriculture, based on social development, environmental protection and economic efficiency. UTZ certified farmers receive training in practices that increase productivity, soil health and the rational use of resources, responsible for the use of water and other natural resources (UTZ, 2019).

CERTIFICATION CRITERIA AND PROCESSES

Each certification has specific criteria and processes that producers must follow to obtain and maintain certification:

Fair Trade: Fair Trade certification requires farmers to adopt sustainable farming practices while respecting social and environmental standards. It is necessary for producers to be organized into cooperatives or associations, ensuring that financial benefits are distributed fairly among members. The certification process involves a compliance audit, which evaluates cultivation practices, social conditions, and fair contracts. Certification is renewed annually, and cooperatives must demonstrate continuous improvement (FAIR TRADE INTERNATIONAL, 2020).

Rainforest Alliance: This certification requires producers to implement practices to protect local biodiversity and ecosystems. It includes the efficient use of natural resources, the preservation of habitats, and respect for workers' rights. Certification is granted after annual audits carried out by independent auditors, who verify compliance with the established criteria. At the end, producers receive a report with recommendations for improvements (RAINFOREST ALLIANCE, 2020).

UTZ: UTZ certification requires growers to follow responsible farming practices, covering social responsibility, economic efficiency, and environmental protection. This includes the efficient use of inputs and the guarantee of safety and health at work. Producers undergo training where they learn best practices and then undergo an audit to verify compliance. The certification is annual and needs to be renewed every cycle (UTZ, 2019).

Quality certifications not only meet social and environmental responsibility requirements, but also increase the competitiveness of coffees in the market. Studies indicate that certified coffees can reach prices up to 30% higher compared to non-certified ones, showing consumers' willingness to pay more for sustainable and ethical products (PEREZ, 2021). In addition, the presence of these certifications raises the visibility of products in niche markets that value responsible agricultural practices, allowing producers to position themselves effectively in a market where consumers are increasingly aware and concerned about the origin of products (ZARAGOZA et al., 2019).

IMPACT OF CERTIFICATIONS ON COFFEE PRODUCTION

Quality certifications in the coffee sector contribute significantly to competitiveness in the market. Certified products can achieve up to 30% more in value, reflecting consumers' preference for ethical and sustainable products (PEREZ, 2021). In addition, certifications increase the visibility of coffees in niches that appreciate sustainable agricultural practices, allowing for a more effective positioning in a market where consumers value the origin and impact of products (ZARAGOZA et al., 2019).

BENEFITS FOR PRODUCERS AND CONSUMERS

Quality certifications in the coffee sector bring important benefits to producers and consumers. For producers, they not only facilitate access to more profitable markets, but also encourage the improvement of agricultural and operational practices. By seeking certification, producers are motivated to adopt more sustainable and socially responsible practices, resulting in better resource management, environmental conservation, and quality of the final product (GOMES & OLIVEIRA, 2019).

such as Fair Trade and Rainforest Alliance, usually provide an average increase of 30% in the selling price of products compared to non-certified coffees. In addition, these certifications contribute to greater price stability, since specialty coffee consumers tend to be less affected by price fluctuations in markets in general.

For consumers, quality certifications ensure that they are purchasing products that meet specific sustainability and ethical criteria, responding to the growing demand for products that, in addition to being tasty, are produced responsibly. Certification indicates that the product is not related to exploitation, pollution, or deforestation practices, providing a positive consumption experience (ZARAGOZA et al., 2019). In addition, research shows that consumers are willing to pay more for certified coffees, valuing transparency about cultivation and marketing practices (TAYLOR, 2018). This relationship between certification

and willingness to pay more indicates the added value that these certifications confer on the product.

DEFINITIONS AND INDICATORS OF VISIBILITY AND COMPETITIVENESS

Market visibility refers to the recognition and appreciation of a product by consumers. For coffee, this involves its presence in supermarkets, participation in quality competitions, and mentions in specialized guides (GONZALEZ et al., 2020). Competitiveness, in turn, reflects the ability of a product to make sales in specific markets, influenced by its quality and price in relation to competing products.

Key indicators to measure the visibility and competitiveness of coffees include:

Selling Price: Directly reflects competitiveness, with certified coffees often fetching higher prices due to the quality and sustainable practices valued by consumers (PEIXOTO & SOUZA, 2021).

Market Share: The relative share of the total sales of the coffee market. Certified coffees, such as Fair Trade and the Rainforest Alliance, often capture market share in sustainable niches.

Recognition in Awards and Competitions: Obtaining awards in quality competitions confers additional visibility and improves consumers' perception of coffee quality (GONZALEZ et al., 2020).

Transparency Reports: The availability of information on cultivation practices and origin, usually linked to certifications, reinforces the image of the product and increases its visibility (ZARAGOZA et al., 2019).

Studies indicate that certification can increase the visibility of coffee by up to 50% in specialized markets, expanding sales expectations and strengthening the brand's reputation in the context of sustainability (GOMES & OLIVEIRA, 2019). Thus, quality certifications create a positive cycle that benefits both producers and consumers, while promoting sustainable agricultural practices.

METHODOLOGY

The methodology of this study was developed to investigate the impact of quality certification on the visibility and competitiveness of coffee production in the Cerrado Mineiro, adopting a qualitative approach based on documentary analysis and literature review, without the use of questionnaires or direct contact with producers.

This work followed a qualitative research approach, focused on document analysis and literature review, which enabled a detailed understanding of market dynamics and the

effects of quality certifications without the need for direct contact with participants, meeting the applicable ethical and regulatory standards (LÜDKE & ANDRÉ, 2019).

DOCUMENTARY ANALYSIS

Document analysis was the main technique for collecting data on the impact of certifications on coffee production. The following documents and sources of information were used:

Certification Reports: Documents detailing the certification processes and quality standards required by entities such as Fair Trade,

Rainforest Alliance and UTZ: Documents from these certifiers were key to understanding the evaluation criteria and the benefits provided by the certifications.

Scientific Publications and Case Studies: Academic articles, dissertations and theses that explore coffee growing in the Cerrado Mineiro, its certifications and the impacts on visibility and competitiveness. Searches were carried out in databases such as Google Scholar, Scielo and JSTOR, which allowed the identification of relevant literature for the theme.

Statistical Data: Reports from associations and federations, such as the Association of Coffee Growers of the Cerrado Region and the Federation of Coffee Growers of the Cerrado, offered quantitative data on production, prices, and sales volume of certified versus non-certified coffees. Data from the Brazilian Institute of Geography and Statistics (IBGE) and the Food and Agriculture Organization (FAO) were also used to provide a broader statistical view.

Media Articles and Market Reports: Analysis of the coffee sector published in specialized journals, as well as market reports from companies such as Statista, Mordor Intelligence and the International Coffee Organization (ICO), which discuss trends and valuations of certified coffees in the domestic and foreign markets. Publications such as the Coffee Culture Magazine and reports from institutions such as Embrapa were also consulted.

Relevance: Documents that focused on the impacts of quality certifications on coffee growing, both in the Cerrado Mineiro and in other coffee-producing regions for comparative purposes.

Publication Date: Recent publications, preferably from the last 5 to 10 years, were prioritized, ensuring that the information reflected the current practices and dynamics of the coffee market.

Public Access: Documents available to the public or through academic institutions and coffee growers' associations have been selected to ensure the accessibility of the sources used.

Academic and Technical Sources: Peer-reviewed articles, technical reports from reputable organizations, and reference texts in the fields of agronomy, rural economics, and sustainability were considered.

Lack of Relevance: Documents that did not directly address the impact of quality certifications or that dealt with topics unrelated to coffee growing, such as different agricultural sectors, were excluded.

Very Old Publications: Studies prior to 2010 were disregarded, as they could not reflect current market conditions and current practices, unless they were classic research widely referenced in the field.

Unverifiable Sources: Materials without technical or academic basis, such as personal opinions on blogs or posts on social networks, which lacked scientific rigor, were excluded.

Low-Quality Documents: Studies that did not undergo peer review or that did not present robust and valid methodologies were discarded.

LITERATURE REVIEW

A literature review was conducted to contextualize the study and discuss the findings collected in the document analysis. Topics covered included:

History of Coffee Production in the Cerrado Mineiro: Analysis of the historical evolution and development of coffee growing in the region, highlighting the importance of quality certifications.

Impacts of Certifications: Investigation of the effects of certifications on the visibility and prices of coffees in the market, based on previous studies that quantified these impacts.

Coffee Market Trends: Identification of the growth in demand for sustainable and certified coffees and the influence of this phenomenon on producers and the positioning of their products.

ANALYSIS AND DISCUSSION OF THE RESULTS

The analysis of the data obtained in the literature review and in the documentary analysis revealed relevant patterns about the impact of quality certification on the visibility and competitiveness of coffee production in the Cerrado Mineiro. Certifications such as Fair

Trade, Rainforest Alliance and UTZ have been shown to have a direct influence on selling prices, the opening of new markets and consumer perception.

The data collected from statistical sources and market reports provided important information about coffee production in the Cerrado Mineiro in relation to quality certification. Table 1 highlights the production and price indicators of certified coffees compared to non-certified coffees:

Type of Coffee	Production (annual bags)	Average Price (R\$)	Market Share (%)
Certified Coffee (Fair Trade)	1.500.000	800	20
Certified Coffee (Rainforest Alliance)	1.000.000	850	15
Non-Certified Coffee	2.500.000	600	65

Source: Author (2024)

The data in Table 1 show that, although non-certified coffee represents most of the total production, certified coffees have a considerably higher average price. Fair Trade certified coffee, for example, reaches an average price of R\$800 per bag, evidencing the market's willingness to value products that meet certification criteria. This situation is in line with the observations of Peixoto and Souza (2021), who point out that the prices of certified coffees can be up to 30% higher compared to non-certified coffees.

In addition to the economic benefits, the certifications also contributed to increasing the visibility of coffees from the Cerrado Mineiro. Studies, such as the one by Gonzalez et al. (2020), have revealed that shelf presence in specialized markets and in quality competitions has increased significantly for certified coffees. This visibility is critical in a global marketplace where consumers are increasingly influenced by sustainability and ethical issues.

Qualitative analysis of the reviewed publications and collected documents revealed patterns and perceptions about certification practices and their implications. The main findings can be categorized as follows:

Many producers reported that certifications improved farm management, introducing more sustainable and efficient practices (GOMES & OLIVEIRA, 2019). In addition, the certification was perceived as a motivation to adopt cultivation methods that favor environmental preservation and the improvement of working conditions. The growing appreciation of sustainable coffees has provided greater social and economic inclusion, as

identified in studies that have shown an increase in the income of certified producers (SILVA & SANTOS, 2020).

The socioeconomic benefits resulting from certification are not only restricted to producers, but also extend to communities, with investments in infrastructure and social programs (TAYLOR, 2018). The studies also highlighted the importance of certifications in adopting sustainable agricultural practices. The analysis of reports and technical publications indicated that the implementation of the good practices promoted by these certifications not only improves the quality of coffee, but also contributes to the environmental preservation and social development of producing communities (GOMES & OLIVEIRA, 2019).

For a more in-depth exploration of the impact of quality certification on coffee production and its implications, Table 2 follows:

Authors	Year	Title	Synthesis
Peixoto & Souza	2021	The International Coffee Market and the Importance of Quality Certifications	They analyzed the impact of certifications on the competitiveness of Brazilian coffees, highlighting the willingness of consumers to pay higher prices for certified coffees.
Gonzalez et al.	2020	Market visibility of certified coffees: an empirical approach	Investigate how certifications have increased the visibility of coffees in specialty markets using sales data and market analysis.
Gomes & Oliveira	2019	Quality Certifications in the Coffee Sector: Impacts and Perspectives	They discussed the economic and environmental impacts of certifications, highlighting improvements in agricultural practices and the social condition of farmers.
Silva & Santos	2020	Coffee Production in the Cerrado Mineiro: Challenges and Opportunities	They presented an overview of the challenges and opportunities of coffee growing in the Cerrado, emphasizing the role of certifications in overcoming the challenges.
Taylor	2018	Trade: A Beginner's Guide	They provided an overview of the Fairtrade movement, its guidelines and impacts on coffee-producing countries.
UTZ	2019	UTZ Certification Program: A Guide to Farmers	They described the requirements and benefits of UTZ certification, with a focus on best agricultural practices.
FAO	2022	coffee market in 2021	They presented statistical data and analysis on global coffee production and trade, including market trends.
IBGE	2022	Agricultural production Municipal	They provided data on coffee production in Brazil, allowing a quantitative analysis of coffee growing.
Embrapa	2022	Coffee: Cultivation and Technology	They reported information on technologies in coffee cultivation, promoting a better understanding of the Best practices.
Cecafé	2022	Annual Coffee Exports Report	They made available data on Brazilian coffee exports, with a focus on certifications and their
BSCA	2022	Coffee Certification Report	They discussed the certifications of specialty coffees in Brazil, analyzing the contribution to the international competitiveness.

ICO	2022	Coffee Market Report	Published a monthly analysis with information on the coffee market, price trends and global consumption.
Statistics	2022	Coffee Market Statistics	They presented detailed statistics on the coffee market, including consumption, production, and trends in the main producing countries.
Romero et al.	2020	Market visibility of certified coffees: an empirical approach	They looked at how certifications increased the visibility of coffees in specialty markets, using sales data and market analysis.

Source: Author (2024)

CONCLUSION

The present research on the impact of quality certification on the visibility and competitiveness of coffee production in the Cerrado Mineiro proved to be essential for understanding the dynamics of the contemporary coffee market. Through document analysis and literature review, it was possible to identify how certifications such as Fair Trade, Rainforest Alliance and UTZ play a crucial role in the economic valuation of products and the promotion of sustainable agricultural practices.

The quantitative data collected demonstrated that certified coffees not only achieve significantly higher prices compared to non-certified ones, but also have a positive impact on market share, reflecting the growing willingness of consumers to choose products that meet ethical and quality standards. In addition, the qualitative results indicated that adherence to certification practices resulted in the implementation of more sustainable cultivation methods and the improvement of the social conditions of the producing communities, directly benefiting farmers and their families.

The survey also highlighted that quality certification not only offers a competitive advantage in the international market, but also increases the visibility of Cerrado Mineiro coffee in niches that prioritize sustainability. Recognition in quality competitions and inclusion on the shelves of specialized markets underscored the importance of marketing strategies focused on promoting certified coffees.

However, the challenges faced by producers in obtaining and maintaining these certifications should not be ignored. Training, adequate infrastructure, and continuous investments are essential to ensure compliance with the criteria required by certifications.

In view of the findings of this study, it is concluded that quality certification is a vital strategy for the future of coffee production in the Cerrado Mineiro. Therefore, it is essential that stakeholders in the sector, including producers, cooperatives and support institutions, continue to promote and encourage the adoption of certification practices. This will not only contribute to environmental and social sustainability but also strengthen the competitiveness



of Brazilian coffee in the global market, while respecting the tradition and cultural value associated with this important commodity.

It is recommended that additional studies be carried out that can deepen the analysis of the impacts of certifications in other coffee-producing regions, as well as explore barriers and effective strategies for the adoption of these practices in different agricultural contexts. Promoting a more sustainable and ethical coffee production model is an urgent need, and quality certification can be one of the keys to achieving it.


REFERENCES

1. ASSOCIAÇÃO BRASILEIRA DE CAFÉS ESPECIAIS (BSCA). (2022). *Relatório de Certificação de Cafés*. Recuperado de www.bsca.com.br
2. ASSOCIAÇÃO DOS CAFEICULTORES DA REGIÃO DO CERRADO. (2022). *Dados Estatísticos sobre a Produção de Café no Cerrado Mineiro*.
3. BARDIN, L. (2011). *Análise de Conteúdo*. São Paulo: Edições 70.
4. CECAFÉ. (2022). *Relatório Anual de Exportações de Café*. Recuperado de www.cecafe.com.br; acessado em: 21/04/2024 às 15:11.
5. ASSOCIAÇÃO BRASILEIRA DE CAFÉS ESPECIAIS (BSCA). *Relatório de Certificação de Cafés*. Recuperado de www.bsca.com.br, acessado em: 21/04/2024 às 10:53.
6. FEDERAÇÃO DOS CAFEICULTORES DO CERRADO. (2021). *Relatório Anual de Produção e Certificações*.
7. FEDERAÇÃO DOS CAFEICULTORES DO CERRADO. (2023). *Relatório Anual de Produção e Certificações*.
8. FERREIRA, J. P. (2005). *A Evolução da Cafeicultura no Cerrado Brasileiro*. Brasília: Embrapa.
9. FERREIRA, M. A., & ALMEIDA, P. R. (2018). *Benefícios Econômicos e Sociais das Certificações de Qualidade no Cerrado Mineiro*. Belo Horizonte: Editora UFMG.
10. GOMES, F. M., & OLIVEIRA, L. C. (2019). *Certificações de Qualidade no Setor Cafeeiro: Impactos e Perspectivas*. Curitiba.
11. GONZALEZ, R., SASSAKI, Y., & TAKASE, S. (2020). Visibilidade de mercado de cafés certificados: uma abordagem empírica. *Jornal de Ciências Agrícolas*.
12. LÜDKE, M., & ANDRÉ, M. (2019). *Pesquisa em Educação: Métodos e Práticas*. São Paulo: Edições Loyola.
13. LIMA, T. A., FERREIRA, R. M., & COSTA, V. R. (2020). *Auditorias e Certificações em Propriedades Cafeeiras*. São Paulo: Editora Oficina de Texto.
14. MENDES, R. T. (2020). *Cooperativismo e Desenvolvimento Rural no Cerrado Mineiro*. Uberlândia.
15. ORGANIZAÇÃO INTERNACIONAL DO CAFÉ (OIC). (2022). *Relatório do Mercado de Café*. Recuperado de www.ico.org; acessado em: 21/04/2024 às 18:22.
16. PEIXOTO, A. L., & SOUZA, F. J. (2021). *O Mercado Internacional de Café e a Importância das Certificações de Qualidade*. Rio de Janeiro.
17. PEREZ, S. (2021). O impacto econômico das certificações de café. *Jornal de Economia Agrícola Aliança das Florestas Tropicais. Sustentável*.



18. SANTANA, M. C., & PINTO, R. L. *Exportação de Café Especial do Brasil: Desafios e Oportunidades*. São Paulo.
19. STATISTA. (2022). Estatísticas do mercado de café. Recuperado de www.statista.com; acessado em: 21/04/2024 às 14:25.
20. SILVA, A. R., & SANTOS, J. P. (2022). *Produção Cafeeira no Cerrado Mineiro: Desafios e Oportunidades*. Porto Alegre: Editar Statista.
21. TAYLOR, P. L. (2018). *Comércio justo: um guia para iniciantes*. Oxford: Publicações Oneworld.
22. UTT. (2019). *Programa de Certificação UTZ: Um Guia para Agricultores*.
23. ZARAGOZA, J., SAAVEDRA, H., & LÓPEZ, M. (2019). Preferências do consumidor por café certificado: uma análise empírica. *Sustentabilidade*.

THE EFFECTS OF *HELICOBACTER PYLORI* ERADICATION THERAPY ON THE INCIDENCE OF GASTRIC ADENOCARCINOMA

 <https://doi.org/10.56238/sevened2024.029-057>

Fellipe Watanabe Martins¹ and Ethel Zimberg Chehter²

ABSTRACT

INTRODUCTION: *Helicobacter pylori* is the major risk factor for the development of gastric adenocarcinoma, and may increase its risk by two times. Thus, in the last twenty years, many studies have investigated whether eradicating this agent reduces the risk of gastric cancer. However, the results were initially inconsistent. Therefore, this systematic review was carried out to identify the impact of *H. pylori* eradication on the incidence of gastric adenocarcinoma. **METHOD:** Using the Pubmed, Cochrane, Medline, and LILACS databases, a systematic review of studies involving *H. pylori eradication treatment* and the incidence of gastric adenocarcinoma was carried out from 2019 to 2024. Meta-analyses, reviews, systematic reviews, clinical trials, and randomized controlled trials in English, involving humans, were included in the review. **RESULTS:** 12 studies were included. All of them showed that the eradication of *H. pylori* reduced the incidence of gastric adenocarcinoma in individuals without preneoplastic lesions, so that this decrease ranged from 43% to 76% among the articles (CI=95%). **DISCUSSION:** Gastric adenocarcinoma is unlikely to develop in those not infected with *H. pylori*. Thus, investigating the effects of the eradication of this bacterium is of great interest to public health. Many factors interfere with the relationship between *H. pylori* and host and, therefore, with the development of gastric cancer. To mention, the socioeconomic condition and specific virulence factors. Another challenge in the issue of *H. pylori* is the treatment of the infection, due to the variety of strains and antimicrobial resistance, making it difficult to eradicate. In countries where *H. pylori* infection and gastric cancer are very prevalent, strategies aimed at analyzing the susceptibility of certain strains to antimicrobials and identifying which genes are responsible for this resistance may be the key to controlling the infection and, therefore, to reducing gastric cancer cases. **CONCLUSION:** Eradication of *H. pylori* decreases the incidence of gastric adenocarcinoma. Thus, screening and treating these infections in populations with a high prevalence of *H. pylori* is beneficial to prevent gastric cancer, with public health in mind.

Keywords: Gastric neoplasms. Eradication of *Helicobacter pylori*. Cancer prevention.

¹ Medical Student
University Center ABC Faculty of Medicine

² Highest degree: PhD
University Center ABC Faculty of Medicine

INTRODUCTION

Gastric adenocarcinoma consists of a malignant neoplasm of the cells of the glandular epithelium of the stomach and can be divided into two histological subtypes according to Lauren's classification, which are the intestinal type and the diffuse type (1).

Gastric cancer is the third most deadly malignant neoplasm in the world and the fifth most prevalent (2), and its incidence is approximately twice as high in men as in women. In addition, its occurrence is more common in developing countries (60% of cases), citing countries in the Far East, Eastern Europe, Central America, and South America. On the other hand, the lowest incidences are observed in North America, Australia, South Asia, and North Africa (1).

Infection with the *Helicobacter pylori* It is one of the most common chronic bacterial infections, so it is estimated that more than 50% of the world's population has this condition (1). In recent studies, Africa has the highest prevalence of infection (70.1%), followed by Latin America (63.4%) and Asia (54.7%). On the other hand, North America had one of the lowest prevalences (37.1%) (3). It has been observed that the risk of acquiring *H. pylori* It is more present in vulnerable populations, who have a worse socioeconomic condition during childhood, due to low access to water treatment and poor hygiene. In this sense, in developing countries, the infection is more commonly acquired in younger individuals, when compared to developed countries (1).

It is known that infection by the *Helicobacter pylori* It is the main cause for the development of gastric adenocarcinoma (1). This bacterium is classified as a class 1 carcinogen by the World Health Organization, so it confers a risk for the development of gastric adenocarcinoma of 0.1-3% (4).

Or *H. pylori* is a spiral gram-negative bacterium capable of surviving the acidic pH of the stomach. This tolerance to the environment is mainly due to its flagella, which allow the bacteria to move through the gastric mucosa, protecting it from the acid, in addition to the production of urease, an enzyme capable of converting urea into ammonia and carbon dioxide, which culminates in a higher pH of the medium (1). The bacterium initially affects the superficial layers of the mucosa, typically causing chronic active gastritis (1). However, 10 to 15% of infected individuals may develop more serious conditions such as peptic ulcer disease (gastric or duodenal), MALT gastric lymphoma, or gastric adenocarcinoma, the latter developing in 2 to 3% of those infected (1). The factors that determine the development of these complications of chronic infection are the virulence factors of the bacteria, host factors, such as the genes that regulate the immune response, and environmental factors (1).

It is estimated that 780 thousand cases of gastric cancer related to gastric cancer are detected annually *H. pylori* Around the world (4). Due to the importance of gastric adenocarcinoma worldwide and since gastric adenocarcinoma infection *H. pylori* is the greatest risk factor for its development, which can be treated, the objective of this systematic review is to evaluate the impact of the eradication of the *H. pylori* on the incidence of gastric adenocarcinoma.

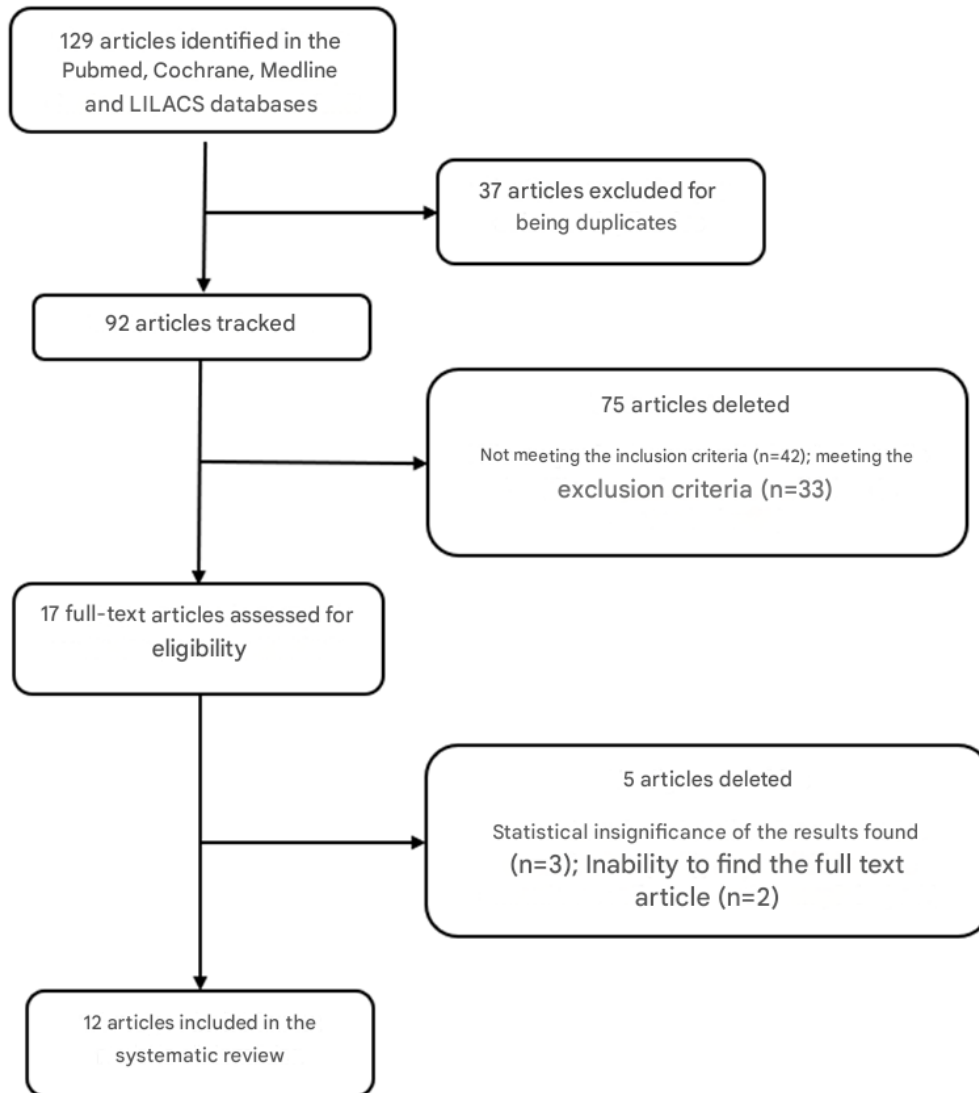
METHOD

A systematic review was conducted in the Pubmed, Cochrane, Medline, and LILACS databases between May 2023 and April 2024. The search strategies were: 1) Indexing words: "stomach neoplasms AND *Helicobacter pylori* eradication AND cancer prevention"; 2) Articles in English; 3) Filter of the last five years; 4) Types of study: meta-analyses, reviews, systematic reviews, clinical trials, and randomized controlled trials. The inclusion criteria used were: 1) The relationship between the treatment of *H. pylori* infection and the incidence of gastric adenocarcinoma; 2) Individuals without precancerous gastric lesions. The exclusion criteria were: 1) Studies that did not meet the inclusion criteria; 2) Studies related to the treatment of *H. pylori* alone; 3) Studies based on animal model or in vitro.

RESULT

In all, 129 articles were initially identified in the databases. Of these, 37 were excluded because they were duplicates. Of the remaining 92 articles, 42 were excluded after reading their titles, as they did not fit the inclusion criteria. Of the remaining 50 articles, 33 were excluded after reading their abstracts because they met the exclusion criteria. The remaining 17 articles were selected to be read in full, and 5 of them were excluded because these were studies with a lack of statistical significance for the results found ($n = 3$) and because they were not found in full ($n = 2$). In total, 12 articles were selected for the literature review. Figure 1 illustrates a PRISMA flowchart for the selection procedure.

Figure 1. Flowchart of the article selection process



The detailed basic characteristics of the twelve studies used for the review are presented in Table 1. All articles were published between 2019 and 2024. As for provenance, the studies were conducted in different countries, including China, the United States, Japan, Taiwan, South Korea, Finland and Colombia. Of these twelve articles analyzed, there are four systematic reviews, three meta-analyses, three cohort studies, and two randomized controlled trials.

Table 1. Characteristics of the studies included in the systematic review

Study	Type of study	Total number of patients	Incidence of gastric cancer after eradication	Gastric cancer mortality	Countries
Duan, 2019 (5)	Meta-analysis	40.740	IRR = 0.52 (95% CI 0.41 - 0.65)	It does not address	China, South Korea, Finland and Japan
Liou, 2020 (6)	Systematic review	8834	RR = 0.55 (95% CI 0.42 - 0.74)	It does not address	China, Colombia, South Korea and Japan
Ford, 2020 (7)	Meta-analysis	8323	RR = 0.54 (95% CI 0.40 - 0.72)	RR = 0.61 (95% CI 0.40 - 0.92)	China, Colombia, South Korea and Japan
Choi, 2020 (8)	Randomized controlled trial	1676	HR = 0.45 (95% CI 0.21 - 0.94)	It does not address	South Korea
Chiang, 2021 (9)	Cohort	6512	RR = 0.47 (95% CI 0.30 - 0.69)	RR = 0.75 (95% CI 14% - 51%)	Taiwan
Kumar, 2020 (10)	Cohort	371.813	HR = 0.24 (95% CI, 0.15–0.41; P<0.001)	It does not address	United States
Lin, 2021 (11)	Meta-analysis	63.833	RR = 0.34 (95%, CI: 0.25–0.46)	It does not address	Japan
Chiang, 2022 (12)	Systematic review	17.856	ARR ranging from 0.42% - 3.37%	It does not address	China, South Korea, Japan and Taiwan
Hu, 2022 (13)	Systematic review	2258	OR = 0.48 (95% IC = 0,32 - 0,71)	It does not address	China
Yan, 2022 (14)	Randomized controlled trial	1630	HR = 0.57 (95% CI, 0.33–0.98)	Statistically insignificant	China
Li, 2023 (15)	Cohort	716.567	HR = 0.37 (95% CI 0.14 - 0.97)	It does not address	United States
Chivu 2024 (16)	Systematic review	1838	HR = 0.45 (95% CI 0.21 - 0.94)	It does not address	Not specified

The type of gastric cancer considered in all studies was adenocarcinoma, including both intestinal and diffuse types. The diagnostic method was histological examination after upper gastrointestinal endoscopy with biopsy.

On the other hand, the diagnosis of *H. pylori* infection was made by several methods, such as urease test, histological examination, culture, *H. pylori* serology, and urea breath test. In addition, the treatment of bacterial infection involved the use of different

therapeutic regimens, among them were used Amoxicillin, Clarithromycin, Metronidazole, Proton Pump Inhibitors, 5-nitroimidazole, Bismuth Citrate and Ranitidine.

All studies showed that the eradication of *H. pylori* decreases the incidence of gastric cancer in individuals without preneoplastic lesions, so that this decrease ranged from 43% to 76% among the articles (CI = 95%). Only three of these studies addressed mortality due to gastric adenocarcinoma, so that two of them indicated that the eradication of the bacterium reduces mortality by 25% to 39% (CI = 95%), while in the other there was no statistical significance (p value = 0.421).

DISCUSSION

Gastric adenocarcinoma is the fifth most prevalent malignant neoplasm in the world and the third leading cause of cancer-related mortality worldwide, and much of this is due to the fact that the diagnosis of the neoplasm is made in advanced stages (2). Thus, given the impact of this disease on health worldwide, the prevention of gastric cancer has been increasingly studied in the last 10 years.

It is known that infection by the *Helicobacter pylori* It is the main cause for the appearance of gastric adenocarcinoma and that this disease is difficult to develop in individuals not infected by this bacterium (17), so that a study carried out in Japan showed that the prevalence of gastric adenocarcinoma in these patients is less than 1% (17). Thus, investigating the effects of the eradication of *H. pylori* on the incidence of gastric cancer is of great interest to public health.

In this sense, the results found by this systematic review strongly indicate that the eradication of *Helicobacter pylori* exerts a protective effect on the incidence of gastric adenocarcinoma, so that the current literature is unanimous regarding this result.

Among the articles included in this review, there are 2 cohort studies conducted in the United States. Both studies were carried out with patients of different ethnicities (whites, blacks, Asians, Hispanics) and concluded that the eradication of the *H. pylori* significantly decreases the risk of developing gastric adenocarcinoma (HR = 0.24 (95% CI, 0.15 - 0.41) (10); HR = 0.37 (95% CI 0.14 - 0.97) (15)). Thus, it is possible to observe that even though some ethnicities are more affected by gastric cancer, such as blacks, Hispanics and Asians (1,10), eradication was beneficial in all of them, showing the importance of implementing policies for tracking and treating the infection by *Helicobacter pylori*, aiming to improve public health.

Regarding mortality due to gastric adenocarcinoma, the 2 articles that addressed this issue and obtained statistically significant results include Asian populations, and therefore at

high risk for gastric adenocarcinoma infection. *H. pylori*. Both studies concluded that the eradication of *H. pylori* decreases the number of deaths caused by gastric cancer (RR = 0.61 (95% CI 0.40 to 0.92) (7); RR = 0.75 (95% CI 14% - 51%) (9)). In other words, in addition to definitively decreasing the incidence of this type of cancer, there is a moderate amount of evidence showing that the proper eradication of *H. pylori* It is also capable of promoting lower mortality due to gastric adenocarcinoma, which is very important in locations with a high prevalence of gastric adenocarcinoma. *H. pylori*, thinking about public health policies.

However, to carry out the eradication of *H. pylori* It is not simple, since numerous factors interfere in the relationship between this bacterium and the host, and consequently in the development of gastric adenocarcinoma. As an example, it is noted that certain regions have higher rates of infection by the bacterium and cancer mortality, as is the case of Africa, Latin America and Asia, than others, such as countries in North America. One of the explanations for this is that the risk of acquiring *H. pylori* It is associated with living conditions and socioeconomic status, especially during childhood. Thus, we can observe that in developed countries such as Switzerland (prevalence of 18.9%), Norway (30.7%), Denmark (22.1%) the prevalence of infection by the *H. pylori* it is much lower than in developing countries, such as Brazil (71%), South Africa (77.6%) and Colombia (80%) (18,19).

In this sense, it is possible to observe that, although gastric cancer is the most prevalent and the one with the highest mortality in Japan, currently only 2% of individuals born after the 2000s are infected with gastric cancer. *H. pylori*, while about 80-90% of those born until the 1950s are colonized by this bacterium. This drastic reduction in the incidence of *H. pylori* It is mainly due to better hygiene conditions, especially before the age of 5 (20).

Making a parallel with our country, about 50% of children between 2 and 5 years of age are infected by the *Helicobacter pylori* and about 70-90% among those aged 5 to 10 years (21). In addition, in a meta-analysis conducted to estimate the global prevalence of *H. pylori*, a prevalence of 71% was observed in Brazil (18). However, in individuals with better schooling, better sanitary conditions and better socioeconomic status, the prevalence of infection with the *H. pylori* is smaller. This was observed by a study conducted in the Southeast region of Brazil with 4604 patients, in which 63.1% of them came from the private health system and, therefore, had better socioeconomic conditions than the majority of the Brazilian population. Of this total number of people, only 1459 (31.7%) were infected with the *H. pylori*, that is, a much lower percentage than the overall prevalence of the country (22).

Thus, as the infection is more common to be acquired at a younger age and socioeconomic and sanitary conditions have such an impact on the prevalence of *Helicobacter pylori* infection, another way to aim at the prevention of gastric adenocarcinoma is by improving the living conditions of the population in developing countries. Thus, fewer individuals would be infected by *H. pylori* and the policies to eradicate the bacterium, which would eventually be implemented, would need to cover fewer people and the effect of this would be beneficial, in view of the current difficulty in carrying out the adequate treatment of this infection due to antimicrobial resistance, which will be discussed below.

VIRULENCE FACTORS

Certain strains of *H. pylori* are known to be more pathogenic than others due to their virulence factors, which contribute to the development of cancer.

Gastric colonization by the *H. pylori* It depends on special mechanisms to occur. Thus, when it reaches the stomach, the bacterium uses its flagella to reach the gastric mucosa. The bacterium has a group formed by four to eight flagella at one or both ends, which have different properties and forms of locomotion depending on the environment in which they are found. Several studies have shown that mutations in genes that decode flagella-specific proteins such as *fliD*, *FlaA*, and *FlaB* can impair the motility of the *H. pylori*, which can decrease and even prevent gastric colonization (23).

The bacterium also depends on the chemotactic response to different molecules such as mucin, sodium, bicarbonate, urea, sodium chloride and some specific amino acids. At least ten genes of the bacterium are related to the reception, transduction, and processing of the chemotactic stimulus, as well as some chemotactic bacterial receptors have been described (*T1pA*, *B*, *C*, and *D*) (23).

The relationship between the bacterium and the host is influenced by the adhesion molecules of the *H. pylori* and surface receptors of gastric cells. For example, bacteria with high expression of blood group antigen-binding adhesin A (*BabA*) are more virulent and more related to gastric adenocarcinoma. Another example is *HopQ* adhesin, present in the outer membrane of the bacterium, which binds to CEACAMs (cell adhesion molecules related to carcinoembryonic antigen) 1, 3, 5 and 6, giving rise to cell signaling that allows the translocation of *CagA*, the main virulence factor of this bacterium, increasing pro-inflammatory mediators in the host cell (23).

The virulence of *H. pylori* is closely related to the presence of the *cag* pathogenicity island (*cagPAI*), a region that encodes the *CagA* oncoprotein and a type IV secretion

system. The CagA protein leads to specific modifications in the morphology of gastric epithelial cells, so that changes that occur in the cytoskeleton of these cells in gastric adenocarcinoma are related to this oncoprotein. In the host cell, CagA undergoes phosphorylation at the EPIYA site. This site is variable and can be composed of different segments (EPIYA-A, EPIYA-B, EPIYA-C and EPIYA-D), so that the EPIYA-A and EPIYA-B segments are commonly found in the strains of *H. pylori* CagA-positive, and those with EPIYA-D segments or at least two EPIYA-C, are associated with a higher risk of developing cancer. For example, a study done in Brazil showed that first-degree relatives of patients with gastric cancer tend to be infected by strains of *H. pylori* containing two or more EPIYA-C segments (23,24).

These factors may be the explanation for the fact that some countries, despite having a prevalence of HIV infection, *H. pylori* relatively low, have high mortality from gastric cancer, such as in Japan (prevalence of 51.7% and 11.47 deaths per 100 thousand inhabitants) (25), China (prevalence of 55.8% and 20.55 deaths per 100,000 population) (26) and South Korea (prevalence of 54% and 9.13 deaths per 100,000 inhabitants) (27) and countries with similar prevalence of this infection, as in the case of Finland (56.8%) (5), but with low mortality (3.37 per 100,000 inhabitants). Thus, the virulence factors of the *Helicobacter pylori* present in these places can cause the effects of gastric infection by the bacteria to be more aggressive and cause more cancer than other strains from other regions of the world. Therefore, it is possible that future treatments will be based on the specific virulence factors of the most prevalent strains in these regions, constituting a more effective treatment than what is currently available.

TREATMENT OF *HELICOBACTER PYLORI* INFECTION

As mentioned earlier, another challenge in the issue of *H. pylori* today is the treatment of the infection itself. This is due to the wide variety of different strains that exist and the different antimicrobial resistances among populations, making it difficult to establish a treatment that is effective for everyone.

There is no effective monotherapy for the treatment of infection by *H. pylori*. As in the studies involved in this review, generally, the treatment of choice involves the use of two antibiotics (amoxicillin; and clarithromycin, metronidazole, or levofloxacin) in addition to a proton pump inhibitor (28).

Most of the therapies of choice are based on comparison between randomized controlled trials. However, characteristics of these studies, such as the dosages of antibiotics, the potency of the proton pump inhibitors used, and the prevalence of resistance

to a given antimicrobial in each population vary greatly from one another, so that treatment recommendations include options that do not achieve acceptable cure rates (28).

Treatment should ideally last 14 days and should be based on high susceptibility or high local success rates. After treatment, the patient should be tested to assess whether therapy has been successful or failed. This helps to indicate, albeit indirectly, whether a certain therapy shows more cure or resistance, helping in the population's therapeutic choice (28).

A study conducted in 2021 in Colombia analyzed strains taken from high-risk populations for gastric cancer and low-risk populations, testing their susceptibility to various antimicrobials. Subsequently, the genes of these strains were amplified and several mutations related to certain patterns of antimicrobial resistance were found (19). Thus, in countries where infection by the *H. pylori* and gastric cancer are prevalent as Colombia itself and even Japan, strategies such as this one of analyzing the susceptibility of certain strains to antimicrobials and, in addition, identifying which genes are responsible for this resistance are extremely pertinent for the control of this infection and, consequently, for the reduction of gastric cancer cases in a targeted and specific way for each population.

However, it should be noted that gastric adenocarcinoma may develop after eradication of gastric adenocarcinoma *H. pylori*, even though this practice reduces the incidence of this disease. One of the hypotheses that explain this, in addition to the fact that cancer has a multifactorial etiology, is that precancerous lesions prior to eradication may not be detected by upper digestive endoscopy (17), and then develop into cancer and be diagnosed only some time later. Thus, it is assumed that the eradication of *H. pylori* does not prevent the progression of these lesions from a certain degree of dysplasia. Thus, in order for this issue to be resolved, new, more accurate diagnostic methods are needed.

Finally, the Kyoto Global Consensus and the Maastricht V Consensus support that all infections by *Helicobacter pylori* must be treated regardless of the presence of symptoms (21). The results found in this systematic review, therefore, are corroborated by these consensuses, since it was observed that the treatment of the general population infected by *H. pylori* decreases the incidence of gastric adenocarcinoma.

CONCLUSION

Helicobacter pylori eradication therapy decreases the incidence of gastric adenocarcinoma. Therefore, public health strategies should be implemented in order to mitigate the occurrence of infection, in addition to screening and treatment of populations



with high susceptibility to this condition, which can be beneficial to prevent the development of gastric cancer.

However, it cannot be stated that mortality due to gastric cancer is impacted by *H. pylori* eradication therapy, since only 3 studies have addressed this issue. Thus, more studies are needed to address this relationship, as it is a subject of paramount importance worldwide.

In addition, since it is currently known that the eradication of *H. pylori* reduces the incidence of gastric adenocarcinoma, future research on the subject should be aimed at improving the treatment of the infection itself and more accurate diagnostic methods, aiming to establish the early diagnosis of preneoplastic lesions.

REFERENCES

1. Wang, M. L., & Rustgi, A. (2007). Polyps and Polyposis Syndromes. **Pediatric Gastroenterology: The Requisites in Pediatrics**, 192–199.
2. Smyth, E. C., Nilsson, M., Grabsch, H. I., van Grieken, N. C., & Lordick, F. (2020). Gastric cancer. **Lancet**, 396(10251), 635–648. [https://doi.org/10.1016/S0140-6736\(20\)31288-5](https://doi.org/10.1016/S0140-6736(20)31288-5)
3. Cho, J., Prashar, A., Jones, N. L., & Moss, S. F. (2021). Helicobacter pylori Infection. **Gastroenterology Clinics of North America**, 50(2), 261–282.
4. Kaneko, K., & Robinson, K. (2021). Analysis of T Cell Responses to Helicobacter pylori Infection. In **Methods in Molecular Biology** (Vol. 2283, pp. 215–223).
5. Duan, F., Song, C., Zhang, J., Wang, P., Ye, H., Dai, L., et al. (2019). Evaluation of the epidemiologic efficacy of eradicating Helicobacter pylori on development of gastric cancer. **Epidemiologic Reviews**, 41(1), 97–108.
6. Liou, J. M., Malfertheiner, P., Lee, Y. C., Sheu, B. S., Sugano, K., Cheng, H. C., et al. (2020). Screening and eradication of Helicobacter pylori for gastric cancer prevention: The Taipei global consensus. **Gut**, 69(12), 2093–2112.
7. Ford, A. C., Yuan, Y., & Moayyedi, P. (2020). Helicobacter pylori eradication therapy to prevent gastric cancer: Systematic review and meta-analysis. **Gut**, 69(12), 2113–2121.
8. Choi, I. J., Kim, C. G., Lee, J. Y., Kim, Y.-I., Kook, M.-C., Park, B., et al. (2020). Family History of Gastric Cancer and Helicobacter pylori Treatment. **New England Journal of Medicine**, 382(5), 427–436.
9. Chiang, T. H., Chang, W. J., Chen, S. L. S., Yen, A. M. F., Fann, J. C. Y., Chiu, S. Y. H., et al. (2021). Mass eradication of Helicobacter pylori to reduce gastric cancer incidence and mortality: A long-term cohort study on Matsu Islands. **Gut**, 70(2), 243–250.
10. Kumar, S., Metz, D. C., Ellenberg, S., Kaplan, D. E., & Goldberg, D. S. (2020). Risk Factors and Incidence of Gastric Cancer After Detection of Helicobacter pylori Infection: A Large Cohort Study. **Gastroenterology**, 158(3), 527-536.e7.
11. Lin, Y., Kawai, S., Sasakabe, T., Nagata, C., Naito, M., Tanaka, K., et al. (2021). Erratum: Effects of Helicobacter pylori eradication on gastric cancer incidence in the Japanese population: a systematic evidence review. **Japanese Journal of Clinical Oncology**, 51(11), 1693.
12. Chiang, T. H., Cheng, H. C., Chuang, S. L., Chen, Y. R., Hsu, Y. H., Hsu, T. H., et al. (2022). Mass screening and eradication of Helicobacter pylori as the policy recommendations for gastric cancer prevention. **Journal of the Formosan Medical Association**, 121(12), 2378–2392. <https://doi.org/10.1016/j.jfma.2022.08.012>
13. Hu, Y., Zhu, Y., & Lu, N. H. (2022). The management of Helicobacter pylori infection and prevention and control of gastric cancer in China. **Frontiers in Cellular and Infection Microbiology**, 12, 1–11.


14. Yan, L., Chen, Y., Chen, F., Tao, T., Hu, Z., Wang, J., et al. (2022). Effect of Helicobacter pylori Eradication on Gastric Cancer Prevention: Updated Report From a Randomized Controlled Trial With 26.5 Years of Follow-up. **Gastroenterology**, 163(1), 154-162.e3. <https://doi.org/10.1053/j.gastro.2022.03.039>
15. Li, D., Jiang, S. F., Lei, N. Y., Shah, S. C., & Corley, D. A. (2023). Effect of Helicobacter pylori Eradication Therapy on the Incidence of Noncardia Gastric Adenocarcinoma in a Large Diverse Population in the United States. **Gastroenterology**, 165(2), 391-401.e2. <https://doi.org/10.1053/j.gastro.2023.04.026>
16. Chivu, R. F., Bobirca, F., Melesteu, I., & Patrascu, T. (2024). The Role of Helicobacter Pylori Infection in the Development of Gastric Cancer - Review of the Literature. **Chirurgia (Bucur)**, 119(eCollection), 1–10.
17. Ito, M., Tanaka, S., & Chayama, K. (2021). Characteristics and early diagnosis of gastric cancer discovered after Helicobacter pylori eradication. **Gut and Liver**, 15(3), 338–345.
18. Hooi, J. K. Y., Lai, W. Y., Ng, W. K., Suen, M. M. Y., Underwood, F. E., Tanyingoh, D., et al. (2017). Global Prevalence of Helicobacter pylori Infection: Systematic Review and Meta-Analysis. **Gastroenterology**, 153(2), 420–429. <https://doi.org/10.1053/j.gastro.2017.04.022>
19. Mannion, A., Dzik-Fox, J. A., Shen, Z., Blanca Piazuelo, M., Wilson, K. T., Correa, P., et al. (2021). Helicobacter pylori antimicrobial resistance and gene variants in high- And low-gastric-cancer-risk populations. **Journal of Clinical Microbiology**, 59(5).
20. Inoue, M. (2017). Changing epidemiology of Helicobacter pylori in Japan. **Gastric Cancer**, 20(s1), 3–7.
21. Leja, M., Grinberga-Derica, I., Bilgilier, C., & Steininger, C. (2019). Epidemiology of Helicobacter pylori infection. **Helicobacter**, 24(S1), 2–6.
22. Rodrigues, M. F., Guerra, A. M. R., Alvarenga, A., Souza, D., Costa, R., & Cupolilo, S. (2018). Helicobacter pylori infection and gastric cancer precursor lesions: Prevalence and associated factors in a reference laboratory in Southeastern Brazil.
23. De Brito, B. B., Da Silva, F. A. F., Soares, A. S., Pereira, V. A., Cordeiro Santos, M. L., Sampaio, M. M., et al. (2019). Pathogenesis and clinical management of Helicobacter pylori gastric infection. **World Journal of Gastroenterology**, 25(37), 5578–5589.
24. Queiroz, D. M. M., Rocha, G. A., Rocha, A. M. C., Moura, S. B., Saraiva, I. E. B., Gomes, L. I., et al. (2011). DupA polymorphisms and risk of Helicobacter pylori-associated diseases. **International Journal of Medical Microbiology**, 301(3), 225–228. <https://doi.org/10.1016/j.ijmm.2010.08.019>
25. Mabe, K., Inoue, K., Kamada, T., Kato, K., Kato, M., & Haruma, K. (2022). Endoscopic screening for gastric cancer in Japan: Current status and future perspectives. **Digestive Endoscopy**, 34(3), 412–419.
26. Gao, K., & Wu, J. (2019). National trend of gastric cancer mortality in China (2003-2015): A population-based study. **Cancer Communications**, 39(1), 1–5.
27. Hoang, T., Woo, H., Cho, S., Lee, J., Kazmi, S. Z., & Shin, A. (2023). Descriptive Analysis



of Gastric Cancer Mortality in Korea, 2000-2020. *Cancer Research and Treatment*, 55(2), 603–617.

28. Lee, Y. C., Dore, M. P., & Graham, D. Y. (2022). Diagnosis and Treatment of Helicobacter pylori Infection. *Annual Review of Medicine*, 73 (1), 183–195.

THE CITY OF PYRRHO: THE FORMATION OF THE PATRIMONIAL IDENTITY OF ARACAJU IN THE NINETEENTH CENTURY

 <https://doi.org/10.56238/sevened2024.029-058>

Adriana D. Nogueira¹, Eder D. Silva² and Julia P.N. Silva³

ABSTRACT

With the purpose of transferring the administration of the capital of the Province of Sergipe D'El Rey, located in São Cristóvão, in the interior of the state, the desire arises to create a city that can house a port to facilitate economic transactions via river-sea, so Ignacio Joaquim Barboza, President of the Province, requests the project and its construction to engineer *Sebastião Joze Bazilio Pyrrho*, with eminently progressive characteristics, thus Aracaju was born in 1855. There are still doubtful questions about Pyrrhus' project, such as: what were the first buildings, whether it was a city designed for that moment or planned for the future, what was the importance of the orthogonal layout at that time... Vila Bela (Mato Grosso) created in the century. XVIII and Teresina (Piauí) of 1852 can help to clarify some facts about the implantation of Aracaju. This article intends to provide reflections based on an investigation based on documents of the time and bibliographic references on the subject, presenting some considerations about the Memory of the construction of Aracaju and showing how its urban configuration arrived in the 19th century. XXI as a referential factor for the formation of the heritage identity of its current urban cultural landscape

Keywords: Project. City. Patrimony. Aracaju.

¹ Federal University of Sergipe. Department of Arts and Design
Cidade universitária, s/n- Jd.Rosa Elze, São Cristóvão, Sergipe
E-mail: adnogueira@gmail.com

² Federal University of Sergipe. Department of Architecture and Urbanism
Rua Samuel de Oliveira, s/n, Laranjeiras, Sergipe
E-mail: eder@infonet.com.br

³ PUC Minas - Graduation in Architecture and Urbanism
Claudio Manoel Street, Praça da Liberdade- Belo Horizonte, Minas Gerais
E-mail: perecinju@gmail.com

INTRODUCTION

In order to understand how the implementation of the capital of the state of Sergipe was conceived, how its cultural landscape was formed in its early years, this article presents 3 topics in an attempt to reflect and clarify some facts, among them what were the first buildings, whether it was a city designed for that moment or planned for the future, what was the importance of the orthogonal layout at that time, among others.

The first topic highlights important points about the type of configuration designed for the origin of the urban landscape of Aracaju, the location of the first buildings, and how such heritage memories ensure prominence for this implantation before its population. From the investigation of the Provincial Reports from 1855 to 1860, it was possible to present the panorama of the region and the historical events during the first five years of the implantation of the new capital Aracaju, the formal aspects of the constructions and the formation of its cultural landscape.

The second topic presents the direct importance of the relationship between the progressive characteristics of the chosen urban configuration, related to the spatial configurations of characteristics similar to two other cities, one of the century. XVIII, Vila Bela, and another with only 3 years difference from its origin, Teresina, in 1852, also thought of as a replacement for the old capital of its Province.

The third topic brings reflections on the importance of the "Square" of Pyrrhus as a key element for the construction of an Aracajuan patrimonial identity through the "Cult of the straight line".

HERITAGE MEMORIES: THE URBAN CONFIGURATION OF ARACAJU AND ITS FIRST BUILDINGS

Ignacio Joaquim Barboza was president of the Province of Sergipe, from 1848 onwards, he decided to move the capital from São Cristóvão to the banks of the Sergipe River, one of the main reasons being the possibility of creating a Port that would facilitate commercial activities. Thus, near an existing village called Povoado de Santo Antônio, the seat and capital of the Province of Sergipe was created, which would be called Aracaju.

Based on a project idealized by the engineer *Sebastião Joze Bazilio Pyrrho* (spelling later changed to José Bazílio Pirro), with a more progressive characteristic, Aracaju is contrasted with the former colonial capital, São Cristóvão, with its winding streets. To this irregularity, present in most colonial cities, Pirro has a proposal for a geometric city, an orthogonal plan of alignments.

Considering the report of the aforementioned engineer, dated **April 18, 1854** (<http://brazil.crl.edu/bsd/bsd/u1201/000073.html> consulted on 10/18/2013), it is possible to understand two situations; the first is that, in 1854 (that is, before the definitive change of the capital that occurred on March 17, 1855), the following functions already existed: Provincial Typography, Police Corps Barracks and the Municipal Jail; the second situation is that the jail of which Pirro speaks would only be a place for to carry out the service "satisfactorily", while no other was thought of in a more suitable location, meaning that this construction would be temporary.

In a Report of **March 1, 1855** (<http://brazil.crl.edu/bsd/bsd/1050/000028.html>, consulted on 18/10/2013), Inácio Barbosa, President of the Province, writes that the Customs House was "provisionally" prepared, having already ordered the construction of a warehouse for the storage of goods. Regarding the construction of the Rent Table, he would have stayed in a "*cramped house and without the proper conditions for the regularity of the service*", he had also ordered the construction of a more appropriate one (Silva, 1920, p.132). He asked the Empire for another engineer to help in the works of the capital, who would become Francisco Pereira da Silva.

The desolate panorama of the sands and swamps of the area still had a negative aspect on the people. There was a rush in the demarcation of the land and the straight and simple layout was very useful. This type of layout suited its "apparent" flat topography, as there was a large part of the land whose level level was close to zero, which could lead to constant flooding, bringing complications to the rainwater drainage system at the time, not to mention problems in the city's future sanitary sewage system.

The plan drawn by engineer Francisco Pereira Silva, who in 1856 was already working with Pirro, is quite illustrative when analyzing the implementation of the project, as it is verified that it still does not register any evidence of urban layout. Only a few buildings built longitudinally on the banks of the Sergipe River (Figure 1a). This suggests that the construction of buildings occurred before the urban layout itself, which could in the near future cause some unpredictable irregularities until the implementation of a Code of Postures (which at the time defined dimensions of ceiling height of houses, width and length of windows, width of sidewalks, including the type of eaves of buildings). The plan of the city in 1857 (Figure 1b), made by Pereira da Silva, shows some streets, presents the location of some buildings, although in the original document there were letters, there was no legend, making it difficult to be sure what these constructions were, although Porto (1945, p.48-49) presented some.

Pirro's implementation project did not have the complexity of an urban plan, nor would it be expected to be so, "*it was summed up in a simple plan of alignments*" (Porto, 1945, p.36). However, it has had a global and a local influence. The first influence was that, at that time, there was a tendency to use straight lines for the implementation of new cities, or in the remodeling of existing ones, in which the checkerboard layout was disseminated. The second influence, of a local scope, was that Pyrrhus did not have time to make a complete survey of the site of the new city. This was said in a letter written by Pirro himself on 30/04/1859 to President Manoel da Cunha Galvão. The concentration of the main buildings in the Fausto Cardoso, Alm. Barroso and Olímpio Campos, resulted "*rather from chance than from a preconceived idea*" (Porto, 1945.p.39, 54-55).

These plans make it clear that many areas are flooded and others are formed by lakes and swamps, an attempt to "organize" the city from its urban layout is perceived, a perfect project for the haste in the demarcation of the land being its flat topography. For example, it can be noted that obedience to the Pyrrhic Plan ended up establishing two blocks over the ditch of the Caborge River (now non-existent) in which the old barracks of the 28BC and the block of the Serigy Palace were built, bringing constant flooding to the place (Rua Itabaianinha).

Figure 1: a) (left) Aracaju in 1856, without scale; b) (right) Aracaju and the main buildings in 1857, without scale. Source: Porto (1945. p.48-49).



LEGENDA

- A- Alfândega; B-Mesa de Rendas; E-Palacete da Presidência; H-Tesouraria da Fazenda; O-Barracão da Tropa de Linha; N-Enfermaria Militar; V- "Vala da Cidade".

A major modification of the Pyrrhic Project was imposed by President Barbosa: the avenue of the street in front of the river that, instead of a straight line, it would follow the curve of the river. He also asked for the opening of a road between Aracaju and the old village of Santo Antônio, in order to connect the "past with the future", which Pirro tried to trace straight. In 1856, the capital had 1,484 inhabitants and, in 1860, it already had 5,000 inhabitants, but with difficulties in maintaining itself as the capital (Nogueira, 2006, p.150).

The orthogonal urban structure had positive aspects, such as greater ease of implementation, without the need for specialized labor, which satisfies greater speed. Despite these facilities, there was a serious problem at that time, which was the lack of bricklayers. Around 1857, only six Alagoans worked on it.

Portuguese colonial cities, since the first colonizers, have the stigma of being disorderly and growing without prior planning. Reis Filho (1968) brings in his work an extensive survey of Brazilian colonial urbanization, although Delson (1997), in turn, clarified that Portugal had a modernization plan that covered the whole of Brazil, which suggests that planning is not a characteristic of recent times, since the Portuguese regional planning scheme, with its fronts of colonization of the "interior", demonstrated that economic interests (such as the extraction of gold in the mines) were the justification for planning *how*, *where* and *why* the villages should be organized. It cannot be said that cities with irregular layouts did not have a specific order, it was just not the one that the orthogonal urban layout represented (Abreu, In Silva, 1997).

The orthogonal layout of the capital in contrast to the irregularity of the streets of São Cristóvão (former capital of Sergipe) is not the key to talking about planning, because it is known that cities with irregular and sinuous layouts also have a planning logic that is different. This geometric tendency of Aracaju is based on technique, which would be the immediate answer to problems and thought is directed by the idea of progress (Nogueira, 2006, p.152)

In *a Report* of the 1st session of the Eleventh Legislature of the Provincial Assembly of Sergipe, on **July 2, 1856** by its President Salvador Correia de Sá e Benevides (successor of Inácio Barbosa), it is said that Pirro was the engineer responsible for the plan and budget of the Customs, as well as the progress of the construction of the Military Infirmary (<http://brazil.crl.edu/bsd/bsd/ul1203/000055.html> consulted on 18/10/2013).

The "Provincial Treasury and Meza de Rendas" was being built to be delivered within 9 and a half months, with the need for another 3 months, when the deadline was about to end there was a collapse, having been given more time to complete it, being considered the

most important provincial office. The police headquarters was contracted in April 1855, and was to be delivered in July 1856.

Also in the same Report, the President of the Province deals with the "Sewage and Landfill of the capital's swamps", having "*stagnant and putrid waters*" in almost all the houses, the work was started, partly by contract and partly by the administration, in charge of the engineer Francisco Pereira da Silva, and praises the "*zeal and restricted vigilance of the skilled and honorable engineer who is in charge of this work*".

Also in 1856, the construction of three drinking water fountains was contracted. The first was completed, without elegance, but it served the function, where people removed water with buckets, the President of the Province says he ordered modern pumps appropriate for this purpose from Rio de Janeiro, meanwhile he ordered a "*sentinel to be placed at the door of the said fountain, in order not to allow objects to be thrown into it that corrupt the water, nor should buckets or dirty vessels be introduced.*" In this 1856 report, the presence of another lieutenant colonel engineer named José Xavier Garcia d'Almeida was mentioned, who was in charge of the work of the second source.

The President of the Province instructed the captain of engineers Francisco Pereira da Silva to build a "house of prayer with small dimensions" and to quickly attend to the inhabitants of the capital, and the customs inspector sent materials to help the work. The provincial palace was contracted for execution in June 1855 and would have 20 months to complete the work, but the bidder died and the heirs did not want to carry out the contract.

The Customs building was completed in 1856, but with complaints from the President that it was nothing more than "*crude sheds, which only necessity makes tolerate in the middle of a beautiful street, sealing off public traffic, and completely upsetting the alignment and beautification of the city*". Thus, he commissioned Pyrrhus to draw up the plan of this work that he would forward to the Imperial Government to authorize the execution.

The capital had a "line troop shed", but on **December 31, 1856**, the work of a 1st line barracks was authorized, and by order of the Treasury court *of February 1857, only the definition of the "most appropriate terrain" remained*, because according to the report "*it was not possible to leave the line force quartered for a long time in a crude straw shed, that over being filthy, it is even more unworthy to remain in the center of a city, the seat of Government*". For the construction of the Mesa de Renda building (which collapsed), another deadline was given for its completion. Several rumors arose about the incompetence of this work, which would no longer offer any security.

On **February 1, 1857**, the Report with which the 2nd session of the Eleventh Legislature of the Provincial Assembly of Sergipe was opened, by President Salvador Correia de Sá e Benevides, reports that it had not yet been possible to start the work on the capital's jail, due to so many other works, generating excessive work for the engineers (<http://brazil.crl.edu/bsd/bsd/> Consulted on 18/10/2013). Aracaju was full of works and houses in precarious conditions that served various administrative purposes. The report brings concern about the "*mowing of the streets, sewage and landfill of the swamps*", being a landscape like an "*immense lagoon from one end to the other*".

A very interesting fact is that still in this report from 1857, one can find a text about the Santo Antônio Road, the one that connected the capital to the Santo Antônio Village, where most of the public employees lived, and that the work had already begun. The then President sought to know about the progress of the work, which his predecessor had entrusted the execution to Citizen José Raimundo Costa Carvalho, but without a contract, without a plan, without any written budget. Thus, he ordered the budget to be made following a regular plan and called the person in charge to continue.

The President of the Province João Dabney D'Avellar Brotero, in his Report with which the 1st session of the Legislative Twelfth of the Legislative Assembly of Sergipe was opened, on **December 31, 1857**, says that a plan for the construction of the Government Palace came from the Court of the Imperial Government and opened a credit for the work (<http://brazil.crl.edu/bsd/bsd/1053/000038.html> Consulted on 18/10/2013). The local engineers objected because the location for its construction had not been defined and because it was not adequate in terms of dimensions and distributions. The Customs building (which had just been built) did not meet the proportions and conveniences (as the previous President had already claimed), so a new plan was made by Pyrrhus.

The Report of the Presidency of the Province presented on **February 26, 1859** brings the partial report of the works in charge of the engineer Captain Francisco Pereira da Silva, in which he expresses the large amount of services in charge of him and Major Pirro. He complains that the salaries of the engineers would not be enough to support a horse for his trips and services, they have to pay high prices for animals and drivers of their luggage on trips necessary for good service, as well as they paid high prices to rent houses and feed, in addition to the utensils to carry out the surveys of plants, leveling and drawings. It also states that there is no office for engineers, so they are forced to work in their homes and with few instruments, which are scattered in different places, some in the provincial *treasury*, others under the custody of the *Warehouse of War Articles* (<http://brazil.crl.edu/bsd/bsd/1054/000113> consulted on 18/10/2013).

This excerpt from Pereira da Silva's report is an outburst of an engineer who has a lot of good will to do, but the resources are very limited, this also corroborates the certainty that the city was being built even as far as possible, with a lot of improvisation. Pereira da Silva also comments that both the 1st line Barracks and the Infirmary were in very bad condition and carried out the inspection of repairs, especially after a great storm, but that the new building of the Barracks was already in the foundations, being able to insert an infirmary in the same building, as there were *divisions* to house it.

In 1858, the "Chapel of São Salvador" was ready, but due to bad weather, in 1859 it was already necessary to reroof the Chapel and the skylight. Pereira da Silva thought it convenient to pave the streets that pass through the chapel, saying that the movement of the sands was constantly clogging the sewer pipes, and adds: "*In general, all the streets of Aracajú need to be paved.*" In the Office of the Presidency and in the *Provincial Treasury* were kept the plans of the buildings. Pereira da Silva mentions some names of engineers and builders who worked at the time, such as Engineer Blown, Engineer Cabrita, Engineer Galdino, Engineer Dr. Galvão, Engineer Barreto and Captain Lieutenant of the Navy Vieira Leitão.

The Report of the Presidency of the Province presented on **February 26, 1859** also brings the partial report of works whose head was Major Engineer Sebastião José Basílio Pirro, says that the foundations of the capital's jail were completed, which had a square base of 150 palms on a side, with the contractor having a period of 3 years to complete it (<http://brazil.crl.edu/bsd/bsd/1054/000113> Consulted on 18/10/2013). The so-called "Charity Hospital", with two floors, for the education of orphaned boys, has two wards, a clothes warehouse, kitchens, latrines, pantries, but it had not yet begun, according to Pirro it would be good to mature the idea of where it could be located (the forecast would be southeast of the capital). The building already had a plan made, but not yet the location of where it would be implemented, which reinforces the lack of planning of the initial urban landscape of the capital.

In the Report to the Provincial Assembly of Sergipe, on **March 5, 1860**, Dr. Manoel da Cunha Galvão (then President) said that the Imperial Government determined that Major Pirro, on January 24, be dismissed from his service in the Province of Aracaju to go to the Upper Amazon. All works were in charge of Captain Engineer Pereira da Silva (<http://brazil.crl.edu/bsd/bsd/1055> consulted on 10/18/2013).

The year 1860 was the year in which the consequences of the Emperor's visit (from January 11 to 21, 1860) were felt in Aracaju. One of them was the continuation of the construction of a dock, called "bridge" (started in 1859) for the disembarkation of the

Emperor and his entourage on the banks of the Sergipe River, whose construction the civil engineer Pedro Pereira d'Andrade was in charge, providing the service free of charge.

Dr. Manoel da Cunha Galvão (already leaving the Presidency) presented a report to the new President Thomaz Alves Júnior that said that he had formed a Commission composed of the Chief of Police (Dr. José Casado Accioli de Lima), the Treasury Inspector (Joaquim José de Oliveira), the Vicar of the capital (Reverend Canon Eliziário Vieira Moniz Telles), the Captain of Engineers (Pereira da Silva), who had already presented a plan and budget to deal with the execution of the cemetery, but had only 1 conto de réis sent by the Emperor for the said work. It was then that Friar Paulo and Friar David, on May 4, managed to gather thousands of people for its realization (data from the report), it is imagined that people came from other nearby cities.

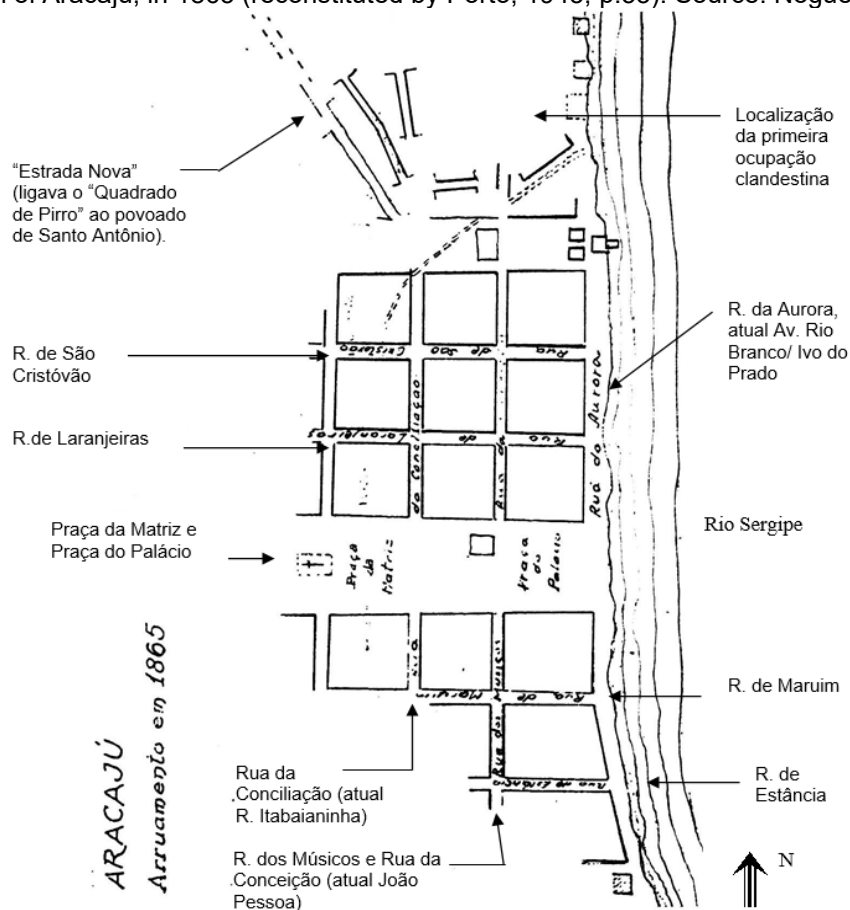
From the text published in the newspaper "Correio Sergipense", on January 14, 1860 (http://memoria.bn.br/pdf/222763/per222763_1860_00007.pdf consulted on 11/27/2013), it is possible to have a summary of the works in progress of the buildings at that time. The bridge on which the royal entourage disembarked was described in detail, including the placement of carpets and two masts placed on the side staircase with the national flag, the arrival was a day of festivities, with presentations, poetry, parades. On the second day, starting at 6:30 a.m., the Emperor visited the new barracks for the Line Troop, a work entrusted to Dr. Guilherme Pereira Rebello, then visited the Baron's Fountain (located near the corner of the "Estrada Nova"), whose water he found "pleasant and transparent". Afterwards, he visited the entire Santo Antônio Village, where he prayed in the church, and on his return, he passed by the other two existing fountains, whose water he did not like (Porto, 1945, p.47).

He visited the Palace, inspecting the work, the plan and the budget compared to that of the barracks; he also went to the tomb of the first President Inácio Barbosa, which was behind the Mother Church, finding it too simple for the creator of the capital. He went to the Customs House, checking the old and the new building, in the latter they were making preparations for the ball in honor of the Emperor. He went to the Treasury, saw that some employees were missing, then went to the City Council, which found "*little regularity in the municipal archive and poor accompaniments of the house*". In the same way, he uttered words of reproach when he went to visit the Hospital that was being built, made considerations about hygienic rules, due to the small accommodations of the ward room, kitchen, place for bodies, among others. He went to the Barracks and then to the Captaincy of the port. In the afternoon he went to visit the classrooms.

It can be seen that there is the name of a "Palace Square", bordering the river, in front of Rua da Aurora (current Av. Rio Branco), which is the current Olímpio Campos Palace, begun in 1856-7 and designed by the engineer Pereira da Silva, began to be executed in 1859, and its works were visited by D. Pedro II, but was only completed in 1863 (Nascimento, 1981).

After 1860, there were already houses on Rua da Conciliação (Itabaiana and Itabaianinha Streets), and Laranjeiras, Músicos Street (later called Pacatuba Street) and R. Maruim Streets progressed. It was only in 1862 that the construction of the permanent Igreja da Matriz really began, and its location, further west, paved the way for the creation of other streets that led to Praça da Matriz (Porto, 1945). São Cristóvão Street was the highest in the place and the most built (after Aurora Street, which was in front of the river). In the 1865 plan of Aracaju (Figure 2), the implementation of the first streets can be seen.

Figure 2: Plan of Aracaju, in 1865 (reconstituted by Porto, 1945, p.53). Source: Nogueira, 2006, p.151.



THE STRENGTH OF THE "PROGRESSIVE" CULTURAL LANDSCAPE WITH AN ORTHOGONAL LAYOUT: EXAMPLES IN VILA BELA-MT (SEC. XVIII), TERESINA-PI AND ARACAJU- SE (CENTURY. XIX)

The layout of Pirro, because it is orthogonal, differs from the layout of the city of São Cristóvão, referring it to an idea of progress and order that was not perceived in the old capital, with its winding streets. However, it is not possible to say that there was a lack of planning only because of the configuration of the urban layout, as could be seen with the various reports and events related to the development of Aracaju.

The lack of Portuguese planning for villages in the colonization of Brazil, since the sixteenth century, is a myth. When Tomé de Souza landed to found the city of Salvador da Bahia, he already had "a plant in his pocket". He arrived in Brazil with the architect Luís Dias, appointed by the Crown and the 1620 plan, "*it was found that in the original construction, an urban plan was used very similar to that of an ideal Renaissance city*" (Reis Filho, 1968, p.68-69).

This concern of the Portuguese Crown with the development of urban centers was systematized in a philosophy of urban planning in the eighteenth century. There was a stylistic preference for baroque symmetry (Delson, 1997.p.XI).

Already in the nineteenth century, the Empire continued the stylistic preferences of Baroque Brazil, declaring standardized urban growth not only desirable but truly mandatory. Thus, the Law of October 1, 1828, which established the guidelines for urban growth in the country in the nineteenth century, contained precise instructions for city halls with regard to urban configuration. For example, the city of Vila Bela, in Mato Grosso, is part of nuclei built in remote regions, with the same objective, which was to demonstrate to "*international observers that the borders of the national territory had been effectively expanded*". This concern was not only with the western border, but with the southern region, with Uruguay and Paraguay, and the northern region, such as the Upper Amazon and its border with the Guianas (Delson, 1997. p.95-96).

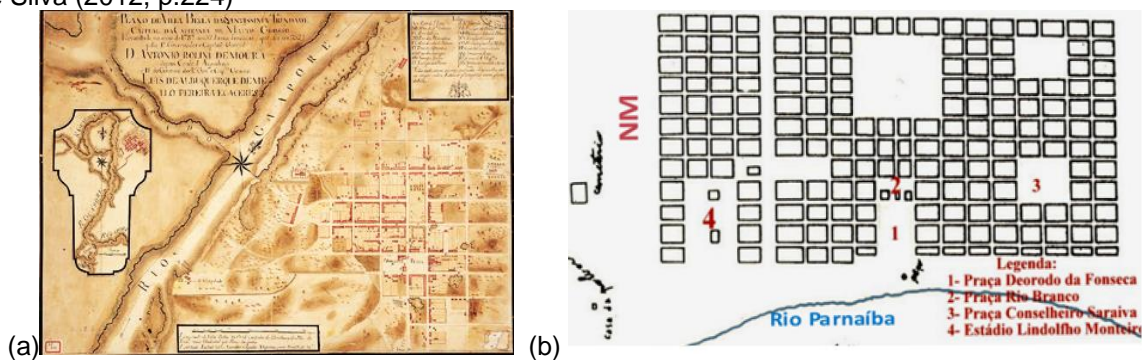
Vila Bela was founded by Antonio Rolim de Moura, on the banks of the Guaporé River, in March 1752, in the extreme west of the Province of Mato Grosso, on the border with Bolivia to retain the advances of Spanish colonization in Brazil. The city's plan was designed in Portugal, as well as its first buildings. With the drop in gold production at the end of the Portuguese colonization period, many people went to live in Cuiabá, in addition to local health problems, such as several occurrences of Malaria (<http://www.youtube.com/watch?v=XUGJWebArUE> consulted on 29/11/2013.).

Teresina, in Piauí, in turn, having been created with the transfer of the former capital Oeiras, elevated to city on August 16, 1852 (only 3 years before the transfer of the capital from São Cristóvão to Aracaju), had as President of the Province José Antonio Saraiva, who, together with a Portuguese master builder named João Isidoro França, designed parallel lines for the layout of the new city, starting from the Parnaíba River towards the Poti River (<http://pt.wikipedia.org/wiki/teresina> consulted on 10/18/2013.).

There is plenty of evidence of the existence of certain concerns for there to be a plan for Teresina, not just considered a project. The first was the choice of the site. According to Braz and Silva (2012), Antonio Saraiva chose the location for the creation of the new capital considering the proximity to the river, the centrality in relation to the province, the topography that was a plateau covered with undergrowth, soil and grass, part stony and part clayey, which would provide material for the constructions, but also to avoid flooded areas, of swamps and subject to flooding (a great difference with the site chosen by Inácio Barbosa for Aracaju), thus defined an area with a level above the Parnaíba River.

Another very favorable point to the implantation of Teresina was the fact that the inhabitants of the village had committed themselves to assist in the process of creating the capital, in view of the few resources of the Province, he also obtained the support of the (sole) owner of the land, who was a rich Portuguese farmer, Francisco da Cunha Castello Branco. The first contractors of public works and most of the families who settled on the cattle ranches in the region were also Portuguese, as well as important merchants from Maranhão. Figure 3 shows the urban configuration of orthogonal geometric layouts, implemented by the Portuguese government for Vila Bela in the eighteenth century and Teresina in the nineteenth century.

Figure 3: a) Plan of Vila Bela, the first capital of the Province of Mato Grosso, XVIII century. Source: Reis Filho (CD-ROM, 2000); b) Teresina plant, established in 1852, as the capital of the Province of Piauí. Source: Braz e Silva (2012, p.224)



APPROPRIATION OF THE PYRRHIC SQUARE AS A REFERENCE FOR LOCAL HERITAGE IDENTITY: THE "CULT OF THE STRAIGHT LINE" (ORTHOGONAL LAYOUT)

The direction of the analysis in this third topic was to the cultural landscape of the cities implanted in the century. XIX, Aracaju and Teresina have more factors in common. Many morphological characteristics can be emphasized from the Teresina layout with the Aracaju project called "Pyrrhic Square":

- a) Both cities were projected to become capitals of their provinces practically at the same time (1852 and 1855);
- b) In Teresina, "Praça Deodoro, like the Portuguese square, is open to the river and the main residential and public buildings of the city are located around it" (Braz and Silva, 2012). In Aracaju, the set of squares also faced the river and the main administrative buildings were installed around it;
- c) the Deodoro Square is the structuring element of the urban form in Teresina and also in Aracaju, the difference is that the church was located first, and in the second, only after the administrative buildings appeared, the Mother Church was built many years later, but also in a prominent position in the Olímpio Campos Square;
- d) the Square, in Portuguese colonial cities, was commonly square, while in the capitals Teresina and Aracaju (remembering that they did not appear in the colonial period but in the nineteenth century), a new format emerged, the rectangular, equivalent to three blocks of the urban fabric, and were not located in its geometric center;
- (e) The Pyrrhic Square is formed by 32 blocks, approximately 55 fathoms on a side (110x110m) each, separated by streets 60 palms wide (13.20m), idealized within 540 fathoms on a side (1188m); the Saraiva de Teresina Plan has blocks of 40 fathoms on a side and streets of 45 palms;
- f) Saraiva's strategy for the occupation of Teresina was interesting, of the 100 blocks planned, 70 were donated to 70 families. *"This leads to the assumption that the proposed cadastral system was one lot per block and that its residential typology was of the single-family type"* (Braz e Silva, 2012, p.228)
- g) Aracaju had to follow an imperial order of implantation, the difference is that the location of the implantation site generated more difficulties in terms of swamps and floodable areas, and there is no news that any lot has been "ceded" to local families as in Teresina.

The goal of the Portuguese government since the entire century. XVIII, having repercussions in the 19th century, was "modernization through standardization", in this sense, Pyrrhus' project fully satisfied the purpose for the creation of a capital.

The implementation of the orthogonal layout of Aracaju expresses one of the characteristics called "*Cult of the Straight Line*", which emphasizes a design of geometric perpendicular mesh in a "checkered" format, which will represent an international model of urbanism, representative of the transformations imposed by the hygienist and, later, modernist paradigms. This model expressed in urban spatiality contributes to urban transformations of a city constituted by an eternal dispute between nature and the built, between the city and the river, the city and the mangrove, the natural and the artificial (Silva, Nogueira, 2018, p.17-18).

When the Pyrrhic Square is considered as a possible patrimonial object, this represents a search for an identity in the face of the national definition of what Heritage is, defined in the Baroque-colonial. Aracaju was born eclectic and progressive, having in these characteristics the key to its identity (Nogueira, 2006).

The process of appropriation of the objects to be preserved (in this case, it would be the orthogonal outline of the Square of Pyrrhus), implies a form of power and control, and is also a form of identity. "*Appropriating itself is synonymous with the preservation and definition of an identity, so being a nation becomes what it is to the extent that it appropriates its heritage*" (Gonçalves, 1996, p.24).

This appropriation was endorsed through the continuity of a cultural landscape represented by the Square of Pyrrhus. Its continuity of orthogonal layout (despite the numerous urban voids and segregated areas) for another 100 years of its implementation (until approximately 1960), the orthogonal layout was being "reproduced" as the city grew, not only for the technical ease of implantation on a practically flat terrain, but also represents the acceptance and identification of the local community, which ended up valuing the original project as a local heritage identity.

In this way, it can be considered that the square of Pyrrhus has been an important reference of the local cultural landscape, a city with a project with a content with a progressive ideal.

FINAL CONSIDERATIONS

Both Vila Bela (1752) and Aracaju (1855) were cities *designed* as required by the imperial government, one with a more political function, the other with a political-economic aspect. Teresina (1852), on the other hand, is perhaps the only one among those



mentioned that can be said to have been designed and *planned*, as it proves to have had ideals and actions that determined functions and activities that could be developed in its near future, at least during the first decades of its origin, in addition to pointing out favorable points of its implementation (such as terrain characteristics, search for wealthy Portuguese partners, etc.). However, all of them fulfilled their role in the face of an important period of growth and development in Brazil.

The cultural landscape that reproduced the orthogonal layout and the "Cult of the straight line" in Aracaju prevailed over the numerous absences of organization and difficulties in planning activities such as the location and construction of the first buildings such as the Infirmary, Lace Table, Jail, Barracks, among others.

Aracaju until the 1960s, that is, a century after its origin, maintained a continuity of the original layout related to the Pyrrhic Square, for convenience and ease of implementation offered by the rectilinear layout and for being on a basically flat topography, in addition to the idea of maintaining the spirit of a "progressive city" and, consequently, "modern", combined with the diversity of typologies and styles of the architecture implemented, differentiating itself from the baroque-colonial of the old São Cristóvão.

In an attempt to modernize itself since its implementation, Aracaju sought in its original cultural landscape the references that could promote the importance of its past and has found this in the characteristics of the Pyrrhic Square project, as a key element to give due importance to its heritage identity.


REFERENCES

1. Abreu, M. de A. (1997). Pensando a cidade no Brasil do passado. In J. B. da Silva (Org.), **A Cidade e o Urbano** (pp. 27-52). Fortaleza: EUFC.
2. Braz e Silva, Â. M. N. (2012). Planejamento e fundação da primeira cidade no Brasil Império. **Cadernos PROARQ**, 18, 217-236.
3. Delson, R. (1997). **Novas Vilas para o Brasil-Colônia: planejamento espacial e social no século XVIII**. Brasília: Alva-Ciord.
4. Gonçalves, J. R. S. (1996). **A retórica da perda: os discursos do patrimônio cultural no Brasil**. Rio de Janeiro: Ed. UFRJ/IPHAN.
5. Jornal **Correio Sergipense**. (1860, 14 de janeiro). Recuperado de http://memoria.bn.br/pdf/222763/per222763_1860_00007.pdf (Consultado em 27/11/2013).
6. Nascimento, J. A. (1981). **Sergipe e seus monumentos**. Aracaju: J. Andrade.
7. Nogueira, A. D. (2006). **Patrimônio arquitetônico e História urbana: Ensaio sobre a estruturação socioespacial de Aracaju e Patrimônio arquitetônico de Sergipe**. São Cristóvão: EdUFS/Fundação Oviedo Teixeira.
8. Porto, F. F. (1945). **A Cidade do Aracaju (1855-1865)**. Aracaju: Livraria Regina.
9. Reis Filho, N. G. (1968). **Evolução urbana no Brasil**. São Paulo: EDUSP.
10. Reis Filho, N. G. (2000). **Imagens de Vilas e Cidade do Brasil colonial** [CD-ROM]. São Paulo: EDUSP.
11. Relatório à Assembleia Provincial de Sergipe. (1860, 05 de março). Presidente da Província Manoel da Cunha Galvão. Recuperado de <http://brazil.crl.edu/bsd/bsd/1055> (Consultado em 18/10/2013).
12. Relatório da 1ª sessão da Duodécima Legislativa da Assembleia Legislativa de Sergipe. (1857, 31 de dezembro). Presidente João Dabney D'Avellar Brotero. Recuperado de <http://brazil.crl.edu/bsd/bsd/1053/000038.html> (Consultado em 18/10/2013).
13. Relatório da 1ª sessão da Undécima Legislatura da Assembleia Provincial de Sergipe. (1856, 02 de julho). Presidente Salvador Correia de Sá e Benevides. Recuperado de <http://brazil.crl.edu/bsd/bsd/ul1203/000055.html> (Consultado em 18/10/2013).
14. Relatório Provincial (parcial de obras) de Sergipe. (1859, 26 de fevereiro). Recuperado de <http://brazil.crl.edu/bsd/bsd/1054/000113> (Consultado em 18/10/2013).
15. Relatório Provincial de Sergipe. (1854, 18 de abril). Presidente Inácio Barbosa. Recuperado de <http://brazil.crl.edu/bsd/bsd/u1201/000073.html> (Consultado em 18/10/2013).
16. Relatório provincial de Sergipe. (1857, 1º de fevereiro). Presidente Salvador Correia de Sá e Benevides. Recuperado de <http://brazil.crl.edu/bsd/bsd/> (Consultado em 18/10/2013).



17. Relatório Provincial de Sergipe. (1855, 1º de março). Presidente Inácio Barbosa. Recuperado de <http://brazil.crl.edu/bsd/bsd/1050/000028.html> (Consultado em 18/10/2013).
18. Silva, C. S. e. (1920). *Álbum de Sergipe (1820-1920)*. São Paulo: Secção de Obras do Estado de São Paulo.
19. Silva, E. D., & Nogueira, A. D. (2018). *Arquitetura aracajuana: a imposição do tempo*. São Cristóvão: EdUFS.
20. Teresina. Recuperado de <http://pt.wikipedia.org/wiki/teresina> (Consultado em 18/10/2013).
21. Vila Bela. Recuperado de <http://www.youtube.com/watch?v=XUGJWebArUE> (Consultado em 29/11/2013).

**CHALLENGES TO THE BRAZILIAN NETWORK OF HUMAN MILK BANKS:
INTERFACE BETWEEN PRIMARY AND TERTIARY CARE**

 <https://doi.org/10.56238/sevened2024.029-059>

Juliana Vale Ferreira¹, Elizabeth Artmann² and Silvia Braña Lopez³

ABSTRACT

This study analyzed the interface between a family health unit and the human milk bank of a maternity hospital in Rio de Janeiro. Through interviews, key actors pointed out problems related to the Health Care Network and strategies to overcome them. Matus' categories supported the analysis of the interviews. The link between primary and tertiary care, between health teams and the community, and the involvement of the actors in this process configured a network recognized and multiplied by the Municipal Health Department, which articulated a network of Human Milk Receiving Stations. The experience contributed to increase the collection of breast milk by milk banks. The study showed that local actions contribute to a more effective capillarization of human milk donation with the effective participation of the units that work in the Family Health Strategy. The institutionalization of actions at the local level is an important strategy to reinforce national breastfeeding policies, in a network logic that goes beyond the traditional reference and counter-reference models.

Keywords: Breastfeeding. Health Planning. Health Care Network. Human Milk Banks. Humanization in Health.

¹ Master's Degree in Women's and Children's Health – National Institute of Women's, Children's and Adolescents' Health, IFF/FIOCRUZ

E-mail: julianaccpr@gmail.com

² National School of Public Health (ENSP-FIOCRUZ)

E-mail: bethartmann@gmail.com

³ National Institute for Women, Children and Adolescents Fernandes Figueira (IFF/FIOCRUZ) –

E-mail: silvia.lopez@globomail.com

INTRODUCTION

The Brazilian Network of Human Milk Banks (rBLH-Br), established in 1998, plays a prominent role in public policies on breastfeeding in Brazil. Human milk banks (HMBs) play a strategic role in public policies in early childhood with the promotion, protection and support of breastfeeding, a right shared between women and children in the country's regulatory framework.^{1,2}

The network operates with voluntary donation of human milk, intended primarily for premature, low-weight babies hospitalized in neonatal intensive care units (NICU). In addition to the collection and processing of expressed human milk (HLH), HMBs integrate care and educational activities related to breastfeeding for society and professionals.^{1,2,3}

The National Food and Nutrition Policy (PNAN), since 1999, highlights the importance of the Health Care Network (RAS) as a support network for breastfeeding and healthy complementary feeding, contributing in an articulated way to HMBs, to expand the supply of breast milk in situations of maternal and infant health problems that make breastfeeding impossible.⁴

In the case under study, the search for a solution to a problem became an opportunity for cooperation between a primary care unit and a tertiary care unit, not programmed by routine flows, narrowing the network communication between different levels of care, as recommended by the RAS.⁵

The successful experience of the process built between the extinct family health unit (USF) Sereno, now the Aloysio Augusto Novis Family Clinic, and the HMB of the Herculano Pinheiro Maternity Hospital - HMHP, with the support of the Programmatic Area Coordination - CAP 3.1 and the Management of the Child Health Program of the Municipal Health Department (SMS) of Rio de Janeiro led it to become the 1st. Expressed Human Milk Receiving Station (PRLHO). The experience was shared in principle with ten other basic health units (UBSs) in the municipality, whose activities are being monitored by the SMS and in the process of expansion and regulation. Currently, the municipality has 33 PRLHO.

This experience was an innovation, where the capillarization of human milk collection was extended to the UBSs, which act within the logic of the Family Health Strategy (ESF), places where a differentiated work was developed in the face of the scenario of public breastfeeding policies, through an integrated network work process.

The dynamics of the work process of the extinct USF Sereno and its interaction in the health network in its broadest sense, resignified its role and contributed to a

rearrangement of the relationship between primary and tertiary care in the context of breastfeeding in the city of Rio de Janeiro.

The objective of this article was to discuss the experience between the USF Sereno and the HMB-HMHP, highlighting the interface between the primary and tertiary care levels in the light of the strategies built by the actors involved in the performance of the network for the promotion, protection and support of breastfeeding, as expressions of the broader political propositions in this field.

CONTEXT OF THE RESEARCH

The partnership between the HMB of the Herculano Pinheiro Maternity Hospital (HMHP) and the USF Sereno began in 2007, in the city of Rio de Janeiro and resulted in an expansion and complexification of the work process of the USF Sereno.

There was a demand from women who breastfed their children, assisted in this unit who, encouraged and supported by the professionals, started to donate the surplus human milk to the HMHP HMB, which was the reference maternity hospital at the time, to be processed and distributed to the Neonatal Intensive Care Units (NICU) and Neonatal Intermediate Care Unit (NICU) of the maternity hospital. This work was consolidated and expanded to other units through the sensitization and training of family health teams. (eSF).

The PRLHO is understood as a service linked to a UBS with the function of collecting breast milk at home and collected by the professionals to the unit to be stored and transported to the reference HMB. The importance of ensuring the quality of the human milk collected through actions to assess the health conditions of the donor woman and traceability of the product donated by PRLHO is highlighted.

In 2014, in the national campaign for the donation of human milk, the Ministry of Health (MS) launched the challenge of increasing the collection of LHO in Brazil by 15%.⁶ The State HMB Commission of Rio de Janeiro has been working on the construction of a technical standard to regulate the activities developed by the PRLHO, recognizing the importance of the work developed in the UBSs.

METHODOLOGICAL PROCEDURES

This is a retrospective case study focusing on the analysis of how breastfeeding policies were implemented at the local level through a partnership between UBS and maternity.

Interviews with semi-structured scripts and focus groups were used to collect data with key informants related to the importance of their participation in the experience.

The interviewees were: 4 professionals from the extinct USF Sereno, 2 nutritionists from the HMB-HMHP, 1 manager from CAP 3.1 and 1 manager from the Child Management of the SMS who had the initial experience and who were willing to participate in the research. The average duration was 30 minutes for each interview. The focus group had the participation of 6 of the 8 people interviewed, 1 mediator and 1 rapporteur, and lasted an hour and a half.

All the statements were recorded, transcribed and analyzed in the light of the categories brought especially by Matus^{7,8,9} and other emerging categories were considered.

To explore the interviews and focus group used in the study, we used thematic analysis¹⁰, adopting the following steps in the analytical process:

- 1st) Floating reading of the interviews and impregnation of the testimonies, view of the whole and apprehension of the particularities of the material. After reading, identification of the themes that can express the interviewees' testimonies.
- 2nd) Identification of the excerpts of testimonies within the previous categories anchored in Matus' theoretical framework: problem, actor, strategy, construction and feasibility analysis, considering: decision, operationalization and permanence.
- 3) Identification of new categories in the testimonies (emerging categories).
- 4) Analysis in the light of the study objective of the results of the interviews and the focus group.

The research was approved by the Research Ethics Committees of the Fernandes Figueira National Institute of Women, Children and Adolescents and by the Committee of the Municipal Health Department of Rio de Janeiro, and followed the ethical aspects of CNS Resolution 466/2012.

RESULTS AND DISCUSSION

A first theme that emerged in the interviews, related to the categories brought by Matus, was the delimitation of the problem situation: the excessive production of milk, generating pain and discomfort for some women, led the professionals of the unit to meet the need for relief of breastfeeding through milking, which was initially despised.

Considering the low stocks in the HMBs of the maternity hospitals, which is a problem demanded in neonatal ICUs, the health professionals of the unit sought help from the Fire Department of the State of Rio de Janeiro in transporting the LHO to a HMB through the Breast-Friendly Firefighter Program. However, the firefighter as a military

member had restrictions on accessing homes located in areas of violence, in this case, where the USF Sereno was located, due to the risk to his safety.

Another problem presented was the lack of inputs to carry out the collection, storage and transportation of milk. In view of this, the actors used strategies in order to put their plan into practice: the donation of human milk to children in the neonatal ICU.

The initiative on the part of the USF professionals to take on this work seeking partnership with the fire department qualifies them as actors. According to Matus¹¹, the formulation of a plan occurs when professionals decide to face the problem, articulating technical and political aspects.

P1- "We did everything with a lot of good will! We campaigned in the community to get glass jars of mayonnaise. We often took the bottles to be sterilized in another unit because our autoclave was very small."

The partnership with the Fire Department extended for two years, when the eSF had the opportunity to participate in a training at the HMB – HMHP, where the proposal was made for the milk donation to go directly to the HMB of this maternity hospital.

With the end of the Bombeiro Amigo project, what could have been a problem became an opportunity⁸ to rethink a safer and more reliable way to ensure the quality of milk, as well as to increase its collection, since the UBSs have direct contact with the women living in the coverage area who are under their sanitary responsibility.¹²

The professionals of the HMB also configured themselves as actors, adopting strategies to overcome problems such as the lack of transportation and the violence of the place that lasted for a certain time.

P2 - I took the empty bottles and took the bottles with milk, put them in a thermal bag, took the bus and came to Herculano Pinheiro, or else they were the ones who did it! They brought it here on the bus, in someone's car, in short, everything so that this milk would not be lost!"

The concern with the quality of the milk was maintained throughout the milking, storage and transport process to ensure the safety of the physicochemical and microbiological quality of the milk. It was necessary to have hygiene at the time of milking, maintenance of the cold chain in transport from the donor's home to the unit, storage and subsequent transport to the maternity hospital.

The Basic Operating Procedures (SOPs) were built in order to follow step by step in accordance with the current legislation that governs the operation of milk banks, which is RDC 171/20063.



The FHU professionals who assumed the logistical responsibility for this work constituted a bridge between the donor and the HMB, because through the home visit they had the advantage of being "inside the home" of the health service user. Home visits are part of the scope of FHS activities, being one of the main tools of action for the CHAs, which should also be carried out by the other FHT professionals.^{12.13}

The epidemics of dengue, H1N1, violence and the fulfillment of the goals established by the municipality's agenda were also points that caused fluctuations in this process, as well as the departure of professionals considered to be of reference, as they had a key role in the mobilization of the teams, so that the work remained in progress and did not succumb to other demands.

In view of these difficulties, the in-service training strategy through the Breastfeeding-Friendly Basic Unit Initiative (IUBAAM) stands out, which contributed to professionals and managers, even in the face of epidemics and other demands on the service, not allowing the activities to end. A change in mentality¹⁴ was observed, which was expressed in the valorization of breastfeeding and milk retention.

The Child Health Program Management of the SMS became an important actor when it observed the positive results regarding the increase in milk collection for HMHP and shared this strategy with ten other UBSs, proposing a Network of Stations for Receiving Expressed Human Milk (PRLHO network), initially called "Human Milk Warehouses". The creation of this network resulted in an increase in milk collection for the NICU of the maternity hospital, which led to the dispensation, at times, of the use of milk formulas to meet prematures and other specific indications for which the therapeutic use of human milk was required.

The construction of the bond between health professionals and women cared for at the unit favored the emergence of a feeling of self-esteem and autonomy of these donors¹⁵ who, moved by a feeling of solidarity, form a voice in the organization and adopt a more active posture of donating human milk.

The involvement of family members, such as husbands, was essential to support breastfeeding and also to donate milk, contributing to the expansion of the solidarity network. This shows the importance of social relations, of the adherence of all actors/subjects involved for the success of the experience.

P7 – "Many parents collaborated with milk donation. There was a boy who participated in all the groups and helped his wife when it came to milking. His participation was very good, because he was also one of our multipliers. They helped work on breastfeeding and milk donation. "

The professionals considered that this work was innovative, where UBS and HMB cooperate mutually, seeking to ensure the quality of care for their users through an integrated health network, articulating horizontally.

P6 – "I see this work as a network, and the network needs to be interconnected, and I see it as SUS. Hospital care interconnected to primary care in a global way, within the Family Health Strategy!"

As a proposal to expand the capillarization of the network, the need for support from the central level in the municipality was pointed out so that other maternity hospitals with HMBs could also establish a link with their UBSs, resulting in their participation as collaborators also in the collection of human milk for their reference maternity hospitals.

At the Baby-Friendly Hospital, mother and baby stay in the rooming-in, allowing the child to be breastfed on demand. Upon returning home, care is transferred to a UBS close to the child's home.

In the city of Rio de Janeiro, following the protocol of childhood care lines 16, the concern is that this network is very well articulated so that the woman, when leaving the maternity hospital, is referred to the UBS to carry out the Mother-Baby Embrace, which consists of actions recommended for the child pertinent to the 1st. week of life. Among these actions, the promotion and evaluation of breastfeeding is carried out. Welcoming and humanized care aims to form a bond between the family and the unit.

The establishment of the partnership between the actors-professionals of the UBS and the HMB counted on the involvement of the management both by the Technical Support Group of CAP 3.1 of primary care, and by the hospital management, strengthening the institutional bond and ensuring a breadth of networking.

The results of the focus group showed that the discourses were almost all in agreement. The group highlighted that the work is innovative and that it brings benefits such as training more professionals for actions aimed at breastfeeding and that the IUBAAM course was a watershed, in the sense of constituting themselves as actors in this process, as highlighted in the interviews.

Professionals from the USF and the HMB and managers enthusiastically commented on the beginning of the partnership between the FHU and the HMB, on the problems faced, and felt proud of this process.

P1- "... There was no freezer because the freezer we had won was an old man from the community... It was a very artisanal thing. We sterilized the bottles, but it was by hand!"

Q2- "There was no SOP (standard operating procedure)! We did it with good will! Then when I often went down there on the bench... I'm very proud of that! By bus, with a bottle."

The SOPs standard operating procedures were built in the partnership between the units. The HMB organized the SOPs, which made the FHU professionals more confident about carrying out their actions.

The participants highlighted that the PRLHO was a milestone, because it used the work process developed within the USF with professionals trained for actions pertinent to breastfeeding along with the legislation that organized the necessary procedures for milking, storage and transportation.

P5 – "I think that this initial work that you had to organize and think about donation was fundamental, and the idea was to take this logistics and fit the current legislation, that was the milestone!"

P3 – "It was a pillar: operation and safety!"

Health work is based on meetings between workers and between them and users, that is, they are permanent flows between actors, and form a network of relationships from which the products related to care gain materiality. ^{17.18}

P1 – "I think it's really cool, that each point complements another! I know how to milk, I know how to collect... I think it's like this complementing the work of the other. Now P8, he's there advertising the work he's already seen, I think it's like this: it's the network, we're at a point in the network."

Embracement as a conversational network corresponds to the possibility of interconnection between knowledge, between professional categories and different levels of care as a dynamic of dialogical bonds between professionals and different, but interdependent, instances. ^{19.20}

Language was also an issue pointed out as a way to facilitate communication between the UBS and the community. The CHAs are residents of the place and know the habits, customs and way of speaking of the user in order to facilitate understanding.

P2 – "Especially because they (CHA) are the ones who visit the houses, the women... The access they (mothers) have to lactarists is much greater than with me. The language is different! Sometimes they go there and [...] that creates that empathy, that bond. And that's what happened to them, for sure, this increased the fundraising much more!"

According to Habermas²¹, the daily communicative use of language occurs between subjects who interact, seeking to coordinate their actions. The CHAs, as residents of the community, are immersed in the local culture, being able to incorporate values and issues related to the experiences of the speaking subjects. In this way, it is necessary to exercise the ability to listen to the other, anchored in the traditions of the world of common life of the actors in interaction, seeking the construction of the new. ^{17.22}

Another issue related to language in the speeches of the focus group participants was breastfeeding counseling, where more important than the clinical management of lactation, the health professional needs to recognize himself as a supporter of the process.

P5 – "So, speaking of language, I think it is worth saying another point: counseling.... So minimally, there was a dissemination, breastfeeding is very important in terms of technique, but the most important thing is how we get there, how we deal with it! And then it's not judging, not giving orders... We are now partners to make things happen, but we respect your history, who you are!"

The user embracement system can be seen as a network of conversations, which corresponds to the possibility of interconnection between knowledge, professional categories and health care points. Welcoming is not only related to the professional-user relationship; It also refers to the welcoming between professionals and services as a dynamic of dialogical bonds between professionals and different instances.^{15.23}

It should be noted that the bond established between the eSF and the community was a differential factor for the success of this work, where the adherence of the donors, even in unfavorable situations, did not compromise the product, because when it went through the processing at the HMB, the physical-chemical analyzes were almost all within the required quality parameters. The bond between professionals and users stimulates autonomy, promoting their participation during the provision of the service.^{15.23}

P2 – "These people, even so humble. And the milk people? The wonderful acidity! It arrived with great quality! He just entered their house, with a compliment... So, it brought dignity to that family, that look, right?"

P1- "We had donors who lived in critical areas, who didn't have water at home! But we talked about the importance of washing our hands, and we said 'this milk is going to be used for a child who weighs half a kilo, so it has to get there with very good quality'. We arrived there to visit by surprise and we saw the care she took to wash her hands, even though she had to carry a bucket of heavy water."

The bond was also built by the relationship of trust between the professionals of both units, where there was always the possibility of monitoring the process through reports, periodic training, participation and mutual support.²⁴

Another subject emphasized in the focus group was the role of public policies in increasing the prevalence of breastfeeding. In Brazil, the policy proposed by the WHO/UNICEF for Baby-Friendly Hospitals (BFHIs) was adopted in Brazil, where baby-friendly hospitals developed educational actions articulated with primary care, through counter-referral at hospital discharge, as well as access to other services and breastfeeding support groups²⁵. Thus, the proposal is expanded by valuing the mother/child dyad.²⁶

P3- "The baby-friendly hospital is very limited, because it is in contact with this woman for 2 to 3 days. The historical prevalence of breastfeeding had been dragging on. In 1996, I had 13% of exclusive breastfeeding in the City of Rio, ... until 2000....2002 rose from 13 to 20% with the BFHI, and then it got stuck! And from the moment the IUBAAM was launched, we managed to have a capillarity in the city, in the 2006 survey we already saw the impact, the prevalence has already risen to thirty-something percent... In 2008 we reached 40.7%. So this historical line shows how primary care made a difference in the prevalence of exclusive breastfeeding."

Global strategies for women's, children's, and adolescents' health point to the need for investment in the health sector with a focus on promoting breastfeeding²⁷, since exclusive breastfeeding rates among children under six months of age are below 50% in most countries²⁸. Brazil follows the same trend, with a prevalence of 41%, according to the 2nd survey on breastfeeding in Brazilian capitals.²⁹

Public policies on breastfeeding for primary care contribute to increasing the prevalence of breastfeeding through longitudinal follow-up recommended by the FHS. This care becomes more qualified considering the multiprofessional teams, home visits, the CHAs as mediators between the needs of the population and the UBSs.

The BFHI was a policy that served as the basis for the construction of the IUBAAM. The 10 steps to breastfeeding in primary care³⁰ show that policies are reinvented and adapted according to local needs, as well as can start at the local level to be structured at a broader level.^{15,31}

The implementation of the IUBAAMs with PRLHOs was strategic to capillarize actions aimed at breastfeeding in order to increase the stock of LHO for the HMB, ensuring milk for a greater number of prematures.

P2 – "With this work, we have already managed to increase exclusive breastfeeding, I think that the issue in relation to donation goes from 40% to 80% at some times of the milk donated by the family clinics being used in Herculano Pinheiro. We have already spent a month only using human milk, in the rooming-in, recently we have been 3 weeks, only with breast milk!"

The Child Health Program Management, as presented at the II Meeting of PRLHO³², in these 6 years of implementation of the PRLHO, today has 14 units and has developed 3 evaluative surveys of this process identifying 4 critical points: specific training, regulation of the PRLHO, dissemination of the PRLHO in the unit, standardization of the donor form.³³

Public policies must be accompanied by systematic evaluations, as part of the governmental routine, continuously adapting according to the results and recommendations provided by them, that is, management and evaluation must always go hand in hand.^{11,19,34}

By not separating management from evaluation of public policies, these authors contribute to articulate theoretical and practical issues, where research addresses local issues and vice versa, in a dialectical relationship.^{34,35}

Also important was the emphasis given both in the interviews and in the focus group, about the commitment and engagement of the professionals/actors in this work, seeking alternatives aimed at the continuity of the partnership. For Matus, this process constitutes the feasibility of permanence.¹¹

The proposal of a PRLHO Network is configured in an activism in favor of breastfeeding, care with pregnancy and puerperium. This change in the perspective of the FHTs occurred with the reorganization of the work process of the FHTs through in-service training through the IUBAAM.³⁶

P5 – "We have an improvement because we have an engagement of people in favor of the promotion, protection and support of breastfeeding. With the initiative of people who raise this flag, who don't let the ball drop!"

P3 - We fight for the cause!

P5 - It's always an engagement! The Americans have a name for this that is advocacy is you fight and defend that idea!

The creativity of the actors and the struggle to defend the work in which they believe enabled a space for the construction of sectoral leaderships in the transformation of policies, showing that new institutional rearrangements promote the ability to radiate values, generate knowledge and promote commitment to these values before the population and the institution.^{11,36,37}

A convergence of themes is observed in the answers presented by the different actors, even with more particularized views. In the interviews, the CHAs focused their questions on activities aimed at promoting breastfeeding, where they perceived themselves as actors involved with a strong role in this process, bringing as a fundamental element for the achievement of this action the in-service training through the IUBAAM course.¹⁹

Professionals from the USF technical team interviewed were in the position of regional managers at the time of the interviews, and their statements express more strongly the concern about how to build strategies for the expansion and consolidation of a PRLHO network so that it becomes increasingly capillary. They also demand a more active participation of management in the feasibility of training with the involvement of a greater number of basic units and milk banks, as well as in the institutionalization of actions.¹⁹

P3 – "I think we cannot abandon the idea that this is regulated by ANVISA, is taken by the Ministry of Health and that it can become an action to be implemented in Brazil."

The actors expressed that they needed to seek solutions to macro problems, outside their scope of action, which requires them to have a permanent ability to exercise a broader view of the process in a constant movement of reinterpretations of the dynamics of the demands of this capillarization.¹⁹

The interviewees observed that the rBLH-Br establishes a communication channel with the milk banks, that is, the network communicates within the scope of tertiary care. Based on this model, they suggested that each HMB should assume contact with their UBSs, in order to expand the milk collection process.

The strategy of consolidating the PRLHO network was pointed out as the expansion of the rBLH-Br itself, as a possible rearrangement to strengthen this macro policy. Such a proposal would become an expansion of political strategies in HMB that advances, and may suffer influences and agendas in its reformulation, involving negotiations with different levels of complexity, which would supposedly favor greater contact at the local level with the HMBs and between them and their State Reference Center.^{23,37}

It is noteworthy that, in the focus group, the statements assume a discursive consensus of mutual cooperation and struggle for the work in which they believe and the ideas they have been formulating and that date back to the beginning of their professional insertions in the USF Sereno. Through the strategies adopted, they made the donation process viable, taking responsibility for a gap in the system.

The feeling produced by the engagement of the actors translates into a militancy in the search for the regulation of their activities. Expressions such as "*we fight for the cause!*", "*It's always an engagement!*" translate implication in this process. They highlight the good communication between professionals and the welcoming climate between health units and between unit and population, with a consequent construction of relationships of trust, commitment and bonding, as recommended by the National Humanization Policy (PNH).²³

A culture of communication should be expanded, therefore, as a basis for the success of the humanization policy in health, reinforcing the development of the participation of users, professionals and managers, in order to value teamwork and solidarity networks; a more collegiate and participatory management model that accounts for the articulation between the different types of knowledge involved.¹⁹

In this experience, it was also possible to identify the guiding principles of the PNH, which advocates the perspective of networking when considering the strengthening of multiprofessional teamwork, support for the construction of cooperative and solidarity networks, the construction of autonomy and the co-responsibility of the subjects.^{15,23}

A network-based model of service organization is configured as a challenge aimed at a process of change marked by the influence of both the macro-political context and the microdynamics of work processes.¹⁹

FINAL CONSIDERATIONS

The role of the professionals in the case studied was innovative and proposed changes in the relationship between the primary and tertiary care levels of the local health system. A greater capacity to capture inputs and practices related to the health promotion of the population in the context of primary care resulted in a better supply of human milk to be destined to the NICUs at the tertiary level of care.

The analysis articulated with some theoretical categories contributes to the understanding of the capillarization of HMB actions for primary care, and presented strategies that can expand actions in order to strengthen public policies for breastfeeding, food and nutritional security of the population.

Such innovation deserves to have an echo that reverberates more strongly to other units, in order to strengthen actions to promote, protect and support breastfeeding and networking.

For this, the PRLHOs need the institutionalization of their activities, so that the proposed changes become official, favoring the structuring of a closer relationship between the rBLH-Br and the primary care network, with the active participation of the UBSs in the collection of milk for the maternity hospitals, strengthening the articulation between the primary and tertiary levels of care. In this way, the process showed that the established network relationship goes beyond the traditional logic of reference and counter-reference.

REFERENCES


1. Rede Brasileira de Bancos de Leite. Bancos de Leite Localização e Território. [acessado 2016 mai 15]. Disponível em: http://producao.redeblh.icict.fiocruz.br/portal_blh/blh_brasil.php.
2. Maia, P. R. S., Novak, F. R., Almeida, J. A. G., & Silva, D. A. (2004). Bases conceituais numa estratégia de gestão: O caso da Rede Nacional de Banco de Leite Humano. **Cadernos de Saúde Pública**, 20(6), 1700-1708.
3. Brasil. Ministério da Saúde (MS). (2006). Resolução RDC Nº 171, de 4 de setembro de 2006. Brasília: Ministério da Saúde. [acessado 2016 fev 02]. Disponível em: http://bvsms.saude.gov.br/bvs/saudelegis/anvisa/2006/res0171_04_09_2006.html.
4. Brasil. Ministério da Saúde (MS). Secretaria de Atenção à Saúde. Departamento de Atenção Básica. (2012). **Política Nacional de Alimentação e Nutrição**. Brasília: Ministério da Saúde.
5. Mendes, E. V. (2010). Redes de Atenção à Saúde. **Ciência e Saúde Coletiva**, 15(5), 2297-2305.
6. Brasil. Ministério da Saúde (MS). (2014). Portal da Saúde. Campanha Nacional de Doação de Leite Humano 2014. [acessado 2015 abr 10]. Disponível em: <http://portalsaude.saude.gov.br/index.php/cidadao/principal/agencia-saude/12924-lancada-campanha-para-incentivar-doacao-de-leite-materno>.
7. Rivera, F. J. U., & Artmann, E. (2014). **Planejamento e Gestão em Saúde: conceitos, história e propostas** (14ª ed.). São Paulo: Hucitec.
8. Artmann, E. (2000). O Planejamento Estratégico Situacional no nível local: um instrumento a favor da visão multissetorial. **Cadernos da Oficina Social**, 3, 98-119.
9. Artmann, E. (1993). **O Planejamento estratégico situacional: à trilogia, matusiana e uma proposta para o nível local de saúde: uma abordagem comunicativa** [dissertação]. Rio de Janeiro: Escola Nacional de Saúde Pública.
10. Minayo, M. C. S., Deslandes, S. F., & Gomes. (2007). **Pesquisa Social: teoria, método e criatividade**. Petrópolis: Vozes.
11. Matus, C. (1996). **Estratégias políticas: Chimpanzé, Maquiavel e Gandhi**. São Paulo: Fundap.
12. Brasil. Ministério da Saúde (MS). (2011). Portaria nº 488, de 21 de outubro de 2011. **Política Nacional de Atenção Básica**. Brasília: Ministério da Saúde.
13. Cruz, M. M., & Bourget, M. M. M. (2010). A visita domiciliar na Estratégia de Saúde da Família: conhecendo as percepções das famílias. **Saúde e Sociedade**, 19(3), 605-613.
14. Oliveira, M. I. C., & Gomes, M. A. (2001). As unidades básicas amigas da amamentação: uma nova tática no apoio ao aleitamento materno. In J. D. Rego (Org.), **Aleitamento Materno** (pp. 343-366). São Paulo: Atheneu.

15. Artmann, E., & Rivera, F. J. U. (2006). Humanização no atendimento em saúde e gestão comunicativa. In S. F. Deslandes (Org.), **Humanização dos Cuidados em Saúde: conceitos, dilemas e práticas** (pp. 205-231). Rio de Janeiro: Fiocruz.
16. Secretaria Municipal de Saúde e Defesa Civil do Rio de Janeiro, Superintendência de Atenção Primária à Saúde. Linha do cuidado da atenção integral à saúde da criança. [acessado 2015 jan 14]. Disponível em: <http://www.ensp.fiocruz.br/portal-ensp/judicializacao/pdfs/485.pdf>.
17. Lima, J. C., & Rivera, F. J. U. (2009). Agir comunicativo, redes de conversação e coordenação em serviços de saúde: uma perspectiva teórico-metodológica. **Interface**, 13(31), 329-342.
18. Franco, T. B. (2006). As redes na micropolítica do processo de trabalho em saúde. In R. Pinheiro & R. A. Mattos (Orgs.), **Gestão em Redes: práticas de avaliação, formação e participação na saúde** (pp. 460-472). Rio de Janeiro: IMS/UERJ-CEPESC-ABRASCO.
19. Artmann, E., & Rivera, F. J. U. (2013). Gestão comunicativa e democrática para a integralidade e humanização do cuidado em saúde: desafios. In R. Pinheiro et al. (Orgs.), **Construção Social da Demanda por Cuidado: revisitando o direito à saúde, o trabalho em equipe, os espaços públicos e a participação** (pp. 225-239). 1ª ed. Rio de Janeiro: UERJ/IMS/CEPESC/LAPPIS/ABRASCO.
20. Teixeira, R. R. (2003). O acolhimento num serviço de saúde entendido como uma rede de conversações. In R. Pinheiro & R. A. Mattos (Orgs.), **Construção da integralidade: cotidiano, saberes e práticas de saúde** (pp. 89-111). Rio de Janeiro: IMS-UERJ/ABRASCO.
21. Habermas, J. (2012). **Teoria do Agir Comunicativo** (Trad. Flávio Siebeneicher). São Paulo: Martins Fontes.
22. Lima, J. C., & Rivera, F. J. U. (2010). Redes de conversação e coordenação de ações em saúde: estudo em serviço móvel regional de atenção às urgências. **Cadernos de Saúde Pública**, 26(2), 323-336.
23. Brasil. Ministério da Saúde. (2004). **HumanizaSUS: Política Nacional de Humanização: a humanização como eixo norteador das práticas de atenção e gestão em todas as instâncias do SUS**. Brasília: Ministério da Saúde.
24. Echeverria, R. (2000). **La empresa emergente, la confianza y los desafíos de la transformación**. Buenos Aires: Granica.
25. Brasil. Ministério da Saúde. (2014). Portaria nº 1.153, de 22 de maio de 2014. Redefine os critérios de habilitação para Iniciativa Hospital Amigo da Criança, como estratégia de promoção, proteção e apoio ao aleitamento materno e à saúde integral da criança e da mulher, no âmbito do Sistema Único de Saúde. [acessado 2015 dez 19]. Disponível em: http://bvsmms.saude.gov.br/bvs/saudelegis/gm/2014/prt1153_22_05_2014.html.
26. Brasil. Ministério da Saúde (MS). **Nascer no Brasil: Sumário executivo da Pesquisa**. [acessado 2017 jun 20]. Disponível em: <http://www.ensp.fiocruz.br/portal-ensp/informe/site/arquivos/anexos/nascerweb.pdf>.



27. Every Woman Every Child. (2015). *Global Strategy for Women's, Children's and Adolescents' Health 2016-2030*. [acessado 2017 jul 22]. Disponível em: http://www.everywomaneverychild.org/wp-content/uploads/2017/01/EWEC_2016_PT_web.pdf.
28. Victora, C., et al. (2016). Breastfeeding in the 21st century: epidemiology, mechanisms and lifelong effect. *Lancet Breastfeeding Series Paper*, 387(10017), 475–490.
29. Brasil. Ministério da Saúde. (2009). *II Pesquisa de prevalência de aleitamento materno nas capitais brasileiras e Distrito Federal*. Brasília: Ministério da Saúde.
30. Resolução Secretaria Estadual de Saúde - SES 2673 de 02 de março de 2005. [acessado 2016 mar 24]. Disponível em: <http://www.aleitamento.com/amamentacao/conteudo.asp?cod=334>.
31. Ball, S. J. (1998). Cidadania Global, Consumo e Política Educacional. In L. H. Silva (Org.), *A Escola Cidadã no Contexto da Globalização* (pp. 121-137). Petrópolis: Vozes.
32. Fundação de Amparo à Pesquisa do Estado do Rio de Janeiro (FAPERJ). (2016). *Relatório final de bolsa de iniciação científica: Avaliação dos fatores associados à doação de leite materno por usuárias de unidades básicas de saúde da cidade do Rio de Janeiro: monitoramento dos postos de recebimento de leite humano ordenhado*.
33. Costa, M. A. H. (2015). *A Clínica da Família como Posto de Recebimento de Leite Humano Ordenhado (PRLHO): um programa, três olhares* [dissertação de mestrado]. Rio de Janeiro: Universidade Estácio de Sá.
34. Hartz, Z. M. A. (2012). Meta-avaliação da gestão em saúde: desafios para uma "nova saúde pública". *Ciência & Saúde Coletiva*, 17(4), 832-834.
35. Barros, M. E. B. (2000). Avaliação e formação em Saúde: como romper com uma imagem dogmática do pensamento. In R. Pinheiro & R. A. Mattos (Orgs.), *Gestão em Redes: práticas de avaliação, formação e participação na saúde* (pp. 261-288). Rio de Janeiro: CPESC.
36. Paim, J. S., & Filho, N. A. (1998). Saúde Coletiva “uma nova saúde pública” ou campo aberto a novos paradigmas? *Revista de Saúde Pública*, 32(4), 299-316.
37. Mainardes, J. (2006). Abordagem do Ciclo de Políticas: uma contribuição para análise de Políticas Educacionais. *Educação e Sociedade*, 27(94), 47-69.

TEACHERS' AND STUDENTS' PERCEPTION OF TECHNOLOGY-MEDIATED CARE IN THE FIGHT AGAINST COVID-19: AN ANALYSIS OF MENTAL HEALTH

 <https://doi.org/10.56238/sevened2024.029-060>

Camilly Campos Vasconcelos¹, Elielza Guerreiro Menezes², Sônia Maria Lemos³, Jessé David Nascimento da Costa⁴, Gabriela Pinheiro de Andrade⁵, Bruno Felipe Vargas Julião⁶, Aline Gomes Sidrone⁷, Amanda Silva Souza de Araujo⁸ and Jander Menezes Cavalcanti⁹

ABSTRACT

Faced with the difficulty presented in guiding and monitoring patients affected by covid-19, many countries have applied wireless technologies to fight the virus effectively. With this in mind, the University of the State of Amazonas (UEA) established the service of a technology to clarify doubts about the coronavirus and provide psychological help to the population. The study sought to analyze the perception of professors and students via

¹ Undergraduate and Nursing (UEA)

E-mail: ccv.enf20@uea.edu.br

ORCID: <https://orcid.org/0009-0006-2131-1803>

LATTES: <http://lattes.cnpq.br/8918579260567685>

² Dr. in Nursing (UEA)

E-mail: egmenezes@uea.edu.br

ORCID: <https://orcid.org/0000-0003-1804-6384>

LATTES: <http://lattes.cnpq.br/4807851287574394>

³ Dr. in Collective Health (UERJ)

E-mail: slemos@uea.edu.br

ORCID: <https://orcid.org/0000-0002-5047-2466>

LATTES: <http://lattes.cnpq.br/1061333513067009>

⁴ Undergraduate and Nursing (UEA)

E-mail: jdndc.enf20@uea.edu.br

ORCID: <https://orcid.org/0009-0003-0806-4308>

LATTES: <http://lattes.cnpq.br/9678138936941482>

⁵ Undergraduate and Nursing (UEA)

E-mail: gpda.enf20@uea.edu.br

ORCID: <https://orcid.org/0000-0002-1857-6142>

LATTES: <http://lattes.cnpq.br/0826372885762251>

⁶ Undergraduate and Nursing (UEA)

E-mail: bfvj.enf20@uea.edu.br

ORCID: <https://orcid.org/0009-0002-9539-6062>

LATTES: <http://lattes.cnpq.br/5484918943308530>

⁷ Undergraduate and Nursing (UEA)

E-mail: ags.enf20@uea.edu.br

ORCID: <https://orcid.org/0009-0008-4406-8601>

LATTES: <http://lattes.cnpq.br/8251231637059934>

⁸ Undergraduate and Nursing (UEA)

E-mail: assda.enf23@uea.edu.br

ORCID: <https://orcid.org/0009-0003-6235-1543>

LATTES: <http://lattes.cnpq.br/0790488139704475>

⁹ Master's Degree in Intellectual Property (EST)

E-mail: jander.cavalcanti@gmail.com

ORCID: <https://orcid.org/0000-0002-0297-8489>

LATTES: <http://lattes.cnpq.br/8976767553359374>



chatbot about mental health demands during the COVID-19 pandemic. This is a cross-sectional study with a qualitative approach, carried out at the Laboratory of Health Technology and Education (LABTECS) of the School of Health Sciences, and was divided into two phases: literature review and interview with professors and students. In phase 1, a total of 2035 articles were identified, of which 1022 were not associated with the proposed theme, 988 did not answer the guiding question and 16 publications were unavailable in full, 41 articles were selected for evaluation and eligibility, 31 articles did not respond to the research objective, and finally 10 articles were included in the analysis. In phase 2, the interviewees reported identifying demands of anxiety, depression and fear on the part of users, forwarding via chatbot to the specialized mental health team to follow up on the follow-up, show that the chatbot was fundamental for mental health guidance during COVID-19 and reveal that they have expanded their knowledge about health technologies. Therefore, wireless technologies proved to be useful for mental health demands, so that health professionals were able to monitor patients effectively, in addition to the need for reflections on accessibility to online services and mastery of the use of wireless technologies by the population.

Keywords: Mental health. Information technology. Technology. COVID-19.



INTRODUCTION

Since its first confirmed case of infection in February 2020, the new COVID-19 virus called SARS-CoV-2 has posed numerous challenges for the country's population. Thus, it is necessary to recognize that the pandemic scenario affected all aspects of individuals' health, including mental health, requesting actions to combat the pandemic, but also interventions that would help professionals to adopt adaptive strategies to skillfully manage the challenges imposed, whether physical and/or emotional (THERENSE, PERDOMO, FERNANDES, 2021).

With regard to prevention measures, the Ministry of Health launched a series of campaigns together with the dissemination of epidemiological data with the objective of informing the population about transmission issues in case of contagion of the disease. The main suggestion is social distancing as a measure to prevent the spread of COVID-19, with the population being widely oriented about the need to remain in quarantine within their home environments. As a result, lockdown measures and information about the health crisis caused by COVID-19 have resulted in consequences such as stress, fear, and concern for a large part of the population, noting the increase in psychological and emotional symptoms of distress around the world (DUARTE, et, al.; 2020).

It is worth remembering that before the pandemic, Latin America already had great psychosocial needs that were not met and were expressed in mental problems, difficulties and disorders that could often be attributed to deep social inequalities and the markedly limited economic capacity of governments to deal with their respective situations. In this sense, five events were identified as collaborators for manifestations of mental suffering (stress, depression, fear, anxiety, insomnia) during the emergence of the new coronavirus: the confirmation that it would be transmitted between humans; the implementation of isolation measures as the only way to reduce the spread of the disease; and the confirmation by the World Health Organization (WHO) that COVID is a pandemic (EGEDE, RUGGIERO, FRUEH, 2020; PAVANI, et, al.; 2021).

A survey conducted with 799 predominantly female (82.7%) identified that almost 70% of the participants reported having been in mental health monitoring at some time in their lives or were currently. Around 25% have a diagnosis of mental disorder. Regarding COVID-19, 23.8% are part of the risk group for the disease and 43.4% live in the same house as people in the risk group. A cross-sectional study with adult individuals living in Brazil who participated in the virtual health survey ConVid - Behavior Survey, from April 24 to May 24, 2020, found that during the quarantine period, frequent feelings of sadness or depression (35.5%), isolation (41.2%) and anxiety (41.3%) considerably affected the mental



health of such participants. In this way, it can be seen that a part of the population already demonstrated a certain fragility, which could consequently be enhanced due to the health crisis scenario (DUARTE, et al.; 2020; MALTA et al.; 2020).

Given the difficulty presented in guiding and monitoring patients affected by COVID-19, many countries apply wireless technologies to fight the virus effectively. Wireless technologies allow access to the patient's continuous care while maintaining patient security and privacy in a health crisis. On platforms such as telehealth services, providers make use of smartphone teleconferences or examine patients' electronic health records for proper diagnosis and evaluation of treatment outcomes. In today's world, many healthcare providers are using teleconferencing to connect virtually with their patients without physical contact (BASHEERUDDINASDAQ, et al.; 2021).

A study guided by expert occupational therapist Sonia Maria Leonardi Ferrari published in 2022, presents an experience of occupational therapy with telehealth groups in Brazil, supported by the Dynamic Occupational Therapy Method, seeking to discuss the use of technology during the Covid-19 pandemic, demonstrating that occupational therapy telehealth group work in mental health settings has many benefits, especially during the pandemic crisis, fostering a sense of belonging, which helped customers to get through this context (FERRARI, et al.; 2022).

However, the pandemic, as well as other periods of crisis, serves not only as a potential analyzer of the institution, but also the experiences direct attention to society's mental health issues, power relations, and practices instituted in the services, with the aim of generating transformative instituting forces. In view of this complexity, multifaceted actions are necessary, with the main objective of breaking with the instituted asylum and resisting these forces that weaken psychosocial care (SILVANO, et al.; 2022).

With this in mind, the Laboratory of Technology in Health and Education (LABTECS) located at the School of Health Sciences (ESA) of the University of the State of Amazonas (UEA) established the chatbot service with the objective of serving the population in the period of the epicenter of the epidemic in the Amazon, in order to clarify doubts in accordance with the recommendations of the World Health Organization, the Ministry of Health and the Health Surveillance Foundation of Amazonas on the control and community transmission by the new coronavirus/COVID-19 to Amazonian society, in addition to providing psychological help to individuals who needed emotional support. The initiative was a partnership between UEA and the State Government and the Health Surveillance Foundation (HEALTH SURVEILLANCE FOUNDATION, 2020).



The technology used through the chatbot was responsible for triaging and forwarding via telephone call to serve the population, allowing the health team to focus on other tasks. In this type of service, the service pre-defines telephone calls, records user interactions and is able to filter and qualify users of the Unified Health System. Thus, interactions follow flows directed to services performed by the technology itself and directed when there are specific issues that the system cannot solve, being transferred to the team of attendants (teachers and students). Thus, the study in question sought to identify "What are the difficulties in the care and referral of mental health demands by professors and students who worked in the chatbot service during the COVID-19 pandemic?"

METHOD

This study is an excerpt from the research "IMPLANTATION AND IMPLEMENTATION OF A MOBILE TECHNOLOGY FOR THE CARE OF ENDEMIC DISEASES AT THE UNIVERSITY OF THE STATE OF AMAZONAS". This research was approved by the Research Ethics Committee of the CEP-UEA under opinion No. 4.148.014.

This is a cross-sectional study with a qualitative approach. In the cross-sectional study, qualitative and/or quantitative data collected over a certain period of time are analyzed. Data are collected from a sample population or in a predefined subset that have common characteristics, except for the variable being studied. This variable is the one that remains constant throughout the study (ZANGIROLAMI, 2018).

The study took place at the Laboratory of Technology in Health and Education (LABTECS) located at the School of Health Sciences (ESA) of the University of the State of Amazonas (UEA) during the period from July 2022 to June 2024. The surveyed population had 11 chatbot operators, among these are nine professors and two health students who worked in the face-to-face and remote service during the COVID-19 pandemic between April 2020 and July 2021.

The first phase of the study: a literature review was carried out to understand the aspects of the study, thus the following occurred: elaboration of the guiding question, search or sampling in the literature, data collection, analysis of the included studies and discussion of the results.

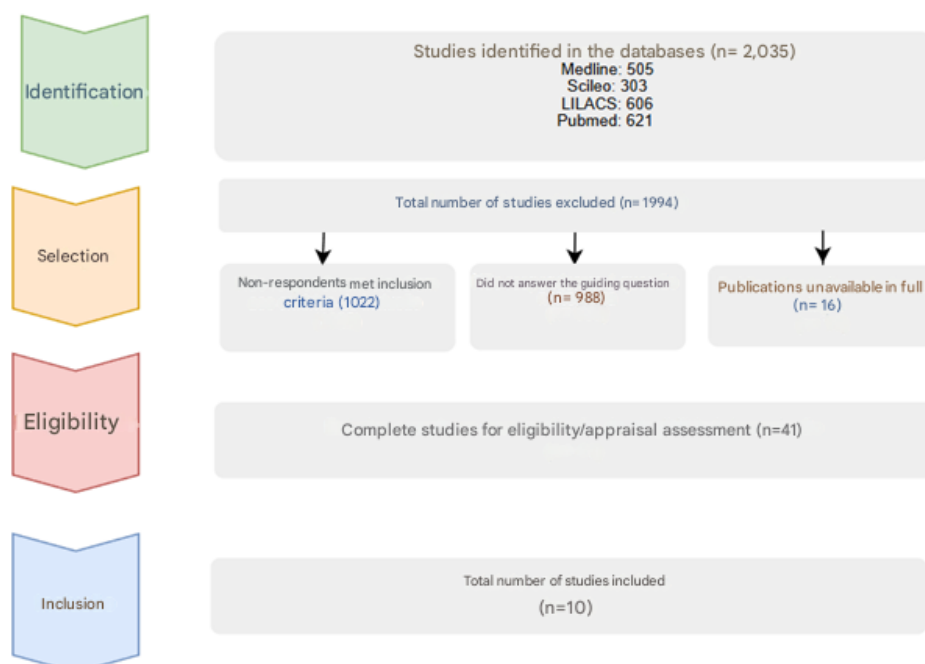
To construct the guiding question, the PICO strategy was used, which represents an acronym for (P) patient/population, (I) intervention/interest, (C) comparison/context, and (O) outcomes. In this study, the population was the professors and students in the health area who worked in technology-mediated care during the COVID-19 pandemic, the interest was to evaluate the impact of the service performed by the mentioned population on mental

health demands during the COVID-19 pandemic; the context was online care during the COVID-19 pandemic. Thus, the research question is: What is the importance of the use of wireless technologies for the orientation of the general public in mental health demands during the COVID-19 pandemic? (TRICCO, et al.; 2018)

To answer the guiding question of the review, a search was carried out through the Virtual Health Library (VHL), the *Scientific Electronic Library Online* (SciELO), Latin American and Caribbean Literature on Health Sciences (LILACS) and the National Library of Medicine (PubMed) databases by crossing the following descriptors controlled: mental health, wireless technologies, health technologies, and COVID-1. Through these descriptors, the studies were analyzed, excluding those that did not meet the criteria and the research proposal, as well as duplicate articles. The inclusion criteria were studies that adapted to articles with full text, articles that dealt with the theme and published in the last 2 years (2020 to 2022).

After the process of filtering the studies, analysis was used through research phases such as database survey, exploration of the material, selective reading, verifying the adequacy of the article with the theme of the study. The selection of articles was conducted in the form of a flowchart with details according to the *Preferred Reporting Items for Systematic Review and Meta-Analyses* (PRISMA) methodology. In this stage, 2035 publications were found for analysis, of which, after reading the abstracts, 10 articles were selected for reading in full. Table 1 presents the summary of the results obtained in each stage:

Figure 1 - Flowchart of the selection of articles for the study of the Integrative Review by PRISMA. Manaus-AM, 2024





RESULTS

The publications selected from the 10 articles to identify the importance of the use of wireless technologies for the orientation of the general public in mental health demands during the COVID-19 pandemic are described in (Chart 1).

Chart 1 - Description of publications according to year, title and Results. Manaus- AM, 2024.

Articles	Year of publication	Title	Results
1	2020	Supporting people with severe mental health conditions during the COVID-19 pandemic: considerations for low- and middle-income countries using telehealth case management	The study analyzes the benefits of these digital technologies in reducing the pandemic and "how" different sectors have adapted to them in a shorter period. The role of social media and television in ensuring global connectivity and serving as a common platform to share authentic information among the general public has been summarised.
2	2021	Online psychological on-call duty: the experience of the UEL Psychological Clinic in the context of Covid-19	The scope of this practice proved to be important for listening to and welcoming the psychic suffering caused by the pandemic, especially for university students who are dealing with insecurities and frustrations, having their life projects crossed by the new world scenario. Some limits of the online Psychological Emergency Service were listed, especially in relation to technological complications. It is hoped that this narrated experience will inspire other services to offer this type of care, or improve their offer, in pandemic times, in order to contribute to the mental health of the population.
3	2021	The Impact of Technology-Enabled Care Coordination in a Complex Mental Health System: A Local System Dynamics Model	Technology-based care coordination is expected to reduce hospitalizations for self-harm and suicide deaths by 6.71% (95% range: 5.63%-7.87%), mental health-related ER presentations by 10.33% (95% range: 8.58%-12.19%), and the prevalence of high psychological distress by 1.76 percentage points (95% range: 1.35-2.32 percentage points).
4	2021	Online Mental Health Interventions in Times of COVID-19: Systematic Review	The results showed that adults and health professionals were the ones who most sought mental health care, through telephone calls and video calls. The main motivations for seeking assistance were feelings of anxiety, depression, panic, eating disorder, and ADHD. Online consultations showed positive and effective effects on mental health care for adults with psychological problems. These promising findings pose challenges to professional ethical issues, especially regarding the care of high-risk patients. In addition, limitations of online care regarding access to the internet and the mastery of



Articles	Year of publication	Title	Results
			technology by the professional and the user should be considered.
5	2021	Can technological advancements help to alleviate COVID-19 pandemic? a review	The study discusses the benefits of these digital technologies in reducing the pandemic and "how" different sectors have adapted to them in a shorter period. The role of social media and television in ensuring global connectivity and serving as a common platform to share authentic information among the general public has been summarised. The role of the World Health Organization and governments globally in preventing the spread of fake news, raising awareness and decreasing the severity of COVID-19 was discussed.
6	2022	Use of digital technologies in mental health during COVID-19	It starts from a critical look at the migration of care face to face to the Internet environment, emphasizing: international experiences in the use of digital technologies in the context of the pandemic; challenges in online consultations, with emphasis on the importance of the ethical, technical/technological and clinical domains that are recurrent in the international literature; challenges and perspectives of the use of technologies. It is essential to develop strategies with government incentives, aiming at the quality of the services offered and the guarantee of adequate hybrid training.
7	2022	COBALT: Supporting the mental well-being of the health care workforce with technology-facilitated care during Covid-19 and beyond	Two-thirds of health workers facing the clinical demands of the Covid-19 pandemic response experience psychiatric symptoms, including post-traumatic stress, anxiety, substance use, depression, insomnia, and suicide. ^{1,2} Compounding the situation, access to mental health services is poor, quality is variable, and stigma is prevalent. COBALT, a digital mental health and wellness platform developed at Penn Medicine, is designed to support healthcare professionals by offering a combination of self-directed resources, virtual group sessions, and one-on-one consultations with a tiered care model from providers, including peers, resilience coaches, psychotherapists, and psychiatrists.
8	2022	ePSICONUT: An e-Health Programme to Improve Emotional Health and Lifestyle in University Students	The results indicated that the professionally supervised use of eHealth tools was associated with better psychological well-being, less anxiety and depression, and better lifestyle habits (such as diet quality), even in situations of stress and change, such as the circumstances of the COVID-19 pandemic. However, more studies are needed to validate and promote the use of eHealth-based intervention programmes.

Multidisciplinary Research and Practice



Articles	Year of publication	Title	Results
9	2022	Telemedicine Interventions as an Attempt to Improve the Mental Health of Populations during the COVID-19 Pandemic-A Narrative Review	The studies included participants from seven countries and the total number of participants in the included studies was 687. The content of these intervention programs includes both established psychotherapeutic programs and new interventions. Remote support was implemented through three approaches: phone/video calls, mobile applications and internet-based programs. The results of the included studies indicate a higher or equal efficacy of telemedicine
10	2022	Virtual Care for Behavioral Health Conditions	The COVID-19 pandemic has highlighted the urgent need for behavioral health services. A substantial part of mental health care transitioned to virtual care during the COVID-19 pandemic, remains virtual today and will continue to be so in the future. Mental health needs continue to increase and there is increasing evidence demonstrating the effectiveness of virtual healthcare for behavioural health issues at the system, provider and patient level. There is also a growing understanding of the obstacles and challenges to virtual behavioral health care.

The sample of this study was composed of 10 original articles. Regarding the year of publication, 1 article was observed in 2020, 4 in 2021 and 5 in 2022.

Of these data presented, 7 are observational studies, 2 of which are review studies (01 systematic review and 01 narrative review) focusing on mental health, especially in a time of Covid-19 and its specificities.

As for the countries of origin of the studies, they are distributed as follows: 3 studies were produced in Brazil, 3 in the United States, 2 in India, 1 in the Dominican Republic and 1 in Poland.

In the second phase of the research, the interview script was used with 8 questions in which each question was related to the experience of professors and students in the health area working in the chatbot service during the COVID-19 pandemic. Thus, the operators' understanding of the technology and the referrals made by teachers and students during their performance in the service were evaluated.

Finally, the data analysis occurred from the exploration of the content previously selected during the literature review, thus the treatment and interpretation of the results obtained through the Bardin method was carried out.

Based on the previously developed analysis, interviews were conducted with 11 operators of the chatbot service, in order to evaluate the protocols and referrals of mental



health demands during the COVID-19 pandemic. Thus, the interview took place at the Laboratory of Technology in Health and Education (LABTECS) of the School of Health Sciences (ESA) located at the University of the State of Amazonas (UEA). The descriptive analysis allowed the identification of six subjective categories as follows:

DECISION TO VOLUNTEER TO WORK IN TECHNOLOGY-MEDIATED CARE DURING THE PANDEMIC

P3 "After observing the need to offer a service to people who were at home and could not go to a health unit. As an active person in the pandemic, we saw the situation (in the units), so that led me to participate in the service"

P6 "To guide the population on the correct attitudes according to what is established by the WHO, but above all to help people who came to us with numerous questions about prevention and treatment"

P5 "First, it was the desire to help and contribute to society. In addition to giving back, since we study at a public university and it becomes our duty"

KNOWLEDGE ABOUT ANY ACTIVITY USING CHATBOT-TYPE TECHNOLOGY

P1 "No, the chatbot was my first contact with this type of technology in health care"

P2 "In cases of difficulty in some service I used the chatbot to help, but as an assistant it was the first time"

P3 "During my academic journey I had experiences in the development of software for health care, but the chatbot came some time later in the midst of the pandemic crisis"

MOST FREQUENT MENTAL HEALTH DEMANDS IDENTIFIED BY TEACHERS

P3 "In the first wave, more cases of anxiety were identified, while in the second wave, most of them were signs and symptoms characteristic of depressive conditions"

P10 "Many people came to the service reporting 'shortness of breath', so after checking the signs and symptoms with a professional, it was understood that it was anxiety"

P4 "All users who used the service for clinical needs also had some psychological need. It was known from the answers that there was some psychic suffering, or the users themselves reported feeling depressed, distressed or afraid"

IDENTIFIED CONDUCTS IN MENTAL HEALTH AND THE DEMANDS OF PROFESSIONALS

P9 "Primary guidance was given to improve the condition, such as helping with breathing control, among other methods"

P10 "During the first wave, there was no planning regarding these cases, and only a reception was carried out with the client. In the second wave, users were directed to a specialized team of psychologists."

P7 "At a certain point we started to work with two teams, one of which specializes in mental health care. Thus, after identification, the referral was carried out by the chatbot itself"



THE ROLE OF THE CHATBOT SERVICE IN MENTAL HEALTH DEMANDS

P7 "Every initiative that took place in order to aggregate was very important. The chatbot has helped many people, in addition to providing this interactivity between teachers and students. However, it could have been more extended to the interior of the state"

P8 "The chatbot has prevented many people from risking themselves outside their homes, sometimes needing small and welcoming guidance only"

P9 "It was impossible to charge the professionals who were serving within the health services for this type of reception, so the chatbot was fundamental in carrying out these guidelines"

LEARNINGS IN RELATION TO MENTAL HEALTH DEMANDS AND REFERRALS DURING THE WORK IN THE CHATBOT

P2 "There were countless learnings, such as valuing the human being in its fullness, sharing pain and being a professional having an attitude based on science, especially at a time when science was being questioned"

P3 "I had some difficulty in using technology, so understanding how the system worked became one of my great learnings, so I was able to learn about the benefits of technologies in favor of health"

DISCUSSION

In view of the reports, it is clear that professors and students had their first contact with this type of technology from the chatbot service. Thus, demonstrating their inexperience in the use of health technologies. This fact can become an obstacle, being faced equally by operators of other wireless technologies used to serve the population during the pandemic, since during their services they faced a technical learning curve when providing care virtually (LIVESEY, et al.; 2022).

However, it is perceived that even with little experience in the care service, the professors and students had a common goal: to help the population in the orientations, so that they would reduce the capacity of the health units compared to the previous scenario, since, although technologies for the provision of behavioral health care were not a method developed only during the first wave, virtual services were not widely used until then, and this rate changed significantly during the pandemic (PALMER, et al.; 2022).

In the face of the pandemic, when faced with the unknown and in the process of mourning, several users demonstrated fragility, perceiving the need for specialized care for these patients, thus following the psychological aspects, a statistically significant increase in depressive and anxiety signs and symptoms was observed, in addition to a decrease in subjective well-being, reiterating the need for preventive measures guided by a method that showed efficacy greater than or equivalent to traditional interventions. Thus, the supports implemented had direct and indirect approaches such as phone calls, video calls, mobile



applications, and virtual programs such as the chatbot itself (CANTISANO, et al.; 2022; RUTKOWSKA, et al.; 2022).

Findings such as these suggest that care management enabled by technologies helps to improve mental health and alleviates the burden on the unified health system. Studies show that compared to the increase in service capacity and standard telehealth, this management reduced more psychological problems, hospitalizations for self-mutilation, hospitalizations for mental disorders, and the prevalence of high psychological distress. It was observed that services mediated by technology such as chatbots were important in reducing the number of patients in health units, being essential for welcoming the population (IORFINO et al.; 2021; THOMAS, et al.; 2021).

However, although telehealth is promoted as a solution to improve access to health, technological barriers and the lack of trained professionals can hinder or prevent access to these services, highlighting the crucial importance of global actions for the promotion of mental health. Thus, it is noteworthy that most of the interviewers obtained knowledge about how to handle wireless technologies correctly, having their skills developed during the service with the support of the technical team present, aiming at a work focused on valuing science and welcoming others, despite such barriers (SALUM, et al.; 2020).

The experience described has contributed significantly to the improvement of the training of health professionals and academics in the use of technologies for care, in addition to promoting reflections and welcoming practices in situations of major catastrophes. Intensive case management via telehealth has proven to be a viable strategy in public health institutions, especially in low- and middle-income countries. This approach can mitigate the elevated risks of psychiatric instability due to COVID-19-related stress in vulnerable populations (SILVA, et al.; 2022; SECCHI, et al.; 2021).

International experiences in technology-mediated mental health care reveal essential aspects, both in the individual dimension, which requires ethics and technological-clinical mastery, and in social and political aspects. The prolonged context of social distancing has brought significant changes in the use of digital technologies. In view of this, professors and students understand that safe actions are indispensable, maintaining the ethical commitment to a qualified performance in the field of mental health (ORTOLAN, et al.; 2021).

CONCLUSION

Technology-mediated services proved to be efficient, being fundamental for the general care of the population, maintaining social distancing recommendations during the



COVID-19 pandemic. Wireless technologies proved to be useful for mental health demands, so that health professionals could effectively monitor psychiatric and psychologically fragile patients, being able to offer continuous and safe support, minimizing the impact of the pandemic on the mental health of the population.

Health technologies are essential in several cases of care and during the pandemic, they were indispensable for reducing the capacity in health services, in addition to facilitating the dissemination of information based on science and the recommendations of the World Health Organization (WHO). Rapid communication about preventive measures, symptoms, and treatments was crucial to educate the population and control the spread of the virus.

Thus, the need for reflections on the accessibility to online services and the mastery of the use of wireless technologies by the population is highlighted, with special attention to the interior of the state. Inequality in access to the internet and the use of technological devices can create significant barriers, preventing many individuals from fully enjoying the benefits of health technologies.

Thus, it is necessary to invest in digital infrastructure and technological training programs to ensure that everyone can access these services equitably. The pandemic has highlighted the importance of technologies in healthcare, but it has also highlighted the need to make these resources accessible to the entire population, regardless of their geographic location or socioeconomic status.

In short, while healthcare technologies have proven vital during the pandemic, the future requires an ongoing effort to ensure that these innovations reach everyone. Only in this way can we build a health system that is more resilient, inclusive, and prepared to face future public health challenges.




REFERENCES

1. Therense, M., Perdomo, S. B., & Fernandes, A. C. da S. (2021). Nós da linha de frente: diálogos sobre o ser da saúde no contexto da pandemia. **Cadernos de Psicologia Social do Trabalho, 24*(2), 265–278.*
2. Duarte, M. de Q., Santo, M. A. da S., Lima, C. P., Giordani, J. P., & Trentini, C. M. (2020). COVID-19 e os impactos na saúde mental: uma amostra do Rio Grande do Sul, Brasil. **Ciência & Saúde Coletiva, 25*(9), 3401–3411.*
3. Egede, L. E., Ruggiero, K. J., & Frueh, B. C. (2020). Ensuring mental health access for vulnerable populations in COVID era. **Journal of Psychiatric Research, 129**, 147–148. <https://doi.org/10.1016/j.jpsychires.2020.07.011>
4. Pavani, F. M., Silva, A. B. da, Olschowsky, A., Wetzel, C., Nunes, C. K., & Souza, L. B. (2021). Covid-19 e as repercussões na saúde mental: estudo de revisão narrativa de literatura. **Revista Gaúcha de Enfermagem, 42*(spe), e20200188.* <http://www.scielo.br/j/rgenf/a/YD6WWBggJmkcBY8jNsFypSd/?lang=pt>
5. Malta, D. C., Gomes, C. S., Szwarcwald, C. L., Barros, M. B. de A., Silva, A. G. da, & Prates, E. J. S., et al. (2020). Distanciamento social, sentimento de tristeza e estilos de vida da população brasileira durante a pandemia de Covid-19. **Saúde em Debate, 44*(spe4), 177–190.*
6. Basheeruddinadaq, S. M., Naveen, N. R., Gunturu, L. N., Pamayyagari, K., Abdullah, I., & Sreeharsha, N., et al. (2021). Wireless Networking-Driven Healthcare Approaches in Combating COVID-19. **Biomedical Research International, 2021**.
7. Ferrari, S. M. L., Pywell, S. D., Costa, A. L. B. da, & Marcolino, T. Q. (2022). Grupos de terapia ocupacional em telessaúde na pandemia de Covid-19: perspectivas de um Hospital-Dia de Saúde Mental. **Cadernos Brasileiros de Terapia Ocupacional, 30**, 1–11.
8. Silvano, A. D., Rezio, L. de A., Martins, F. A., Bittencourt, M. N., Cebalho, M. T. de O., & Silva, A. K. L. da, et al. (2022). Psychosocial Care Center: daily work and articulation with the network in the pandemic. **Revista Rene, 23**, e71660.
9. Fundação de Vigilância em Saúde (FVS). (2021). Situação epidemiológica da Covid-19 no Amazonas. Manaus, 22 de fevereiro de 2021. <https://covid19.uea.edu.br/call-center-chatbot>
10. Zangirolami-raimundo, J., Echeimberg, J. de O., & Leone, C. (2018). Tópicos de metodologia de pesquisa: Estudos de corte transversal. **Journal of Human Growth and Development, 28*(3), 356–360.*
11. Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., & Levac, D., et al. (2018). Extensão PRISMA para revisões de escopo (PRISMA-ScR): lista de verificação e explicação. **Annals of Internal Medicine, 169*(7), 467-473.* <https://doi.org/10.7326/M18-0850>
12. Livesey, C., Kugler, K., Huang, J. J., Burton, E., Rangnekar, A., & Vojta, G., et al. (2022). COBAL: Supporting the mental well-being of the health care workforce with



technology-facilitated care during Covid-19 and beyond. *Healthcare, 10*(3), 100640. <https://doi.org/10.1016/j.hjdsi.2022.100640>

13. Palmer, C. S., Brown Levey, S. M., Kostiuik, M., Zisner, A. R., Tolle, L. W., & Richey, R. M., et al. (2022). Virtual Care for Behavioral Health Conditions. *Primary Care, 49*(4), 641-657. <https://doi.org/10.1016/j.pop.2022.04.008>
14. Cantisano, L. M., Gonzalez-Soltero, R., Blanco-Fernández, A., & Belando-Pedreño, N. (2022). ePSICONUT: An e-Health Programme to Improve Emotional Health and Lifestyle in University Students. *International Journal of Environmental Research and Public Health, 19*(15), 9253. <https://doi.org/10.3390/ijerph19159253>
15. Rutkowska, A., Cieślik, B., Tomaszczyk, A., & Szczepańska-Gieracha, J. (2022). Mental Health Conditions Among E-Learning Students During the COVID-19 Pandemic. *Frontiers in Public Health, 10*, 871934. <https://doi.org/10.3389/fpubh.2022.871934>
16. Iorfino, F., Occhipinti, J. A., Skinner, A., Davenport, T., Rowe, S., & Prodan, A., et al. (2021). The Impact of Technology-Enabled Care Coordination in a Complex Mental Health System: A Local System Dynamics Model. *Journal of Medical Internet Research, 23*(6), e25331. <https://doi.org/10.2196/25331>
17. Thomas, M. J., Lal, V., Baby, A. K., Rabeeh Vp, M., James, A., & Raj, A. K. (2021). Can technological advancements help to alleviate COVID-19 pandemic? a review. *Journal of Biomedical Informatics, 117*, 103787. <https://doi.org/10.1016/j.jbi.2021.103787>
18. Salum, G. A., Rehmenklau, J. F., Csordas, M. C., Pereira, F. P., Castan, J. U., & Ferreira, A. B., et al. (2020). Supporting people with severe mental health conditions during the COVID-19 pandemic: considerations for low- and middle-income countries using telehealth case management. *Brazilian Journal of Psychiatry, 42*(4), 451-452. <https://doi.org/10.1590/1516-4446-2020-1078>
19. Silva, N. H. L., Ottolia, R. F., Marques, L. G., & Antúnez, A. E. A. (2022). Use of digital technologies in mental health during Covid-19. *Estudos de Psicologia (Campinas), 39*, e200225. <https://doi.org/10.1590/1982-0275202239e200225>
20. Secchi, Á., Dullius, W. R., Garcez, L., & Scortegagna, S. A. (2021). Intervenções on-line em saúde mental em tempos de COVID-19: Revisão sistemática. Universidade de Passo Fundo, Programa de Pós-Graduação em Envelhecimento Humano – Passo Fundo/RS – Brasil. <https://doi.org/10.5935/2318-0404.20210013>
21. Ortolan, M. L. M., & Sei, M. B. (2021). Online psychological emergency attendance: the experience of UEL's Psychological Clinic in the context of Covid-19. Universidade Estadual de Londrina, Programa de Pós-Graduação em Psicologia – Londrina/PR – Brasil. <https://doi.org/10.5935/2318-0404.20210048>

CINEMA AND EDUCATION: CONTRIBUTIONS TO HUMANIZING YOUNG PEOPLE <https://doi.org/10.56238/sevened2024.029-061>**Andreia Lopes Assis¹, Keyla Cristina Teixeira dos Santos², Marinalva de Oliveira Teixeira³ and Suely dos Santos Silva⁴****ABSTRACT**

Youth is often seen as problematic and maladjusted. However, there are few efforts to understand it, especially in school. This article addresses the movie *Among Us*, which portrays the friendship of 3rd grade teenagers. The analysis focused on the identities and roles of the characters. The writer and director portrays, in a fun way and without shocking the viewer, the reality and meaning of adolescence, highlighting the importance of friendship. The screenwriter managed to convey to the public the youthful vision of entertainment. The film addresses topics such as drug use, alcohol and sex, in a planned meeting. The objective of the work is to understand the psychological and identity universe, provoke reflections and present possibilities to include cinema in education.

Keywords: Cinema. Exclusion. Adaptation. Image. Young Latin Americans.

¹ Special student of the Master's Degree in Education at the Graduate Program in Education at the Federal University of Jataí (UFJ)

Faculty of Education of the Federal University of Jataí (UFJ).

ORCID: <https://orcid.org/0009-0006-0510-4572>

E-mail: deialopesaais26@gmail.com

² Master's student in Education at the Graduate Program in Education at the Federal University of Jataí (UFJ)

Faculty of Education of the Federal University of Jataí (UFJ)

ORCID: <https://orcid.org/0009-0000-6429-4771>

E-mail: keyla.santos@discente.ufj.edu.br

³ Master in Business Administration

Federal University of Jataí (UFJ)

ORCID: <https://orcid.org/0009-0005-3531-1938>

E-mail: marinalva.oliveira@ufj.edu.br

⁴ Advisor and PhD in Education from USP

Faculty of Education of the Federal University of Jataí (UFJ)

ORCID: <https://orcid.org/0000-0002-7185-6637>

E-mail: suely_silva@ufj.edu.br



INTRODUCTION

As a result of the technological and scientific revolution, society has come to be seen as a producer of knowledge, creating platforms for access to information that generally promote quick access to diversified knowledge. As a result of economic and technological globalization, this process has intensified, which in recent years has led to transformations in the political, social, technological, economic, educational and cultural fields. Such transformations obviously do not reach all people equally, which produces more subtle forms of exclusion.

Another important source of knowledge production is cinema, which can be explored at all stages and levels of education, due to the wealth of information and relevant social themes, which can be presented in his works and worked on in the classroom through his products, the films. Cinema produces and makes available works that address diversified content and even themes experienced in the daily life of society. The films can be presented to students to encourage the debate of social, political, humanitarian, educational issues, among others.

Cinema provides education professionals with access to a tool for pedagogical practice. When used in a critical, conscious, and planned way, it can promote the cognitive development and socialization of the individual, in addition to contributing to their integral formation and preparation for living in society. In this way, Carvalho (2017, p. 2), states that: "The use of videos and films in the classroom emerges as tools that provide opportunities for socialization, learning and the development of various knowledge and skills". By using cinema in education, it is possible to promote different ways of understanding how the production of material and symbolic knowledge occurs.

Luiza da Luz Lins, general director of the Florianópolis Children's Film Festival, in an interview conducted by the *Cultura Infância website*, in August 2017, said, when considering Law No. 13,006/2014, that "the right of the Brazilian child to see himself on the screen is one of the important points, to be guaranteed with the law". International cinema is still very focused on the representation of the public with higher purchasing power, which makes it difficult for young Latinos to identify with the content of the films. Those in situations of social vulnerability often see on screens a completely discrepant image of their reality and of what is presented as a possibility for the future.

Thus, in an attempt to guarantee access to cinema in Brazil, Federal Law No. 13,006/2014 was sanctioned, which adds paragraph 8 to article 26 of Law No. 9,394/1996 to the Law of Guidelines and Bases of National Education (LDB). This paragraph included in the LDB determined that, as of its validity, it became mandatory to show films of national



production, for at least two hours a month, in Brazilian public schools, and that this activity should constitute the complementary curricular component integrated into the institution's pedagogical proposal.

Furthermore, what happens in practice is the absence of public policies that guarantee the enforceability of this law, both in relation to inspection and, mainly, to the availability of resources and incentives to schools, so that it is possible to provide, in public schools, this contact with Brazilian cinema. The reality still shows a gap in the law regarding the mechanisms and forms of enforceability of this action, which makes it unfeasible to comply with it. There is insufficiency, if not, absence of effective public policies that promote equal access to cinema by students in the public school system, which would give access to the cultural aspects of Brazilian society.

Contact with cinematographic works provides intellectual and creative development of students. Its absence, especially for students from low-income families, who often do not have access to cinema outside the school environment, can limit the potential of most of them to explore and reflect on relevant themes that the films address. The film of different cinematographic genres can present, in a playful way, social, cultural and political issues, providing the individual with the opportunity to develop new knowledge by relating to their lives the ways in which the characters find solutions to problems presented in the narratives, for example.

Cinematographic works contribute to society by providing access to entertainment and various cultural elements. They also offer the public possibilities to expand knowledge through reflection, imagination and representation. To make sense to students, it is necessary for teachers to provoke situations that motivate them to reflect on the film's message in its depth and explore different perspectives. Thus, the use of cinema in the subject's formative process, from its first stages, is relevant, as it can provide learning through playful and active methodologies. Duarte (2002, p. 17) points out that: "Watching films is a social practice as important, from the point of view of people's cultural and educational formation, as reading literary, philosophical, sociological works and so many more".

DEVELOPMENT

Stuart Hall (2016, p. 31-36), in his book *Culture and Representation*, presents the understanding that cultural productions such as cinematographic works represent values, behaviors and social ideologies, which in turn can strengthen or weaken society. There are certain cinematographic works that intend to represent past or present facts of society, and

cinema also has the ability to anticipate by portraying the possibility of future scenarios. According to Stuart's theory of cultural representation, these film productions should not be interpreted as models to be followed, but as critical reflections on individual behaviors. He also warns that cinema has the power to represent and question social practices and values, as a mirror that exposes not only reality, but also the consequences of certain behaviors. Thus, by portraying these issues, cinema alerts to the possible consequences of these behaviors in society, which, if not questioned, can trigger problems in various psychosocial spheres.

Film as a pedagogical methodology is sometimes used in school sporadically, without clear objectives that can generate some type of learning, which can limit its formative impact. According to Carvalho (2017, p. 2), "The use of videos and films in the classroom emerges as tools that provide opportunities for socialization, learning and the development of various knowledge and skills". That is why it is important to use cinema in a planned way, to produce discussions and activities that relate audiovisual content with the cultural capital and linguistic repertoire of students, in order to expand them.

In this sense, in order to understand how cinema can be used in the production of knowledge, a research was carried out on a Brazilian film, considering the historical and social context in which the script was based.

For this study, the following methodological procedures were adopted: 1) research of interviews published in the media with directors and actors of the film *Among Us*, written and directed by Paulo Morelli, who was also director of the film *City of Men*, and 2) analytical observation of the film itself, in order to understand both the main and secondary message of the work. The film object of this analysis was released in 2014, with a duration of 1h40min57. The audio was made available only in Portuguese, without subtitles, and the work falls into the drama genre, with an indicative rating for the public from 14 years old.

In an interview with G1 (2013), the director of the film said how important the participation of his son Pedro, a young man, was for the success of the work in Brazilian cinema. Pedro participated in the recordings and the elaboration of dialogues and scenes, showing the best angles and commenting on each character during filming, said his father. Morelli believes that it was only possible to produce a work with great quality due to Pedro's commitment, because he is young and enthusiastic about cinema, to which he credits part of the success presented in the final work. The cast of the work was made up of nationally known actors, such as Carolina Dieckmann, Caio Blat, Maria Ribeiro, Paulinho Vilhena, Martha Nowill, Júlio Andrade and Lee Taylor. All are very popular with the general public, as

they usually participate in long-running soap operas on open channels and for generating a lot of media exposure, making them known.

The film was awarded in the categories of best screenplay and best actress at the Rio de Janeiro Festival, in which Carolina Dieckmann acted as a supporting actor. Caio Blat acted as the protagonist with the character Felipe, responsible for carrying the mystery of the story. The actor acted with his wife Maria Ribeiro (45 years old), with whom he was married from 2007 to 2017, who, in addition to being an actress and writer, is a Brazilian film director.

Caio Blat (33 years old), in an interview with G1, spoke of the desire to continue the work *Among Us*, problematizing that, when the characters are 45 years old, the film *Among Us 2* will aim to show how they will be, and that the release forecast would be in 2025. *Among Us* is a Brazilian drama with characteristics of an Argentine film. The author bets on the reflective and complex style to differentiate it from the comedy genre.

Thus, the use of films as a pedagogical practice in educational institutions offers possibilities for the teaching and learning process to occur with the respective expansion of culture. However, for this practice to be effective, education professionals must seek adequate qualification that allows them to understand how audiovisual resources can be strategically integrated. Bulgræn (2010 *apud* Carvalho 2017) asserts that:

[...] Undoubtedly, the teacher, in addition to being an educator and transmitter of knowledge, must act, at the same time, as a mediator. In other words, the teacher must place himself as a bridge between the student and knowledge so that, in this way, the student learns to "think" and question for himself and no longer passively receive information as if it were a deposit of the educator (Bulgræn, 2010, p. 31 *apud* Carvalho, 2017, p. 2).

The proposal to debate youth and, especially, what their lives will be like in the future is a topic that interests schools and teachers. The author Marcos Napolitano, in his book *How to use cinema in the classroom*, states that: "In this sense, the school can make a contribution to the diversification of audiovisual culture by working with films of different origins, times and languages, despite the difficulties of access" (Napolitano, 2003, p. 61). Drama tends to be a type of film in which the problem is related to everyday or subjective social issues, which can be real or imaginary. Whatever they are, the goal is to provoke intense emotions in the viewers.

The cinematographic work *Among Us* discusses the passage from youth to adulthood, the dilemmas and uncertainties of this phase of life. By analyzing the film as a pedagogical proposal, it was possible to think of the following strategies to be used to work



on the film: adapt the curriculum, guide the student to analyze or make a written review of the work, hold a debate after the film and use specific parts of the film to illustrate concepts.

MOTIVATIONS FOR THE USE OF CINEMATOGRAPHIC WORKS

The film is an important pedagogical resource for the teaching practice and the formative process of the individual and the collective sense, as is the theme of *Among Us*. The plot makes the viewer emotional, but also reflects and can elucidate, or even solve, personal, family and social conflicts. Because of these possibilities, this film is recommended in teaching practice. The cinematographic work also has the function of being a source of new scientific knowledge, providing possibilities to education professionals and strategies to work with curricular content, in addition to analyzing the real world from fiction. Although the pedagogical work with films in school and university is possible, the bibliographic references point out that social inequalities are factors that hinder and/or prevent the provision of teaching practice that achieves the objectives that cinema can offer. Economic, social and cultural differences end up interfering internally in the school community and are maintained after the end of studies, which should not occur.

In the film *Among Us*, the plot mixes elements of drama and suspense, explores tensions, frustrations, secrets, comparisons and, above all, professional insertion and its barriers, human feelings that are mixed during the reunion of school friends after 10 years. The film deals with themes such as friendship, guilt, regret and the personal changes that occur over time. By using actors who already had a close relationship, the film benefited from more genuine representations, especially in moments of conflict and intimacy, which contributed to the sense of verisimilitude in the portrayal of longtime friendships.

Director Paulo Morelli chose actors who were friends in reality to compose the cast of the film, which presents two periods. In 1992, a group of 3rd year high school students defined themselves as the most friendly in the class and decided to write letters to be opened after 10 years. Their intention was to know how they would be when they saw themselves again in the same geographical place where they were during schooling, the place of the parents of one of them. The commitment made at the time was to spend a weekend at the country house where they would open the written letters. Through a film, true facts can be reproduced, such as the murder of actress Daniela Perez, which to this day still moves society.

Among Us portrays the yearnings of middle-class young people with the future, especially in relation to the profession, the assumption of sexuality and the formation of families or not. At the reunion of this group of friends, 10 years after the end of high school,



emotions were aroused, and there were kisses, smiles and jokes, but also many demands. The year of the reunion was 2002, with the death by traffic accident of one of the friends, on the way to the meeting, who was present, but physically absent. Felipe took possession of the manuscripts, quality material written by his deceased friend, and published a book, with great success.

The high point of the narrative is undoubtedly the reading of the letters that were written by the members of the group and buried in a box near the house where the meeting between the school friends took place. To ensure that no one would find the letters, they placed a stone over the buried box to mark the location and set a tree as a reference. The scene shows the fallen and dry tree, a symbolic image for the continuity of that friendship.

During the reading of the cards, the characters showed feelings of joy, passion and betrayal. In an atmosphere of melancholy, the farewell of the characters takes us back to reality and to the understanding that the individual does not always have the power of decision or the guarantee of planning his life. There is unpredictability in life, which can completely alter one's plans, and this is the symbolic message of the work that, although what was previously planned is frustrated, it is possible to see other possibilities even unthought of until then.

SOCIETY WATCHING MOVIES: TRIALS

The judgment that determines the quality of a work is based on various reports from viewers. To define a film as good or bad, some characteristics are observed. The subject observes whether it is fun or not, the quality of the image and in which historical context it is reproduced. Normally, when watching a movie, society makes a prejudgment, and this posture is not the best to determine the content of the movie. After watching the film, the individual can conclude the idea he proposed at the beginning, that is, to tell the story of young friends very naturally.

The entire organization of the script was very faithful to the way youth lives, with lots of fun, alcoholic beverages, drugs and even the passions and discords between them. The script presents the involvement of all the characters to represent the friendship of young people around 20 years old. In a country house far from any interference from other people and noises, they isolate themselves to enjoy that exciting moment, and the scenes value dark tones. The protagonist, played by actor Caio Blat, changes his behavior out of ambition and selfishness in the face of the opportunity to take for himself the material of his friend, who died in the accident.



To be able to understand the message between the lines of the plot, it is important to know physical, psychological, and economic elements. The film is a classic narration, as it identifies a protagonist. The predominant colors are somber, etched at dusk, to collaborate with the mysterious atmosphere of the story. Only a few scenes were shot in sunlight. The relevant information for the understanding of language, customs, manners and how young people act helps to understand the universe of contemporary young people. It is also seen in the film how women are inserted in the job market when it comes to publishing, and even the freedom to drink, use drugs or choose sexual partners. The work not only intends to show how young people see life and work, but how an attitude based on what can be good can affect morale and emotional feelings in the future.

THEORETICAL REFLECTION

For the purposes of this reflection, education, culture and society have left history as an important legacy to continue education. According to Maria Lúcia de Arruda Aranha (2014, p. 19-31), "Thinking about the past, however, is not an exercise in nostalgia, curiosity or erudition: the past is not dead, because the roots of the present are founded in it".

Knowledge is not innate, and the experiences lived are felt and interpreted differently by each person, as the film showed. That is why it is important to have theoretical knowledge that helps in understanding how the interpretation of events and feelings occurs and, therefore, the learning of young people. According to Durkheim (2011, p. 53), "Education is the action exerted by adult generations on those who are not yet mature for life". For the author, the social role of education is seen as a means by which adult generations transmit norms, values and knowledge to young people, preparing them to integrate into society.

Nowadays, it is necessary to rethink the teaching practice in the sense that school and university education provide diverse cultural experiences, such as: going to museums; technical trips; cultural trips; going to the movies, as well as to the theater; cinema at school, among others, to systematically provide more culture and, finally, more autonomy. The education practiced in schools moves away from culture and art, and the impoverished learning they provide aims to alienate students. According to Weber, education without art and culture is focused on a type of bureaucratic domination: "It seeks to train students for practical purposes, aiming to train the student for practical purposes useful to the administration", both in the organization of public authorities, as well as in offices, workshops, industrial laboratories, disciplined armies" (Weber, 1971, p. 482).

For Maria Alice Foracchi, the socialization process of young people is characterized by the search for identity and autonomy, when youth is seen as a period of transition and confrontation with social norms. By relating this perspective to cinema, especially in works such as *Among Us*, it is observed that the representation of the dilemmas, friendships and conflicts of young people, in the school and social context, creates a symbolic space that favors the development of their autonomy. In this way, cinema emerges as a powerful means for reflection and learning and allows young people to recognize and understand their experiences, in addition to the family and social pressures they face. This process highlights the importance of exploring these themes in the educational environment, expanding the understanding of the complex relations of identity and social belonging that permeate youth (Weisheimer, 2014, p. 91-117).

The practice as a curricular component is characterized by contributing to the training of students to work in basic education, through research in cinema.

According to Saviani (2010):

To understand the need to harmonize education with scientific and technological progress, teaching must be a conscious, deliberate, systematic and methodical process, aimed at a double function: to serve as a source of information and to contribute to the organization of students' cognitive activity (Saviani, 2010, p. 61).

However, he draws attention to the fact that, in capitalist society, this attempt to justify inequalities resorts to new arguments, more specifically, the discourse of meritocracy. This discourse basically consists of the defense that the social position of individuals has to do directly with the use of available social opportunities and with the talent and competence of each one, and inequalities, therefore, are the natural result of differentiated personal successes. The use of cinema as a pedagogical resource in the teaching practice and in the subject's formative process in the classroom constitutes a source of new scientific knowledge and can be worked with the same proportion as the other curricular contents, contributing to deny the fallacious meritocratic discourse.

The authors Silva, Santos and Cunha (2017, p. 4) cite that: "the first inclusions of cinema in the educational field can be observed since the early years of the twentieth century". In this way, the film made available to society already had a character that goes beyond entertainment, constituting itself as educational cinema. This knowledge is essential for the formation of the autonomy of thinking, but generally schools do not provide it, or the subject is unable to extract the message that is implicit because he is not in the habit of watching movies. Cinema is an inexhaustible source of knowledge production, but it is less explored than it should.



In the work *The Student and the Transformation of Brazilian Society*, Foracchi (1977) examines the role of students in social dynamics and approaches youth as a transition phase, which goes through family dependence and the search for autonomy. According to the author, the student is socially driven to fulfill family and social expectations and finds, in education and student movements, a form of contestation and expression of identity. The educational environment and class pressure intensely influence youth behavior, creating a circumstance of conflict between adaptation to the environment and the aspiration for transformation of oneself and the world.

In the book *Youth in Modern Society*, Foracchi (1972) investigates the social dynamics that shape youth identity and notes that in modern society, youth is often labeled as a phase of rebellion and inadequacy. For Foracchi, young people are seen less as developing individuals and more as subjects who must be molded to fit preexisting norms. This definition is limiting and leads to the standardization of behaviors, making it difficult to genuinely understand the challenges and conflicts that characterize this phase. The author analyzes the way in which institutions, especially the school and the family, influence the construction of this stereotyped image, offering little attention to the complexity and uniqueness of youth. Thus, framing youth has never been successful, nor desirable.

By observing youth from a sociological perspective, Foracchi argues that the stigmatization of young people as "problematic" derives from the absence of approaches that consider them in their entirety and aim only at discipline and control. The author defends the importance of understanding young people as active social beings, whose attitudes and values reflect not only their personal conditions, but also the pressures and tensions of the social context in which they live. In this way, Foracchi criticizes the reductionist and meritocratic approach, proposes a more comprehensive understanding of youth and indicates that the (re)knowledge of cultural, educational and socioeconomic influences is essential for a true understanding of the behavior and aspirations of youth.

PROPOSAL FOR FILM ANALYSIS FROM A CRITICAL-REFLECTIVE PERSPECTIVE

In this section, we present a proposal for pedagogical practice focused on the critical-reflective perspective, based on the reflections we made in the bibliographic research and on the experience of watching and analyzing the film *Among Us*. Social reflections were also made obtained mainly in the disciplines taken in the 1st and 2nd periods of the Pedagogy Course, Sociology I and Sociology 2, in which the film was shown and discussed.

In this way, the theoretical and practical basis made it possible to highlight how cinema through fiction or other genres is important for people's intellectual and emotional

formation. In the third-to-last scene, actor Paulinho Vilhena reveals his character, a young man with a psychological disorder who, after going three days without taking the medicine, has an anxiety crisis. Already very impatient with the jokes of his friends, he loses emotional control. The situation provokes in him the desire for anger and suicide. In this sense, family problems and the ways of experiencing and solving them impact the formation and reflect situations in adult life.

Cinema can be a powerful channel to express intentions and feelings that the characters or even the spectators could not possibly be articulated directly in situations of reality. The film's visual, sound, and narrative language explores the characters' interiors, their deepest motivations, and unexpressed thoughts. This occurs in various ways, through internal dialogues, monologues, meaningful silences, use of visual symbols, or even sound design and the soundtrack itself.

Through fantasies and elements of fiction, it is possible to treat realities and present, in a figurative and playful way, the possibilities of science and its developments, allowing the visualization and experience of cinematographic language. The purpose of cinema in education is to promote interpersonal interaction and the problematization of the reading of old/new codes, preparing to assimilate, understand, interpret, produce and reproduce knowledge. In the meantime, for the film to produce results, it is necessary to have a dialogue between cinema, literature and education and the comprehensive and complex social representations required in adult life. Regarding the use of cinema in educational institutions, Cipolini (2008, p. 47) emphasizes that:

[...] If we make a retrospective in relation to cinema-education, we can see that since its invention cinema has been pointed out as a source of research, and since then, much has been theorized and discussed about it. If at the beginning of the twentieth century the cinematographic theory debated whether the image expressed or reproduced reality, today we know that reality does not illustrate, nor reproduce reality, but (re)constructs it from its own language, produced in a certain historical context (Cipolini, 2008, p. 47).

Next, some images used in the promotion of the film were selected, such as a photo taken on the set and scenes from the film. In the first image, director Morelli and his son Pedro can be seen at the location of the recordings. In the second, a scene from the film, where the characters are all together in one of the moments of interaction and distraction. The third image reveals the scenes in which the characters open the letters and in a tense atmosphere with each other. In the fourth, a scene from the last moments of the end of the film is portrayed. Understanding the process of film production makes us understand that the transmission and production of knowledge are not exclusive roles of the school, but also

happen in cinema in films of various genres, such as drama, romance, adventure, comedy, science fiction, action, among others.

Frame 1 - Behind-the-scenes photo and scenes from the movie *Among Us*



Source: G1 Cinema, 2024.

The reasons for addressing this theme were academic, due to the need to deepen knowledge in culture and cinema and how both can be used in the classroom. As Alencar (2007, p. 137) points out, "[...] Cinema makes it possible for people to meet, expands each one's world, shows on the screen what is familiar and what is unknown, and stimulates learning." Thus, it is natural that "it sharpens perception, makes reasoning more agile to the extent that, in order to understand the content of a film, we need to concatenate all the resources of the filmic language" (p. 137). We defend Brazilian cinematography so that reflections and concatenations can be based on the understanding of our potentialities as an autonomous nation free of segregating ideologies.

FINAL CONSIDERATIONS

After the content analysis, it was possible to notice that cinema and school education can be related for didactic use or for the production of other knowledge and audiovisual products. By analyzing the comments related to the exhibited and commented work, the relevance of including cinema in school and university is confirmed so that students/spectators can problematize situations that they experience or fear to experience.



From this perspective, the cinematographic work, as well as the literary one, has the ability to reflect the real tip presented. Cinema, therefore, is a resource that can teach how to understand and interpret society, in addition to influencing the choices and habits of the individual and the collectivity. In this way, one of the comments about the work can be observed, which a young man says was very moved by the following phrases: "I only hope that when I look in the mirror, I will still recognize myself. Who will we meet? Will we have changed the world, or the world us?" This reflection is quite impactful, since it considers human formation.

Thus, the results obtained with the analysis of the film were the following: i) ability to expand the possibilities of discussions and knowledge of the importance of bringing cinema to the classroom, and ii) proposing, increasingly, cinema for the training of teachers in the public school system in Brazil and Latin America. The intention is to contribute to the formation of the population, which needs to detach itself from the influences of the global north, especially when it comes to the appreciation for Brazilian cinema.

The importance of this study brings reflection on the training of university students to work in basic education, with quality based on professionalism. In this way, one cannot refrain from having broad cultural and artistic experiences so that the mentality can change for the generations passing through the school.

It is at this moment of training that research must be carried out that really complements intellectual training and close and individualized contact with the advisor, who has in-depth knowledge of theories, important factors for quality training to work in basic education. Finally, when observing the relevance of researching the use of cinema in school and university, there is a lack of studies in the area of cinema, in which culture and the appropriation of symbolic goods of each country, including its cinematography, are first conditions with a civilizing human right.

REFERENCES

1. Alencar, S. E. P. (2007). *O cinema na sala de aula: uma aprendizagem dialógica da disciplina história* (Dissertação de Mestrado). Faculdade de Educação, Universidade Federal do Ceará, Fortaleza, CE.
2. Almeida, R. de. (2017). Cinema e educação: Fundamentos e perspectivas. *Educação em Revista*. Universidade Federal de São Paulo (FEUSP), São Paulo. Disponível em: <https://www.scielo.br/j/edur/a/kbqWpx6Vq6DszHrBT887CBk/abstract/?lang=pt#>. Acesso em: 2 maio 2022.
3. Amaral, J. J. F. (2007). *Como fazer uma pesquisa bibliográfica* (21 p.). Ceará: Universidade Federal do Ceará. Disponível em: <http://200.17.137.109:8081/xiscanoe/courses-1/mentoring/tutoring/Como%20fazer%20pesquisa%20bibliografica.pdf>. Acesso em: 2 maio 2022.
4. Aranha, M. L. de A. (2014). *História da Educação e da Pedagogia*. São Paulo, SP: Editora Moderna Ltda., p. 19-31.
5. Barbosa, D. J. de M. L. (2018). *Cinema no contexto escolar: por uma pedagogia da criação*. João Pessoa. Disponível em: https://repositorio.ufpb.br/jspui/handle/123456789/12455?locale=pt_BR. Acesso em: 3 jan. 2022.
6. Bogdan, R., & Biklen, S. (1994). *Investigação qualitativa em educação: uma introdução à teoria e aos métodos* (cap. 1 e 2, p. 48-52). Portugal: Porto Editora.
7. Brasil. (2017). *Base Nacional Curricular Comum (BNCC)*. Brasília, DF. Disponível em: <http://basenacionalcomum.mec.gov.br/abase>. Acesso em: 8 set. 2021.
8. Brasil. (2006). *Educação infantil: saberes e práticas da inclusão: dificuldades acentuadas de aprendizagem: deficiência múltipla*. Brasília: MEC, Secretaria de Educação Especial. Disponível em: <http://portal.mec.gov.br/seesp/arquivos/pdf/deficienciamultipla.pdf>. Acesso em: 27 out. 2024.
9. Brasil. (1996). Lei nº 9.394, de 20 de dezembro de 1996. Estabelece as diretrizes e bases da educação nacional. *Diário Oficial da União*, Brasília, DF, 23 dez. 1996. Disponível em: https://www.planalto.gov.br/ccivil_03/leis/l9394.htm. Acesso em: 27 out. 2024.
10. Brasil. (2014). Lei nº 13.006, de 26 de junho de 2014. Acrescenta o § 8º ao art. 26 da Lei nº 9.394, de 20 de dezembro de 1996, que estabelece as diretrizes e bases da educação nacional. *Diário Oficial da União*, Brasília, DF, 27 jun. 2014. Disponível em: https://www.planalto.gov.br/ccivil_03/ato2011-2014/2014/lei/l13006.htm. Acesso em: 27 out. 2024.
11. Carvalho, A. C. de S. (2017). *Importância da inserção de filmes e vídeos na prática docente no ensino fundamental I*. Disponível em: <https://www.ufjf.br/pedagogia/files/2017/12/Import%3%a2ncia-dalInser%3%a7%3%a3o-de-filmes-e-v%3%addeos-na-pr%3%a1tica-docente-no-EnsinoFundamental-I.pdf>. Acesso em: 15 jul. 2022.

12. Cipolini, A. (2008). *Não é fita, é fato: tensões entre instrumento e objeto – Um estudo sobre a utilização do cinema na educação* (Dissertação de mestrado). Faculdade de Educação, Universidade de São Paulo, São Paulo, SP.
13. Duarte, R. (2002). *Cinema & Educação*. Belo Horizonte: Autêntica.
14. Durkheim, É. (2011). *Educação e Sociologia* (p. 08-120). Petrópolis: Editora Vozes Ltda.
15. Foracchi, M. M. (1972). *A juventude na sociedade moderna*. São Paulo: Ed. da Universidade de São Paulo; Companhia Editora Nacional.
16. Foracchi, M. M. (1977). *O estudante e a transformação da sociedade brasileira* (2ª ed.). São Paulo: Companhia Editora Nacional. Série 2 – Ciências Sociais, v. 17.
17. G1 Cinema. (2013). Caio Blat lança 'Entre nós' e afirma que filme 'dá tapa na cara dos jovens'. *G1*, 30 out. Disponível em: <https://g1.globo.com>. Acesso em: 17 out. 2024.
18. Hall, S. (2016). *Cultura e representação* (Trad. Gislene Silva; Rev. técnica Liliane Prado). Rio de Janeiro: Apicuri.
19. Mohr, A., & Godoy, H. (Orgs.). (2017). *Prática como componente curricular: que novidade é esses 15 anos depois*. Florianópolis: NUP/CED/UFSC. Disponível em: http://www.licenciaturas.ufsc.br/files/2018/05/mohr-wielewicki_2017_orgs_pratica-como-comp-curricular.pdf. Acesso em: 10 set. 2021.
20. Napolitano, M. (2003). *Como usar o cinema na sala de aula*. São Paulo, SP: Editora Contexto.
21. Silva, K. R. da, Santos, F. G. P. dos, & Cunha, M. B. da. (2017). Ciência e cinema: Um olhar para as possibilidades no ensino de ciências. *Arquivos do MUDI*, 21(3), 109-119. Disponível em: <https://periodicos.uem.br/ojs/index.php/ArqMudi/article/view/40946>. Acesso em: 3 jan. 2022.
22. Weber, M. (1971). Tipos de Educação e Educação burocrática. *Guanicuns, Rev. Faculdade de Educação e Ciências Humanas de Anicuns Goiás*, 118-132.
23. Weisheimer, N. (2014). Marialice Foracchi e a formação da sociologia da juventude no Brasil. *BIB*, (77), 91-117.

REALIZATION:

SEVEN
publicações acadêmicas

ACCESS OUR CATALOGUE!



WWW.SEVENPUBLI.COM

CONNECTING THE **RESEARCHER** AND **SCIENCE** IN A SINGLE CLICK.