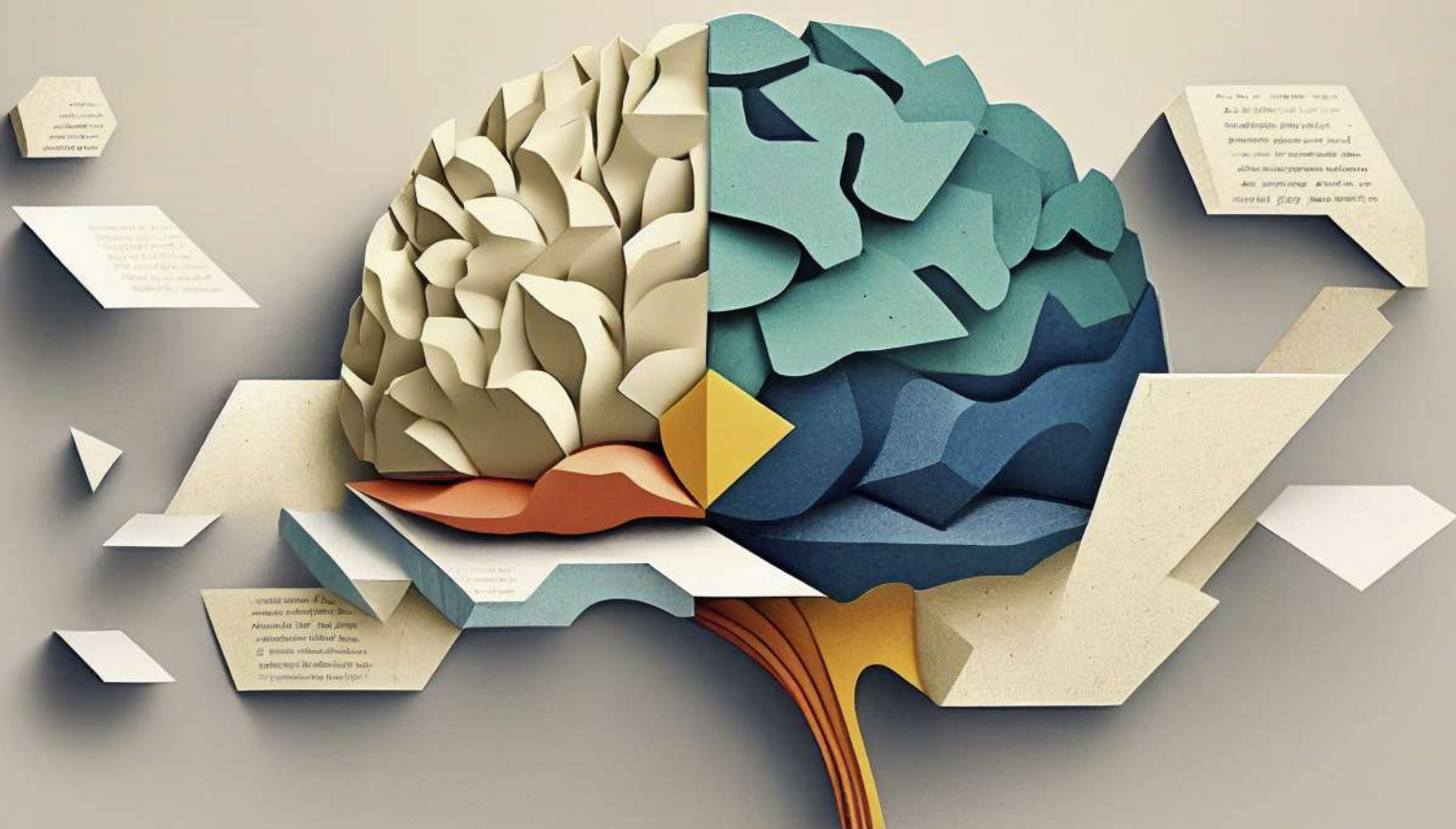


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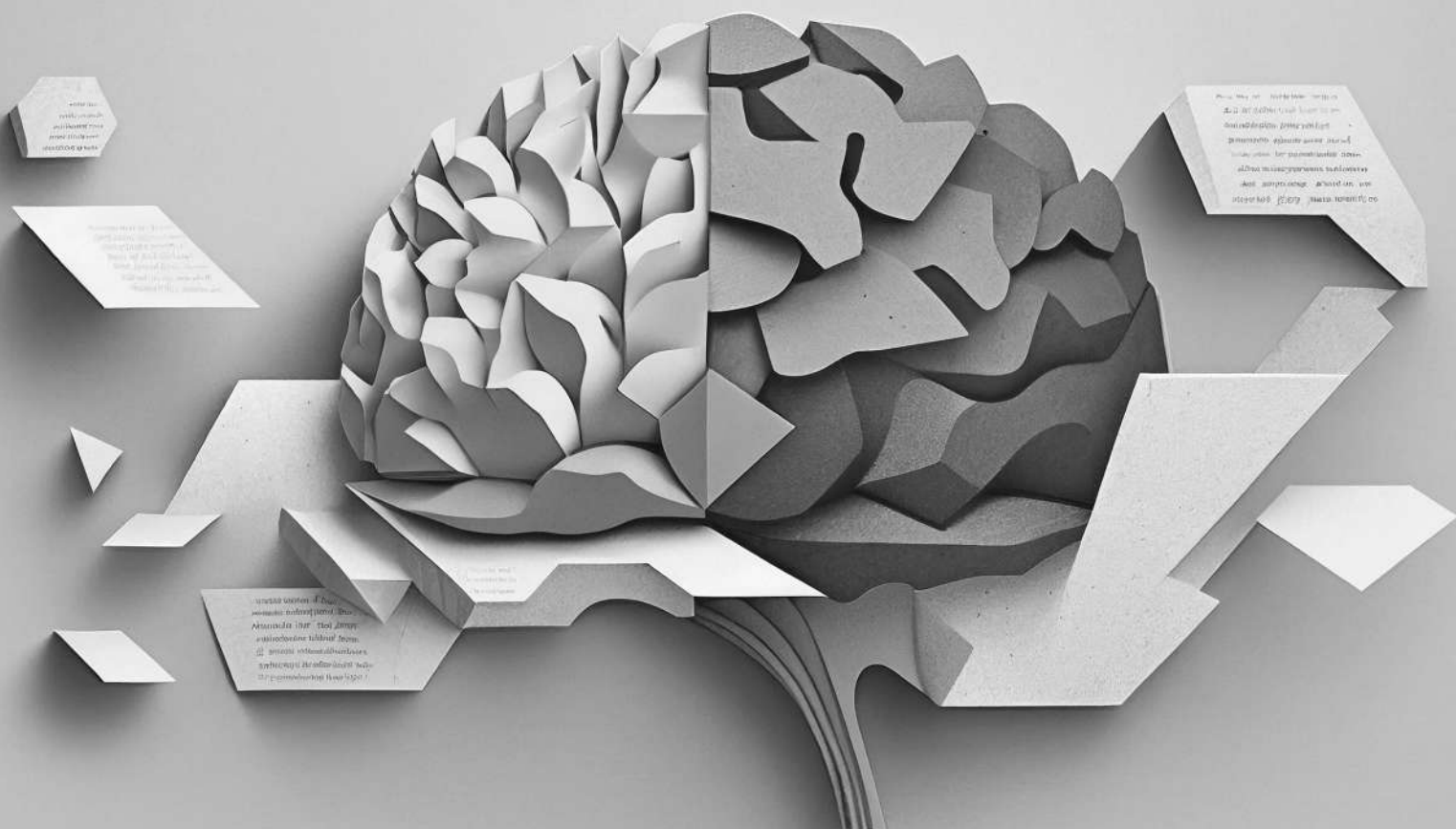


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Seven Editora.

Interconnections of Knowledge [electronic resource] :
Multidisciplinary Approaches / Seven Editora. – São José
dos Pinhais, PR: Seven Editora, 2024.

Electronic data (1 PDF).

Includes bibliography.

ISBN 978-65-6109-019-3

1. Development. 2. knowledge. 3. multidisciplinary. I.
Title.

CDU 001

Indexes for systematic catalogue:

1. CDU: Knowledge 001

Cataloguing at source: Bruna Heller (CRB10/2348)

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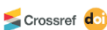
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  <https://doi.org/10.56238/sevened2024.010-020>

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 <https://doi.org/10.56238/sevened2024.010-071>

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Psychosocial impact of psoriasis: Beyond the skin

 <https://doi.org/10.56238/sevened2024.010-001>

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ABSTRACT

Introduction: Psoriasis is a chronic and recurrent dermatological condition characterized by the appearance of red, slightly raised plaques with silvery scales. These plaques feature a sharp edge that distinguishes the affected area from the surrounding normal skin. It is a chronic dermatological condition that can cause feelings of shame, dirt, and untouchability in sufferers, intensified by the fear of isolation and rejection. The relationship between the nervous and immune systems is intertwined, where emotional stress can affect the skin and dermatological conditions can influence the emotional state of the individual. **Objective:** To explore the psychosocial impact of psoriasis, analyzing its implications for patients' quality of life and well-being, promoting a better understanding and empathetic approach to those living with the condition. **Methodology:** The study is classified as basic and theoretical research. The literature review was carried out in the search engines Google Scholar, Scopus and Web of Science, using descriptors such as "psoriasis", "emotional health", "psychological impact" and "quality of life". **Discussion and Results:** The etiology of psoriasis involves complex interactions between the immune system, environmental factors, and genetic predisposition. Studies indicate that dermatological lesions arise due to the release of inflammatory substances, leading to the formation of erythematous-desquamative lesions. Psoriasis is associated with increased cortisol production in response to chronic stress, negatively impacting overall health. The World Health Organization (WHO) recognizes the psychosocial challenges faced by patients, including social stigma and prejudice. Cognitive behavioral therapy is suggested as an effective tool to help patients manage the condition. Additionally, immunobiologicals represent an innovative therapeutic approach for severe or moderate psoriasis, requiring close monitoring due to potential side effects. **Final Considerations:** Currently, psoriasis has no definitive cure and can manifest itself unexpectedly, causing discomfort. Treatment may involve medications, injections, topical ointments, and dietary changes. However, for many, the skin condition can persist, leading to frustration. Despite being identified as a dysfunction of the immune system, there are still many uncertainties about this disease.

Keywords: Psoriasis, Emotional health, Psychological impact, Immune system, Chronic stress.

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INTRODUCTION

The skin, with its intricate tapestry of sensations and meanings, goes far beyond being just a protective shell of the human body. It is the stage where the most intimate narratives of our existence unfold, a mirror that reflects not only our physical health, but also the emotional and psychosocial contours that shape our identity. In this constant interaction with the world around us, the skin reveals itself as a sensitive screen, capturing the nuances of our emotions and the marks of our interactions. However, when this screen is tainted by diseases such as psoriasis, it can turn into a minefield of vulnerabilities, triggering a whirlwind of feelings ranging from shame and isolation to a desperate search for acceptance and understanding.

The skin, in addition to being the largest organ in the human body and performing vital functions such as protection and thermal regulation, also plays an important role in our self-image. It is a visible expression of our health, emotions, and interactions with the world around us. For many, skin is an essential part of identity, reflecting not only physical health but also emotional and psychosocial aspects.

For those living with psoriasis, a chronic dermatological condition, this relationship with the skin can be even more complex and painful. Psoriasis sufferers often report feelings of shame, dirt, and untouchability, feelings that are intensified by the fear of being isolated and rejected. Suspicion of abandonment and a feeling of exclusion are common, leading to a profound experience of devaluation and inadequacy (Paraiso *et al.*, 2021).

This is a two-way street, as the nervous system and the immune system are intrinsically intertwined. Emotional stress can trigger a number of biochemical reactions in the body that affect the skin, while dermatological conditions can influence an individual's emotional and psychological state (Cruvinel; Saturnino, 2023).

The complexity of the relationship between the skin and the human being transcends the mere surface, penetrating the deep domains of neuroscience and immunology. In this multifaceted scenario, the understanding and care of psoriasis emerges as ethical and clinical imperatives.

In this scenario, the repercussion of this theme emerges as an area of growing urgency, since according to the Brazilian Society of Dermatology, the number of Brazilians diagnosed with the disease is in the range of five million (Infinity Pharma, 2020).

A study conducted in Brazil by Janssen in 2023 revealed that the effects of psoriasis go beyond visible skin manifestations, significantly impacting patients' quality of life. The most relevant findings were: approximately 70% of patients reported facing emotional imbalances, including anxiety in 39.7% of cases and depression in 27.1%; 42% of participants were unemployed at the time of the survey; 60% did not engage in regular physical activity, adopting a predominantly sedentary lifestyle; and 37.1% of participants were obese, with 36.4% being overweight. Emotional imbalance,

financial difficulties resulting from unemployment, and a sedentary lifestyle are all factors that can intensify the symptoms of psoriasis. Stress and poor diet can trigger or aggravate flare-ups, exacerbating the inflammation and skin irritation characteristic of the disease (Johnson & Johnson Innovative Medicine, 2023).

Data from the Brazilian Society of Dermatology (2020) indicate that the prevalence of psoriasis in Brazil is 1.31%, being slightly higher in men (1.47%) than in women (1.15%). The prevalence of the disease increases significantly with age: 0.58% in people under 30 years of age, 1.39% between 30 and 60 years of age, and 2.29% in individuals over 60 years of age. The regions of the country also show variations in the prevalence of psoriasis, with higher rates in the South and Southeast regions compared to the Midwest, North and Northeast. In addition, 73.4% of Brazilian patients with moderate to severe psoriasis report impaired health-related quality of life.

Thus, it is imperative that the medical community, health professionals, and society in general recognize and understand the emotional and psychological contours of this condition, seeking more humanized and integrated approaches to care.

Throughout this article, we will explore the psychosocial impact of psoriasis, analyzing its nuances, challenges, and implications for patients' quality of life and well-being. Through this journey, we aim to shed light on the often invisible complexities of this disease, fostering a deeper understanding and a more empathetic approach towards those living with psoriasis.

METHODOLOGY

Considering the directions of Paiva (2019), the present study is categorized as a basic and theoretical research, which seeks to expand scientific knowledge about the relationship between psoriasis and emotional health. This is an exploratory research of a qualitative nature, which is based on concepts and information extracted from the scientific literature.

This work involves a critical and synthetic review of information from relevant published studies on the interaction between psoriasis and emotional well-being. The approach adopted aims to synthesize existing knowledge and provide substantial conclusions about the emotional impacts of psoriasis, as highlighted by Mancini and Sampaio (2007).

To carry out this literature review, strategies were employed, using academic and scientific electronic platforms. Specific terms were used in the search, delimiting the parameters that guided the careful selection of studies and the comprehensive understanding of the existing panorama on the subject. Thus, the search engines Google Scholar, Scopus and Web of Science were explored for the selection of articles, using pertinent descriptors such as "psoriasis", "emotional health", "psychological impact" and "quality of life".

To elucidate complex issues present in the text, we used specific searches on the Google search engine. This method provided access to new sources of knowledge, following an approach based on scientific and epistemological principles. As emphasized by Rozeira et al. (2023), this methodology unveils the beauty of unpredictability, the wit of complexity, and the truth in the journey of discovery. Each new concept unveiled represents a unique piece in the relentless search for discernment. In summary, the assimilation of new concepts proved to be essential to strengthen the structure of this scientific study.

PATHOPHYSIOLOGY

Psoriasis is a chronic inflammatory dermatosis of the skin, characterized by the rapid and intense proliferation of epidermal cells, leading to the formation of erythematous-scaly lesions. Psoriasis lesions consist of overlapping scales, resembling pieces of mica, with a reddish hue. These scales can be easily removed by shaving the affected area. They can vary in size from small spots (guttate) to larger, coin-shaped lesions (nummules), and sometimes group together to form circular figures. Some lesions may lighten in the center, while remaining active at the edges, creating an arching pattern (gyrata) (Guimarães *et al.*, 2023).

Understanding the different types of psoriasis and their symptoms is essential for proper diagnosis and treatment. In this context, Table 01 aims to present the main types of psoriasis and their distinct characteristics.

Lesions appear as fissures on the palms of the hands and soles of the feet.

Type of Psoriasis	Description
Vulgar Psoriasis	Lesions of varying sizes, delimited and reddish, with dry, adherent, silvery or grayish scales that appear on the scalp, knees and elbows.
Inverted Psoriasis	Wetter lesions, located in areas of folds such as the scalp, knees and elbows.
Guttate psoriasis	Small localized lesions, in the form of drops, associated with infectious processes. They often appear on the trunk, arms and thighs (very close to the shoulders and hips) and occur more frequently in children and young adults.
Erythrodermic Psoriasis	Generalized lesions on 75% or more of the body.
Nail Psoriasis	Pinpoint depressions or yellowish spots appear mainly on the fingernails.
Arthropic Psoriasis	Associated with joint involvement in around 8% of cases. It appears suddenly with pain in the tips of the fingers and toes or in large joints such as the knee.
pustular psoriasis	Lesions with pus on the feet and hands (localized form) or spread across the body.
Palmoplantar psoriasis	The lesions appear as fissures on the palms of the hands and soles of the feet.

Source: Virtual Health Library of the Ministry of Health (BRASIL, 2016)

This non-contagious condition of unknown origin is widely recognized for its various forms of presentation, with the plaque form being the most prevalent, accounting for approximately 90% of cases (Silveira *et al.*, 2017). Visible lesions in various regions of the body can have a significant

impact on patients' lives, limiting their daily activities due to shame, insecurity, and frustration with their own bodies (Šmejkalová *et al.*, 2020; García-Sánchez *et al.*, 2017).

Although lesions are most commonly found on areas such as elbows, knees, and scalp, they can also arise in skin folds, palms, soles of the feet, and fingernails, or present in the form of pus-filled blisters. In addition to cutaneous manifestations, some individuals may develop complications that affect beyond the skin, such as psoriatic arthritis, intestinal changes alternating between constipation and diarrhea, and cardiovascular diseases (Infinity Pharma, 2020). When the disease spreads throughout the body, it is called the enteric form. There are more complex variants, such as arthropathic psoriasis, which affects the joints, and erythrodermic psoriasis (Guimarães *et al.*, 2023).

It is known that psoriasis affects both sexes and can occur in all age groups, however studies indicate the average age of onset of the disease at around 33 years, with 75% of cases manifesting before the age of 46 years (World Health Organization (WHO), 2016). In addition, there is evidence of a bimodal onset of the disease, with peaks observed between 16 and 22 years of age and between 57 and 60 years of age (Paraiso *et al.*, 2021).

According to Shinjita (2023), psoriasis is a chronic dermatological condition characterized by an abnormal increase in skin cell production, resulting in the formation of red plaques with silvery scales on the skin. The author notes that although the exact cause of this rapid cell growth is still unknown, disorders in the immune system and genetic predisposition are considered important factors. The condition can be triggered or exacerbated by a variety of factors, including minor skin lesions, sun exposure and sunburn, infections such as HIV and streptococcal, certain medications, emotional stress, alcohol consumption, smoking, and obesity.

As far as the interaction between the immune system and the central nervous system (CNS) is concerned, they are interconnected, responding mutually. The CNS captures stimuli and forwards them via nerves or blood circulation to lymphocytes, initiating the immune response. In response to frequent and intense stimuli of stress and anxiety, the immune system is activated, causing T lymphocytes to migrate to the epidermis, releasing pro-inflammatory cytokines, resulting in skin lesions (Paraiso *et al.*, 2021).

Cortisol production increases in the face of chronic stress, negatively impacting overall health. It is crucial to address the emotional changes that come with chronic stress, such as anxiety, apathy, and depression. The assistance of specialized professionals, including psychologists, can be vital in addressing these challenges and avoiding negative consequences for emotional well-being and health (Paraiso *et al.*, 2021).

It is obvious that the skin reacts to emotional stress in an active way, involving immune cells, hormones and neurotransmitters. These cells regulate inflammation in the skin, exerting pro- and anti-inflammatory effects. Cutaneous responses to stress include the release of cytokines such as

interleukin-6 (IL-6), interleukin-1 (IL-1), and interferon-gamma (IL- γ), as well as the activation of hormones such as peripheral skin corticotropin-releasing hormone (CRH), proopiomelanocortin-derived adrenocorticotrophic hormone (ACTH), and others (Guimarães *et al.*, 2023).

The nervous system also plays a role in the pathogenesis of psoriasis by influencing the immune response through inflammatory mediators. Immune cells express receptors for neurotransmitters and hormones, allowing neurochemical modulation of the immune response. In addition, cytokines released during stress can activate adjacent nerves or access the Central Nervous System (CNS) through blood circulation (Guimarães *et al.*, 2023).

It is important to highlight that cutaneous stressors, such as ultraviolet radiation, can stimulate components of the HPA (hypothalamic-pituitary-adrenal) axis of the skin and other active neuropeptides. These neuropeptides can influence brain areas involved in skin-brain communication (Guimarães *et al.*, 2023).

Changes in the HPA axis and sympathetic-adrenal-spinal dysfunctions show differences between psoriasis patients and healthy individuals in response to stress. Psoriatic disorders can result in isolation and the development of depressive disorders. Psoriatic skin biopsies reveal increased expression of CRH, a central component in the brain-skin axis (Guimarães *et al.*, 2023).

The worsening of psoriatic lesions is related to increased production of inflammatory mediators, potentially contributing to neurotransmitter imbalance and depressive and anxious symptoms. Thus, inadequate regulation of stress signaling pathways can influence the clinical manifestation of psoriasis, requiring multidisciplinary approaches (Marek-Jozefowicz *et al.*, 2022; Guimarães *et al.*, 2023).

Psoriatic lesions, especially in the hands and feet, are challenging to treat. The presence of pruritus may be an indicator of resistance to treatment. Systemic inflammation and circadian rhythm dysregulation can contribute to peripheral nervous system failures (Marek-Jozefowicz *et al.*, 2022).

The precise etiology of psoriasis still remains a mystery, but it is recognized that the disease is multifactorial, involving complex interactions between the immune system, environmental factors, and genetic predisposition. Studies indicate that dermatological lesions may arise due to the release of inflammatory substances by T lymphocytes, leading to the dilation of skin blood vessels and neutrophil infiltration, resulting in an accelerated production of scales due to the immaturity of skin cells (Machado *et al.*, 2019).

There are a number of extrinsic factors that can trigger or aggravate psoriasis lesions, including cold weather conditions, infections, and stress. In addition, there are several comorbidities associated with disease severity, such as alcoholism, depression, obesity, diabetes mellitus, hypertension, plurimetabolic syndrome, colitis, and rheumatoid arthritis. These factors contribute to a



significant impact on patients' quality of life, affecting psychosocial aspects, daily activities, and interpersonal relationships (Moscardi *et al.*, 2017).

The clinical manifestations of psoriasis are varied and may include the vulgaris form, characterized by dry, erythematous plaques and whitish desquamation; nail psoriasis, which affects the fingernails and toenails; scalp psoriasis, with reddish areas and thick, silvery-white scales; guttate psoriasis, often triggered by bacterial infections such as tonsillitis; and arthropathic psoriasis, which in addition to cutaneous manifestations, can lead to severe psoriatic arthritis with joint pain (Mendes, 2019).

Currently, there is no definitive cure for psoriasis, and treatment is primarily aimed at controlling and reducing the severity of symptoms. Therapeutic options include the use of glucocorticoids, administered both orally and topically, and phototherapies. However, it is important to note that drug treatment is not always effective in controlling symptoms and can result in a significant deterioration in patients' quality of life (Paraiso *et al.*, 2021).

According to Gonçalves (2023), psoriasis is characterized by an alteration in skin cells, being a complex immune-mediated condition. In this context, immune cells play a central role in a problem that affects the entire body. The author states that the body's defense cells induce the dilation of blood vessels, and inflammatory substances, along with other immune cells such as neutrophils and macrophages, migrate to the skin, intensifying the disease. This inflammatory sequence is often interrupted by treatment, highlighting the importance of classifying the patient according to the degree of severity of psoriasis as an initial step in the management of the disease.

Between 5 to 30 percent of people with psoriasis develop psoriatic arthritis, a condition that causes pain and swelling in the joints. Psoriasis can present with sudden exacerbations, often triggered by skin irritations such as mild lesions and severe sunburn, as well as infections such as colds and strep throat. These worsenings are frequent during the winter, after alcohol consumption and in stressful situations. Medications such as antimalarials, lithium, angiotensin-converting enzyme (ACE) inhibitors, terbinafine, interferon alpha, beta-blockers, and tumor necrosis factor inhibitors can also trigger psoriasis flare-ups. Additionally, exacerbations are more prevalent in obese individuals, HIV carriers, or smokers (PorShinjita, 2023).

Medical advances have provided new perspectives in the treatment of psoriasis, focusing on reducing the severity of the lesions and, in some cases, almost completely resolving the disease. In Brazil, a new drug called ixekizumab was recently approved and promises to significantly improve patients' quality of life. However, it is a high-cost treatment, administered by monthly injection and indicated for more severe cases and patients who have not responded to conventional treatment (National Commission for the Incorporation of Technologies in SUS (CONITEC, 2020)).

The complexity of psoriasis is still a mystery in many ways, as it manifests itself in cycles of symptoms that alternate between periods of exacerbation and remission, with its causes still partially unknown. This dermatological condition has a genetic predisposition and is triggered by external stimuli, rather than a single isolated factor.

Psoriasis treatment is personalized, taking into account the clinical, severity, and extent of the disease. Therapeutic options range from topical medications and phototherapy to systemic medications, including both traditional and immunobiological approaches.

Although science does not yet predict a cure, there are numerous treatment possibilities and Coping Strategies, such as (Folha de Londrina, 2023):

1. **Topical Medications:** These are applied directly to the skin and include creams, ointments, lotions, and shampoos. Products such as corticosteroids, vitamin D analogues, and vitamin A analogues help reduce inflammation and peeling of the skin, relieving the symptoms of psoriasis.
2. **Light Therapies (Phototherapy):** Use ultraviolet light to treat psoriasis. Controlled exposure to light can reduce inflammation and peeling of the skin. Therapies such as narrowband UVB and PUVA are examples of available treatments.
3. **Oral or Injectable Medications:** In more severe cases or when other treatments are not effective, medications such as immunosuppressants, retinoids, cytokine inhibitors, and biological agents are used. These help control inflammation and peeling of the skin.
4. **Psychological Support:** Psychology professionals can help patients cope with emotional and psychological issues such as anxiety, depression, and stress, as well as develop strategies to improve quality of life.
5. **Support Groups:** These are safe spaces where patients can share experiences, gain information, and receive emotional support from people facing similar situations.
6. **Healthy Lifestyle:** Adopting healthy habits can help reduce symptoms and improve quality of life. This includes maintaining a balanced diet, exercising regularly, avoiding alcohol and tobacco, managing stress, and maintaining a proper sleep routine.

For Shinjita (2023), systemic treatments for psoriasis derive from medications that act on the entire body or specific systems. They can be administered orally or by injection. Systemic immunosuppressants, such as cyclosporine, mycophenolate mofetil, and methotrexate, suppress the immune system to control psoriasis, but they can compromise the body's ability to fight infections and cause side effects such as hypertension, gastrointestinal problems, bone marrow suppression, and liver damage. Biologic agents, such as etanercept, adalimumab, and infliximab, inhibit immune system chemicals and are given by injection, except for tofacitinib, which is oral. They are effective for severe psoriasis, but can have significant side effects. Biosimilar drugs are also available as



alternatives. For moderate to severe forms of psoriasis and psoriatic arthritis, systemic retinoids such as acitretin and isotretinoin can be used, but they carry risks of serious birth defects and other adverse effects, including changes in triglyceride levels and liver, blood, bone, and capillary problems. Apremilaste is another oral option with more common side effects like nausea and diarrhea.

Patients with psoriasis often face significant challenges in their quality of life, affecting their daily activities, which can limit or even prevent them. It is important to note that the psychological and emotional impact of psoriasis is not necessarily linked to the severity or extent of the disease (Guerreiro, 2018; Scaccabarozzi, 2016).

HEALTH IMPACTS

Brazil recognizes the importance of psoriasis as a chronic and disabling disease, in line with the guidelines established by the World Health Organization (WHO) in 2014. This condition is non-communicable and is characterized by being painful, disfiguring, and currently without a definitive cure. The WHO highlights that the challenges faced by patients go beyond physical symptoms, including social stigma and prejudice, which can aggravate mental health problems (Dantas; Carmo, 2023).

The stigmatization associated with psoriasis often leads affected individuals to avoid social interactions, fearing reactions of rejection or ridicule (Dantas; Carmo, 2023).

In addition, psoriasis has a psychodermatological nature, and is often associated with mental disorders such as anxiety and depression, which can intensify the symptoms of the disease. This vicious cycle of social isolation, triggered by stigma, can result in a deterioration of mental health, further exacerbating the symptoms of psoriasis (Dantas; Carmo, 2023).

The implications of psoriasis go beyond skin manifestations, extending to the emotional, social, and personal spheres of patients. The disease can be the origin of negative feelings, such as fear and frustration, requiring a biopsychosocial and multidisciplinary approach to promote the readaptation and reorganization of daily activities and ensure the integrity of the quality of life of affected individuals (Guerreiro *et al.*, 2018; Silva; Faro, 2019).

Psoriasis is closely linked to emotional aspects and can act as a triggering or aggravating factor of the disease. Steiner and Perfeito (2003) point out that physical or emotional stress can influence several dermatological conditions, and is also a stress generator. For dermatologists, it is important to recognize this connection, which is present in many skin diseases, and to evaluate the interaction between emotions, conflicts, and stress in each patient (Silva; Silva, 2007).

According to Lipp (2003), psoriasis and stress are intertwined in several ways. Stressful situations can trigger or aggravate psoriasis lesions, while the lesions themselves can be sources of



emotional stress. The individual perception of stressful events is influenced by each person's subjectivity, which can affect the progression of the disease.

Scientific and practical evidence indicates that modern life, despite offering many features and benefits, also presents significant sources of stress that can negatively impact the well-being and health of the population. In this setting, cognitive-behavioral psychotherapy can be an effective tool to help psoriasis patients better manage their clinical condition. However, in order to adequately address stress, it is essential to understand this response of the body (Silva; Silva, 2007).

Psychological stress arises when a person feels that the demands of the environment are greater than their ability to adapt. In studies on psychological stress, the focus is on environmental events considered excessive for the individual's ability to cope, or on their reactions to these events, such as the perception of stress and resulting negative feelings (Cohen *et al.*, 2007).

When subjected to excessive stress, the body faces progressive wear and tear. This prolonged strain can directly influence the onset of diseases and aggravate already existing conditions. Constant interaction with stressors can lead to a state of imbalance, where the body's ability to recover and maintain homeostasis is compromised (Silva; Silva, 2007).

The stress response involves a number of mechanisms that operate at different levels of the body. This response is triggered by psychophysiological changes that occur when individuals are exposed to situations that can cause irritation, fear, confusion, or feelings of happiness. This reaction to stress can manifest itself in a variety of ways, including physical, emotional, and behavioral symptoms (Silva; Silva, 2007).

According to Silva and Silva (2007), in terms of progression, stress can be categorized into several distinct phases. The initial phase is characterized by a state of alertness, where the body immediately reacts to the stressor, showing signs such as increased heart rate, sweating, and muscle tension. As the stressor persists or intensifies, the body enters a resistance phase, where it tries to restore internal balance by utilizing its adaptive reserves. At this stage, symptoms such as memory difficulties, irritability, and excessive fatigue may appear.

However, if exposure to the stressor continues, the body may enter a near-exhaustion phase. At this stage, the body's defenses begin to weaken, leading to oscillations between periods of well-being and moments of discomfort, anxiety, and irritation. This state of vulnerability can intensify the emergence of diseases or aggravate pre-existing conditions (Silva; Silva, 2007).

Finally, the exhaustion phase is reached when the body can no longer maintain a proper balance in the face of persistent and intense stressors. At this advanced stage, physical and emotional symptoms worsen significantly, manifesting as loss of sense of humor, changes in appetite, apathy, depression, and physical exhaustion. This phase highlights the importance of integrated,



multidisciplinary approaches to effectively manage stress and minimize its negative impacts on the individual's overall health and well-being (Silva; Silva, 2007).

Studies have explored the complexity of this condition, seeking to understand the multiple influences that can contribute to its manifestation and progression. Emotional stress, smoking, alcohol consumption, family history, and hormonal changes are just some of the aspects that have been investigated in relation to psoriasis. A cross-sectional study conducted by Xhaja et al. (2014) provided valuable insights into the interaction between these factors and the severity of psoriasis (Exhibit 02). The research covers a wide range of aspects, from the relationship between stress and psoriasis to the impact of the disease on patients' quality of life.

More than 40% of patients felt that psoriasis negatively impacted their quality of life, reflecting the psychosocial challenges associated with the disease. – Influences and Factors Associated with Psoriasis

Influences and Factors	Results
Stress	More than 70% of patients reported that stressful events increased the severity of their psoriasis, indicating a relationship between emotional stress and skin condition.
Smoking	About 60% of men and 20% of women were smokers, suggesting that smoking may be a risk or aggravating factor for psoriasis.
Medicines	Approximately 20% of patients were being treated with one or more of the medications listed in the questionnaire, without a significant association with psoriasis.
Recurrent Infections	About 20% of patients reported recurrent infections, which can influence the severity or recurrence of psoriasis
Alcohol consumption	Approximately 80% of men consumed alcohol, which may have implications for psoriasis, although the exact relationship is not specified
Family history	More than 40% of patients had a relative with psoriasis, suggesting a genetic predisposition to the disease.
Allergies	Only a few patients reported allergies, with no significant association with psoriasis.
Hormonal Changes	About 36% of women indicated that hormonal changes, such as puberty and menopause, exacerbated their psoriasis, highlighting the role of hormones in the condition.
Quality of life	More than 40% of patients felt that psoriasis negatively impacted their quality of life, reflecting the psychosocial challenges associated with the disease.

Source: Xhaja et al. (2014)

In another study conducted by Picardi *et al.* (2005), cited by Porpeta *et al.* (2023), the relationship between stressful events, attachment styles, alexithymia, and perceived social support in patients with psoriasis was investigated. Using methods such as the Paykel Interview for Recent Life Events, the Experiences in Close Relationships questionnaire, the Toronto Alexithymia Scale, and the Multidimensional Scale of Perceived Social Support, the researchers assessed these aspects in comparison to a control group. The results revealed that patients with psoriasis had lower perceived social support, greater attachment-related avoidance, and a higher probability of alexithymia compared to the control group. In addition, the study suggests that alexithymia and poor social support may increase susceptibility to psoriasis exacerbations, possibly due to impaired emotional regulation. This finding underscores the importance of considering psychosocial and emotional factors in the management of psoriasis, indicating that aspects such as social support, attachment

style, and alexithymia may play significant roles in the manifestation and progression of the disease (Porpeta *et al*, 2023).

The study conducted by López-Estebanz, Sánchez-Carazo and Sulleiro (2016) indicated that the presence of a family history of psoriasis is correlated with a decrease in patients' quality of life, even when the severity of the condition is considered. Although family history did not significantly influence the prevalence of concomitant diseases, its impact was more evident among younger patients. In addition, it has been observed that older patients tend to have a higher number of comorbidities compared to younger patients. This study emphasizes the need to take into account family elements and patients' age when assessing the effects of psoriasis on comorbidities and quality of life. Recognizing these relationships can be key to developing therapeutic approaches and interventions focused on improving the well-being and quality of life of individuals affected by psoriasis (Porpeta *et al*, 2023).

In another study, the impact of stressful life events on the occurrence or worsening of psoriasis and chronic urticaria in patients was investigated. The Gurmeet Singh Presumed Stressful Events Scale was used to assess the stressors experienced by the participants in the year prior to the onset or worsening of dermatological conditions. In the group of patients with psoriasis vulgaris, 26% reported stressful events, the most frequent being financial problems (8%), followed by the death of a close family member (4%), sexual problems and family conflicts (both with 4%), among other events listed, each with 2% of occurrence. In the group with chronic urticaria, 16% of the patients identified stressful events, with the death of a family member being the most common (6%), followed by family conflicts, financial and sexual problems, each with 2% of mentions. These results highlight the influence of psychological stress on the emergence or exacerbation of chronic dermatological conditions. The study suggests that relaxation therapies and stress management programs may play a crucial role in managing these diseases. Psychological interventions can empower patients to reassess and cope more effectively with stressful events, potentially reducing the morbidity associated with psoriasis and chronic urticaria (Malhotra; Mehta, 2008; Porpeta *et al.*, 2023).

Based on the reviewed research, it is observed that the origin of psoriasis is linked to a combination of factors, including the patient's autoimmune behavior and genetic predisposition. Additionally, stress plays a significant role in the manifestation of the disease, as reported by patients. Due to the chronic nature of the condition and the associated psychosocial implications, patients face challenges related to personal acceptance and satisfaction, often facing discrimination and prejudice, as mentioned by Cruvinel and Saturnino (2023).

Psoriasis is often associated with an increased risk of anxiety and depression. The constant worry about the disease, the impact on social interactions, and the feeling of isolation can contribute

to the emergence of these disorders. Psychological assistance, whether through individual or group therapy, can be beneficial in managing psoriasis-related anxiety and depression (Remröd *et al.*, 2015).

Romiti *et al.* (2018) sought to assess the clinical severity of plaque psoriasis in the Brazilian population and investigate possible associations with demographic characteristics, lifestyle, health-related quality of life (HRQoL), and work productivity. Using the Psoriasis Area and Severity Index (PASI), Body Surface Area (BSA) and the Dermatology Quality of Life Index (DLQI), it was found that, of the 1125 patients evaluated, 205 (18.2%) had moderate to severe psoriasis. Regression analyses showed that the severity of psoriasis was directly associated with physical inactivity, pain, anxiety, and depression as comorbidities. In addition, there was an inverse association with HRQoL and work productivity. It is noteworthy that cross-sectional studies do not make it possible to assess temporal trends, and observational studies do not establish definitive causality or eliminate possible biases and confounders associated with variables not evaluated (Porpeta *et al.*, 2023; Paraíso *et al.*, 2021).

Psychological factors, such as stress or emotional distress, are often pointed out as triggers or aggravators of psoriasis. These psychological traits can influence perception, interpretation, and ability to cope with stressful situations. In a study conducted by Remröd *et al.* (2015), stress reactivity in patients with psoriasis was investigated. The research aimed to determine whether patients who associate psychological distress with worsening of the disease, called "stress reactors" (SRs), differ psychologically from "non-stress reactors" (NSRs). Of the participants, 64 (63%) identified stress as a trigger for psoriasis exacerbation (SRs). These had significantly higher scores in anxiety, both state and trait, depression, and in five personality traits assessed by the SSP: somatic anxiety, psychic anxiety, susceptibility to stress, lack of assertiveness, and distrust, compared to the NSRs. The perception of stress as a causal element in psoriasis may be related to a more fragile psychological constitution. These findings suggest a valuable opportunity for health professionals to identify and offer additional psychological support to vulnerable patients (Porpeta *et al.*, 2023).

According to Silva (2003), studies indicate that psoriasis can trigger feelings of rejection and stigmatization, affecting patients' daily lives. These feelings can interfere with social adaptation, leading to challenges in the work environment and in social situations such as trips to hairdressers and clubs, as well as influencing the way the patient dresses. The visibility of the lesions and the changes in physical appearance can generate intense feelings of irritation and anguish, making the individual more susceptible to stress.

The patient's ability to adapt, or coping skills, is elementary to deal with the challenges imposed by the disease. Developing effective strategies for managing symptoms can help improve patients' quality of life and emotional well-being.



FINAL THOUGHTS

The complex relationship between emotions and dermatological health reveals the interconnection between the nervous system and the skin, two systems that share a common embryonic origin. The physical manifestation of our emotions, often described by popular expressions such as "nerves on edge" or "purple with rage", has a biological basis that connects stress hormones to skin receptors.

Psoriasis, an autoimmune disease that causes inflammation and peeling of the skin, exemplifies this intricate relationship. The dysregulated immune component in psoriasis is similar to that seen in psychiatric conditions such as depression, indicating a possible connection between these diseases. In addition, situations of heightened emotional stress, such as abuse, violence, or significant loss, can exacerbate dermatological events, reflecting the direct impact of emotions on skin health.

The advent of immunobiologics represents hope for patients with severe or moderate psoriasis, offering an innovative therapeutic approach that aims to modulate the defective immune response. However, close medical follow-up is important to monitor and manage the potential side effects associated with these medications.

Psoriasis affects a large proportion of patients unsatisfactorily, despite the variety of treatments available. Between 31-70% of patients are not satisfied with existing therapies, highlighting the need for new therapeutic approaches. Currently, treatments are often prescribed without the aid of biomarkers predictors of response, which can result in significant financial and time costs in cases of treatment failure (Brazilian Consensus on Psoriasis, 2020).

Advances in genetics have shown promise in identifying novel therapeutic targets, focusing on specific signaling pathways such as Th1 and Th17, as well as the role of microRNAs in modulating inflammation. These findings suggest the potential of nutrigenomic approaches and new biotechnologies for the treatment of psoriasis (Brazilian Consensus on Psoriasis, 2020).

Several studies are underway to investigate drugs with novel mechanisms, including adenosine A3 receptor agonists, cathepsin inhibitors, and agents that target specific pathways such as STAT3 and retinoic acid receptor. In addition, current research also focuses on improving existing mechanisms, such as PDE4 inhibitors and janus kinases (JAK), with more than 18 drugs under investigation (Brazilian Consensus on Psoriasis, 2020).

In the Brazilian context, the introduction of new drugs, such as JAK inhibitors, tildraquizumab and brodalumab, with different efficacy and safety profiles, is expected. Meanwhile, topical modalities for mild psoriasis are being investigated, including innovative formulations such as cyclosporine and methotrexate microemulsions in gold nanoparticles (Brazilian Psoriasis Consensus, 2020).



In summary, despite significant advances in the treatment of psoriasis, there is still an urgent need to develop more effective, safer, and affordable therapies, as well as predictive biomarkers of response. Continued research and investment in new therapeutic approaches are crucial to improving the management of this complex and multifaceted dermatological condition.

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Profile of hemodialysis patients in the Brusque Region, State of Santa Catarina (SC), Brazil

 <https://doi.org/10.56238/sevened2024.010-002>

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ABSTRACT

Introduction: Chronic Kidney Disease (CKD) is a multifactorial pathology. Depending on its severity, the treatment consists of dialysis, with hemodialysis being the most widely used method in Brazil. The objective of this study was to develop a profile of hemodialysis patients in the region of Brusque, Santa Catarina State, Brazil, addressing aspects of general and socioeconomic data, treatment data, lifestyle and quality of life, level of service satisfaction, and an approach to spirituality. **Method:** This is a descriptive, cross-sectional study with a qualitative and quantitative approach, carried out at the Hemodialysis Center in the Brusque region. Data collection was done through a structured questionnaire, divided into six blocks based on the guidelines of Toassi & Petry (2021). The data were tabulated and organized in Microsoft Excel 2019 software, through a simple descriptive analysis, following the recommendations of the cited authors. **Results:** Covering 75%, it revealed a diversified profile of patients. In summary, most of the participants were between 51 and 72 years old, predominantly male residents of Brusque, married, with low education, who consider themselves religious and have a monthly income of up to 2,000 reais. Regarding the evaluation of the service, the results were positive, with emphasis on the good relationship between patients and doctors and nurses. Regarding religious beliefs, the results show that they play a significant role in the patient's life and are a source of emotional support. **Conclusions:** Understanding this diverse profile is essential to improve quality of life, adherence, and clinical outcomes of treatment.

Keywords: Renal Dialysis, Chronic Renal Failure, Epidemiology, Disease Impact Profile, Patient Satisfaction, Spirituality.

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INTRODUCTION

Chronic kidney disease (CKD) is a silent condition that often progresses to end-stage renal failure (Barretti, 2022). CKD consists of a decrease in the Glomerular Filtration Rate (GFR), with a progressive and irreversible loss of kidney function (BRASIL, 2014). According to Ferreira (2023), based on the 2022 Dialysis Census of the Brazilian Society of Nephrology, Brazil registered 153,831 patients on dialysis treatment. In addition, according to the Brazilian Society of Nephrology (2022), hemodialysis is the predominant modality in the country, accounting for 92.5% of patients under treatment. The frequency of hemodialysis sessions, for most patients undergoing treatment, is 3 times a week, lasting 4 hours. In addition, more than 80% of medical care for chronic dialysis therapy is funded by the Unified Health System.

According to the 2014 Brazilian Clinical Guideline for the Care of Patients with Chronic Kidney Disease, CKD is a multifactorial, insidious, long-term pathology that is often asymptomatic for most of its evolution. Therefore, it is crucial to identify individuals at risk of developing CKD for the purpose of early diagnosis and to recognize the worse prognostic factors, which are associated with a more accelerated progression of kidney function loss. Groups at risk of developing CKD include people with diabetes, hypertension, the elderly, those with obesity (BMI > 30 kg/m²), those with a history of circulatory system disease, a family history of CKD, smokers, and the use of nephrotoxic agents.

In order to develop a profile of hemodialysis patients in the Brusque region, it is crucial to discuss the quality of life and satisfaction of these patients in relation to the hemodialysis service. Chronic Kidney Disease (CKD) impacts several areas of the patient's life, also interfering with factors that influence clinical practice and treatment adherence (Silva et al., 2011). Thus, the evaluation of the degree of user satisfaction encompasses a comprehensive analysis of the structure, care and services provided during the treatment process (Roderick, 2005).

In addition to this context, some studies, such as the one by Lucchetti et al. (2010), show that the relationship between spirituality and clinical practice has shown better outcomes in treatment adherence and quality of life of patients. In more depth, it also reports that patients with beliefs had lower levels of diastolic hypertension, lower mortality from cardiovascular causes, and lower mortality in general (Lucchetti et al., 2010). However, according to Puchalski and Romer (2000, apud Longo, 2011), measuring spirituality and religiosity in clinical practice is a challenge, given the complexity of the elements and definitions involved in the denomination. In this study by Puchalski and Romer (2000), the acronym FICA is cited as a widely used tool for spiritual assessment, in which information is collected that explores the relationship of beliefs in treatment, also addresses community involvement and social support of religious centers. In addition, the 2019 cardiovascular prevention guideline of the Brazilian Society of Cardiology also included the topic spirituality and



psychosocial factors in cardiovascular treatment, highlighting the FICA questionnaire as an evaluative tool for having the best psychometric characteristics.

In view of this scenario, the study aimed to identify the profile of hemodialysis users in the Brusque Region - Santa Catarina.

METHODOLOGY

This is a cross-sectional descriptive study with a qualitative and quantitative approach to analyze the profile of participants with CKD on hemodialysis in the Brusque region. The research was conducted at the Hemodialysis Center in the region of Brusque, Santa Catarina State, Brazil. The target population included all participants over 18 years of age who had been on hemodialysis for more than 90 days, and participants who were not part of the inclusion criteria, who did not want to participate or did not have the possibility of communication were excluded from the study.

Data collection was carried out through a structured questionnaire that includes open and closed questions, allowing quantitative and qualitative data to be obtained, based on the concepts of the book "Scientific Methodology applied to the Health Area" by Toassi & Petry (2021). The questionnaire was applied from 05/15/2022 to 12/01/2022, divided into six blocks of questions. The time needed for each participant to complete it was recorded in order to evaluate the applicability of this developed tool. The first block addressed the identification of participants and general data, including name, age, gender, city of residence, marital status, weight, comorbidities, and medications in use. The second block focused on socioeconomic profile, addressing schooling, gross income, and whether they have health insurance. The third block investigated information about hemodialysis treatment, while the fourth block explored the lifestyle and quality of life of the participants. The fifth block evaluated the level of satisfaction with hemodialysis services, and the questions were adapted based on the work of Roderick (2005). In the sixth block of questions, to assess the spirituality of the participants in clinical practice, the acronym FICA was used, based on and adapted from the work of Puchalski et al., 2009. The acronym is derived from English, in which the letter F: "Faith or Beliefs", means faith or beliefs, letter I: "Importance and influence", letter C: "Community" means community and letter A: "Address" means approach in treatment. The organization of the data and the performance of the simple descriptive analysis using Microsoft Excel 2019 were guided by the recommendations of Toassi & Petry (2021).

This study was conducted in accordance with ethical and regulatory guidelines, with the approval of the Research Ethics Committee (REC) of UNIFEBE - Centro Universitário de Brusque, number 5.371.265.

RESULTS

The survey covered 75% of the participants in the hemodialysis service in the Brusque region. The mean time of application of the questionnaire was 13 minutes and 7 seconds, the minimum duration was 8 minutes, 20 seconds and the maximum was 25 minutes.

Of the 87 participants in the survey, 52.87% of the users of the hemodialysis service surveyed are male. The mean age was 57.3 years and the mean weight was 69.9 kg. Among the comorbidities present, the most prevalent was Systemic Arterial Hypertension, representing 73.56% of the participants and only 16.09% did not have comorbidities. Regarding schooling, 45.98% of the patients had incomplete primary education, as shown in Table 1. Regarding family income, 44.83% reported receiving up to 2,000 reais and 72.41% did not have health insurance. The other characteristics regarding identification, general data, and socioeconomic profile are described in Table 1.

Table 1. Blocks 1 and 2 - identification, general data and socioeconomic profile.

Age	Range according to age		N	%
		18 - 28 years old	5	5,75%
	29 - 39 years old	6	6,90%	
	40 - 50 years	13	14,94%	
	51 - 61 years	25	28,74%	
	62 - 72 years old	28	32,18%	
	73 years or older	10	11,49%	
	Average age	57,3 years		
Gender		N	%	
	Feminine	41	47,13%	
	Masculine	46	52,87%	
City you reside in		N	%	
	Age range	N	%	
	18 - 28 years old	5	5,75%	
	29 - 39 years old	6	6,90%	
	40 - 50 years old	13	14,94%	
	51 - 61 years old	25	28,74%	
	62 - 72 years old	28	32,18%	
	73 years or older	10	11,49%	
Marital status		57.3 years	Gender	
	N	%	62,07%	
	41	47,13%	5,75%	
	46	52,87%	City of residence	
	N	%	2,30%	
	1	1,15%	9,20%	
Abrupt		61	70,11%	%
		8	9,20%	1,15%
		6	6,90%	4,60%
		4	4,60%	17,24%
		1	1,15%	35,63%
		6	6,90%	Marital status
		N	%	11,49%
		54	62,07%	5,75%
		5	5,75%	2,30%

	18	20,69%	
Height	Stable union	2	2,30%
	Widower	8	9,20%
	Intervals	N	%
	Less than 40 kg	1	1,15%
	40 - 50 kg	4	4,60%
	51 - 60 kg	15	17,24%
Body Mass Index (BMI) *	61 - 70 kg	31	35,63%
	71 - 80 kg	19	21,84%
	81 - 90 kg	10	11,49%
	91 - 100 kg	5	5,75%
	100 kg or more	2	2,30%
Comorbidities **	Average	69,9 kg	Height
	N	%	73,56%
	2	2,30%	45,98%
	25	28,74%	14,94%
	38	43,68%	13,79%
	19	21,84%	10,34%
	3	3,45%	Body Mass Index (BMI)*
	N	%	%
	3	3,45%	35,63%
	44	50,57%	24,14%
	27	31,03%	24,14%
	13	14,94%	Comorbidities**
	Isolated comorbidities		%
64		73,56%	94,25%
40		45,98%	5,75%
Dyslipidemia		14,94%	%
	12	13,79%	25,29%
	9	10,34%	45,98%
	14	16,09%	9,20%
	N	%	6,90%
	31	35,63%	5,75%
	21	24,14%	6,90%
Has 3 or more associated comorbidities	21	24,14%	%
	14	16,09%	Continuous medication use
	N	%	44,83%
	82	94,25%	21,84%
	5	5,75%	Schooling
	N	%	4,60%
	22	25,29%	18,39%
Completed high school	40	45,98%	3,45%
		9,20%	%
	6	6,90%	26,44%
	5	5,75%	72,41%
	6	6,90%	Monthly Gross Family Income

Source: Prepared by the authors.

Caption: N, absolute number of responses. %, percentage calculation of responses. * Body Mass Index: calculated based on the information provided in the questionnaire, formula BMI = weight / (height x height). ** Isolated comorbidities represent the responses of comorbidities stratified specifically by comorbidity, and the patient may have more than one associated comorbidity.

Table 2 shows the data on hemodialysis, highlighting that 39.08% of the patients had three or more previous hospital admissions. Regarding the frequency of weekly hemodialysis, 91.95% underwent hemodialysis 3 times a week. Regarding hemodialysis in other services, 85.06% reported that they did not travel and only 13.79% underwent hemodialysis in another clinic when they needed to travel. Responses about complications, limitations, and major hemodialysis-related discomforts were grouped into similar categories for better statistical analysis and data interpretation. Regarding hemodialysis, 67.82% reported no complications and/or limitations. Among the most prevalent complications are tiredness, malaise, and hypotension, while the most frequent limitations include dietary restriction and impact on work. In addition, 41.38% indicated that they did not feel discomfort when undergoing hemodialysis.

Table 2. Block 3 - Data on hemodialysis

Intervals		%	%	
	1,15%	22	Up to 2,000 real	
	2 times	Up to 5,000 real	19	
	Up to 10,000 real	5	5,75%	
	4	4,60%	12,64%	
16	18,39%	N	Prefers not to answer	
	Health Insurance	39	N	
	Yes	23	26,44%	
	63	72,41%	14,94%	
	1,15%	6	6,90%	
	8 years or more	9	Number of previous hospitalizations	
N		N	%	
	25,29%	33	37,93%	
	22,99%	33	37,93%	
	39,08%	21	24,14%	
11		N	Duration of treatment in the hemodialysis service	
	%	4	4,60%	
	44,83%	80	91,95%	
13	22,99%	3	3,45%	
	14,94%	N	%	
	6,90%	10	11,49%	
	10,34%	7	Reaction to discovering the diagnosis	
	%	1	1,15%	
	37,93%	1	1,15%	
	37,93%	68	78,16%	
21		N	Frequency of weekly hemodialysis	
	%	30	34,48%	

	4,60%	18	20,69%	
	91,95%	23	26,44%	
	3,45%	16	Transplant Waiting List Waiting Time	
N		N	%	
	11,49%	12	13,79%	
	8,05%	74	85,06%	
	1,15%	1	1,15%	
1		N	%	
	68	78,16%	67,82%	
	Had complications and/or limitations	N	%	
	Complications:	City Hall Car	30	34,48%
	Edema	Drive your own car	18	20,69%
	Pain	Out-of-Home Treatment (PDT)	23	26,44%
	Bruise	Brought by car by companion	16	18,39%
	Situations in which you need to travel	5		
	Malaise	I do hemodialysis at another partner clinic		
	Hypotension	I don't travel		
	Hypertension	Other		
	Complications and/or limitations due to hemodialysis*	1		
	There were no complications	59		
	28	32,18%		
N		N	%	
	Dietary restriction	3	25,29%	
	Affects work	4	74,71%	
1		2	%	
	Displacement	8	9,19%	
	Environment	1	1,15%	
	Tiredness	3	3,45%	
	Pain	12	13,79%	
	Lack of freedom	3	3,45%	
	Systemic blood pressure	1	1,15%	
	Restricting the amount of water	2	Hemodialysis affects the work routine	
	%	21	24,14%	
	25,29%	36	41,38%	

Source: Prepared by the authors.

Caption: N, absolute number of responses. %, percentage calculation of responses.

* Responses grouped into similar categories for statistical analysis

Of the participants who did not practice any type of physical exercise, 49.42% were found. Regarding the amount of water ingested daily, 82.76% of hemodialysis users have water restrictions, and 83.91% ingest 1 to 4 glasses of water per day. Another relevant fact shows that 85.10% consider themselves independent in the performance of daily activities and 54.02% are retired, as shown in table 3.

Table 3. Block 4 - Data on lifestyle and quality of life

65	N		N	Biggest hassle of doing hemodialysis in 1 word*
	N		%	12,64%
	Displacement		8	9,19%
	3 times a week		Environment	1
	3 times a week or more		5	Tiredness
	3,45%		43	49,42%
Pain			13,79%	%
	Lack of freedom		3	3,45%
	2 glasses - 500 mL	Systemic blood pressure	1	
	4 glasses - 1 Liter	30	Restriction of the amount of water	
	2,30%		7	8,05%
	21		24,14%	6,90%
	None		36	41,38%
Do you have any dietary restrictions?			N	%
	Sim		72	82,76%
	Não		N	%
Drink alcohol			11	12,64%
	2 times a week		19	21,83%
	3 times a week		9	10,34%
	3 times a week or more		5	5,74%
In daily activities			43	49,42%
	It is independent		N	%
	1 cup - 250 mL		8	9,20%
Performs professional activity			35	40,23%
	4 glasses - 1 Liter		30	34,48%
	6 Flakes - 1.5 Liters		7	8,05%
	8 flakes - 2 liters		6	6,90%
	Doesn't drink water		1	1,15%
Do you have any dietary restrictions	Breaks		N	%
	Yes		72	82,76%
	No		15	17,24%
	Quarterly		N	%
	No		76	87,36%
	Rarely		10	11,49%

Source: Prepared by the authors.

Caption: N, absolute number of responses. %, percentage calculation of responses.

Regarding the hemodialysis service, 98.85% of the patients reported that the hemodialysis clinic has a well-distributed space, 97.70% reported that they have privacy when undergoing hemodialysis, that the environment is calm and pleasant. In addition, 98.85% of the patients have a good relationship with the physician of the service and with the nurses only 60.92% report having a good relationship. Another relevant fact is that 98.85% of the survey participants feel safe in the hemodialysis clinic and 100% trust in the capacity of nurses. Regarding the multidisciplinary team,

100% answered that they had easy access to a nutritionist and social worker in the hemodialysis clinic, as shown in table 4.

Table 4 - Block 5 - User satisfaction with the hemodialysis service

About the hemodialysis service	3 times or more	1	1,15%	In daily activities	Não (%)
	%	86	It's self-contained	74	85,10%
	Get help	13	14,90%	Has a professional activity	39,08%
	%	86	Retired	47	54,02%
	Financially dependent	6	6,90%	0	Yes
	9,20%	84	No	26	29,89%
	Breaks	N	%	3	Weekly
	34,48%	83	Monthly	11	12,64%
	Quarterly	6	6,90%	1	Semiannual
	24,14%	85	Annual	19	21,84%
	Has easy access to continuous use medications:	79	90,80%	8	9,20%
	Questions	Yes (N)	Yes (%)	No (N)	No (%)
	Have a good relationship with the doctor:	86	98,85%	1	1,15%
	Has a good relationship with the nurse:	53	60,92%	34	39,08%
	Do you feel safe:	86	98,85%	1	1,15%
	Trust in the ability of nurses to care for you:	87	100%	0	0%
	Have enough time to discuss with the nurses:	84	96,55%	3	3,45%
	It's easy to make an appointment with your doctor:	84	96,55%	3	3,45%
	You could discuss questions and problems with your doctor:	83	95,40%	4	4,60%
	You trust the hemodialysis clinic's ability to take care of you:	86	98,85%	1	1,15%
	You get information about what you want to know about your kidney disease and treatment:	85	97,70%	2	2,30%
	Has easy access to continuous-use medications:	79	90,80%	8	9,20%
	Easy access to medicines in the public service:	74	85,06%	13	14,94%
	Easy access to social assistance:	87	100%	0	0%

Source: Adapted from Roderick, 2005.

Caption: N, absolute number of responses. %, percentage calculation of responses.



In the last block of the questionnaire, we presented an analysis of the spirituality of hemodialysis service users, adapting the interpretation of data from the *FICA* questionnaire. The answers were categorized and organized in a qualitative table, grouping similar data, to facilitate data analysis. However, this highlights the disadvantage of not having a more in-depth discussion on the subject. As a result, 80% of the survey participants consider themselves religious and 10.34% spiritual. In addition, 87.36% of them reported having beliefs that help them deal with problems and 87.36% also considered giving a lot of importance to their faith or religious beliefs. For 89.66% the faith or beliefs influenced to deal with stress or health problems and 95.40% did not have beliefs that could affect the medical decision or their treatment and even 87.36% considered the doctor to consider their religious issue with the treatment independent. It was also addressed about the support offered by the religious community, from which we obtained a variety of responses, which were later categorized to facilitate statistical analysis. The results, as detailed in Table 5, are distributed in several categories. In Category 1 - Prayers and Spirituality, we obtained 31 answers to prayers, 4 answers to watch Masses on television, 1 answer to talk to the priest and 1 answer to listen to Mass. In Category 2 - Church Support, we recorded 8 responses to receive home visits, 4 responses to donations and aid, 2 responses to meeting friends at church, and 1 response to believing in miracles. In Category 3 - Hope and Emotional Support, 4 responses were accounted for the feeling of hope and strength, 1 response to feel better after going to church, 2 responses to face problems in a different way, and 1 response to speak directly to God. In Category 4 - Social Support, we observed 4 responses to group conversations and 2 responses to emotional support through advice. In addition, 2 responses were classified in Category 5 as "Never sought support", and 19 responses were included in Category 6 as "Did not know how to answer".

Table 5 - Block 6 - Relationship between spirituality and clinical practice

F – Faith / belief			
Easy access to a nutritionist:		100%	0
	Religious	Hemodialysis disrupts your social life:	28
	59	67,82%	10,34%
	22	25,29%	65
74,71%		The hemodialysis clinic has a pleasant atmosphere:	85
	2	2,30%	86,21%
	85	97,70%	2
	If not: what gives you meaning in life?	The hemodialysis clinic has well-distributed space:	86
	1	1,15%	58,33%
	85	97,70%	2
	Do not know	Do hemodialysis with the same group of patients every day:	87
100%			
0 life? *		N	Likes to meet other patients from your session when you come for hemodialysis:
	95,40%	4	4,60%
	It is easy to see at the clinic when you feel unwell:	87	100%
	0%	2	Clinic offers snacks:
87		0	0%
	Yes	78	89,66%
	No	F – Faith/belief	Do you consider yourself religious or spiritual?
Do you have any specific beliefs that may affect medical decisions or your treatment? *		%	%
	70	80,46%	4,60%
	9	10,34%	95,40%
None			
8		Do you have spiritual or religious beliefs that help you cope with problems? *	%
	%	74	Yes
	86,21%	13	No
12	13,79%	N	If not: what gives you

			meaning in life?
	%	37	Family
	58,33%	15	Self-esteem
	8,33%	8	Don't know
	33,33%	I – Importance or influence	What importance do you place on faith or religious beliefs in your
	N	%	2,3
	76	87,36%	21,84
Little		10,34%	%
	2	2,30%	Has faith or beliefs ever influenced you to cope with stress or health problems? *
	N	%	0
Yes		89,66%	%
	9	10,34%	Do you have any specific beliefs that could affect medical decisions or your treatment? *
	N	%	1,15
	4	4,60%	12,64
No			
83		C – Community	Are you part of any religious or spiritual community? *
	N	%	87,36
	74	85,06	3,45
	13	14,94	She supports you, how? *
	N	%	8,05
Category 1: Prayers and Spirituality		42,53	%
	15	17,24	33,33

	8	9,20	6,9
	6	6,9	5,75
	2	2,3	1,15
	19	21,84	Is there a group of people that you "really" love or that are important to you? *
	N	%	40,23

Source: adapted Puchalski, et al., 2009.

Caption: N, absolute number of responses. %, percentage calculation of responses.

* Responses grouped into similar categories for statistical analysis

DISCUSSION

Based on the results obtained in the present study, the first block of questions of the questionnaire sought to bring results referring to the general data of the participants. We concluded that most of the participants were male, which is consistent with the 2012 report of the Brazilian Census of Chronic Dialysis that fifty-eight percent of the patients were male (Sesso, 2014). In addition, the most prevalent comorbidity among the interviewees was arterial hypertension, and of all participants, 94.25% used continuous medications. Thus, in line with this percentage, Guyton and Hall (2011, p. 425-426) show that among the most common causes of end-stage renal injury are diabetes mellitus and hypertension, which together account for more than 70% of all cases of CRF. A study conducted at a hemodialysis center in the interior of Rio Grande do Sul also reinforces that these are the most prevalent comorbidities among patients with CKD (Souza et. al., 2022).

The results of the questionnaire on the socioeconomic profile revealed that most of the participants had not completed elementary school, which coincides with previous studies on the sociodemographic profile of patients with CKD on dialysis (Freitas et al., 2013). In addition, most participants do not have health insurance and have low income, showing that, according to Travassos (2006), there is a significant influence of social condition and place of residence on access to health services in the country. Additionally, the study by Lopes et al. (2014), entitled 'Health-related quality of life of chronic kidney patients on dialysis', shows that most patients receive up to two minimum wages per month.

The third block of questions of the questionnaire brought significant results related to hemodialysis. According to the data obtained, 39.08% of the patients attending the hemodialysis service had already had three or more hospital admissions prior to the beginning of treatment. According to Nitsch et al., 2013, hemodialysis patients are more prone to decompensation and complications, so even before hemodialysis treatment, these patients had already been hospitalized. In addition, it has been observed that most patients are on treatment for a period of one year or less,

and this fact leads us to emphasize that performing early interventions can slow the progression to more severe stages (Ene-Iordache et al., 2016). Another interesting result is that 91.95% of the participants undergo hemodialysis 3 or more times a week, a result that brings us to reflect on whether this periodicity generates a proximity of these patients to the hemodialysis service or if it provides difficulty in the consistency of treatment adherence.

Based on the comprehensive results of the research, the fourth block of questions of the questionnaire sought to analyze data on the quality and lifestyle of hemodialysis patients. Regarding the practice of physical exercise, it was found that almost half of the participants are not engaged in any type of physical exercise, this is a worrying finding, since studies have found that physical exercise twice a week for 5 months increases the physical function and aerobic capacity of hemodialysis patients (Molsted et al., 2004). On the other hand, independence in the performance of daily activities was a positive characteristic, since most patients maintain a degree of autonomy in their routines. These data differ from the literature, which show that patients with CKD have a decreased ability to perform routine daily activities or work (Lopes et al., 2014). As previously mentioned (Molsted), regular physical exercise is extremely important for this population. Regarding occupational status, more than half, representing 54.02% of the participants, are retired. Regarding lifestyle habits, the data highlight a prudent approach on the part of patients undergoing hemodialysis treatment. Adherence to fluid restrictions and dietary guidelines are essential self-care for the proper management of patients with chronic kidney disease undergoing hemodialysis treatment. Therefore, water intake is a crucial aspect to be considered, 40.23% of the patients interviewed consume only a limited amount, about 2 glasses of 500mL per day. Adherence to adequate fluid intake is usually measured by interdialytic weight gain (IDG). Lower than recommended or excessive IDPG is related to increased risk of morbidity and mortality. The difference in weight between one dialysis and another, in percentage (%IDWG), is recommended to be between 4 and 4.5% (Nerbass et al., 2011). In addition, a significant percentage, corresponding to 82.76% of the patients, have some type of dietary restriction, evidencing the importance of a diet adapted to medical needs. And yet the vast majority, equivalent to 87.36%, choose not to drink alcoholic beverages, due to the implications that alcohol can have on compromised kidney health.

The results regarding the evaluation of the hemodialysis service, the structure of the clinic stood out positively among the patients, according to the results of our research, 98.85% of the patients evaluated that the space of the clinic is well distributed, demonstrating the efficiency in the planning of the environment. This reflects the fact that almost all patients are satisfied with privacy during hemodialysis sessions, contrasts considerably with another study that presented a significantly lower result, with only 21.5%, thus highlighting a remarkable dissimilarity between the two results (Roderick et al., 2005). These data show us the clinic's commitment to offering a functional and



welcoming space, contributing to the positive experience of patients during hemodialysis treatment. The evaluation of the care provided by the team in the hemodialysis clinic reveals a duality of perceptions on the part of the patients. While a remarkable percentage of 98.85% of the patients enjoy a good relationship with the physician of the service, the statistic of only 60.92% report having a good relationship with the nurses, which points to a variation compared to the results of other studies that applied the Roderick questionnaire and obtained a result of more than ninety percent stating to have a good relationship with both the physician and the physician. and with the nurses of the service (Silva et al., 2011). Despite this, it is observed that a significant percentage of the participants report feeling safe in the clinic facilities. This confidence is reinforced by the fact that 100% of patients have full confidence in the ability of the nursing team. Accessibility to complementary services is also a positive point, since all interviewees claim to have easy access to a nutritionist and social worker in the hemodialysis clinic, which surprises us positively when compared with other findings in the literature that do not reach a consensus of totality (Roderick et al., 2005). Regarding the repercussion of dialysis on the social life of patients and on the relationship with their partners, in both questions, more than 50% of the research participants stated that dialysis treatment does not interfere with these aspects. The diversity of perceptions regarding the relationship with the team highlights the importance of continuous improvements in communication and interaction with nurses, while on the other hand, the results demonstrate the general confidence in the quality and safety of the treatment environment provided by the clinic, as well as the functionality of the multidisciplinary team.

Regarding the analysis of spirituality, the last block of questions of the research questionnaire revealed a strong presence of religious and spiritual aspects in the lives of the participants, with 80% of them identifying themselves as religious who, according to Lucchetti et al. (2010), the book "Handbook of Religion and Health" (Koenig; Mccullough; Larson, 2001) emphasizes the importance of beliefs in health, explaining that religiosity means the extent to which an individual believes, follows and practices a religion. This religiosity can be in an organizational sphere (participation in the church or religious temple) or in a non-organizational sphere (such as praying, reading books and watching religious programs on television), and 10.34% of the participants consider themselves as spiritualized that according to the book mentioned above, spirituality is a personal search to understand issues related to the end of life. to its meaning, on the relations with the sacred or transcendent, which may or may not lead to the development of religious practices or the formation of religious communities. In addition, a large majority stated that their beliefs play a significant role in helping them cope with problems, and the same percentage consider beliefs to be of utmost importance in their lives. Surprisingly, many participants reported that their beliefs positively influenced their ability to cope with stress and health problems. However, the vast majority, 95.40%,

stated that their beliefs do not affect their medical decisions or treatments. Thus, 87.36% of the participants consider that it is independent for the physician to take into account their religious beliefs in the treatment. Despite this, physicians face several barriers when discussing beliefs with patients, such as lack of knowledge, little experience, discomfort with the topic, and difficulty recognizing its importance (Lucchetti et al. 2010). Overcoming these barriers is essential to provide comprehensive health care that is sensitive to individual needs, that is, when it is the patient's will, their beliefs can be correlated to their treatment.

CONCLUSION

Thus, correlating the analysis of the results previously described, we can conclude that the research reveals a diversified profile of hemodialysis patients in the Brusque region. In summary, most participants are in the age group of 51 to 72 years, with an average age of approximately 57 years. There is a predominance of residents of Brusque, male, married, with low education, considered religious and with a monthly income of up to 2,000 reais. Although most of them report that they are independent in their daily activities, a limitation presented is the fact that the treatment is face-to-face and requires time for each session, added to a weekly frequency of 3 times a week, makes the profile of these patients people who do not perform professional activity and do not travel far from the hemodialysis service. These facts make it difficult to travel, interfere with freedom and even the possibility of having a paid job to improve their monthly income.

When we approach the interaction of patients with the hemodialysis service, the results show high levels of satisfaction. This is mainly reflected in the positive relationship established with doctors and nurses, in an environment that is perceived as calm and safe. In addition, the data indicate that there is easy access to the multidisciplinary team, and that this is crucial to clarify doubts about the treatment, since a significant portion of the patients have a low level of education, making it a critical factor, given the complexity of the treatment, which involves dietary and water restrictions, among others, as well as the need for strict adherence by the patient.

Another trend presented in the answers reveals that spirituality plays a significant role in the lives of patients, most of whom have a religious connection that is a source of emotional support. In addition, another characteristic is that patients consider medical treatment to be independent of religion and that their beliefs do not affect medical decisions related to clinical follow-up, data that are related to the results of clinical follow-up. Thus, this positive result in relation to the hemodialysis service, added to the religious support, contributes to the understanding of the treatment and helps in a better quality of life for these patients.

Among the limitations of our study, we faced the challenge of managing the large amount of data collected, which made it difficult to analyze the information and develop a more synthesized



profile of hemodialysis patients. In addition, we noticed a limitation in the interpretation of the FICA questionnaire, due to the necessary explanation of the questions to the participants. Thus, the statistical analysis of the questionnaire was adapted and the answers were categorized into similar blocks. The data were grouped in a qualitative table, which made it impossible to perform a deeper and more reflective analysis of this theme.


These findings can serve as a basis for future work, in which it is suggested that studies be carried out to answer the questions that remained pending in this work. Therefore, there is a need to further explore the population's understanding of beliefs and whether they really help in the treatment of hemodialysis patients. In addition, there is a need for studies that understand the characteristics of the profile of dialysis patients and their particularities, questioning the fact that hemodialysis treatment is face-to-face and high-frequency, whether this would help to bring patients closer to treatment or whether this is a point that interferes with their adherence. Thus, understanding this diverse profile is essential to provide personalized and effective care that meets the needs of each patient, promoting a better quality of life, better adherence to treatment, and better clinical outcomes.

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The relationship between theoretical concepts in electrodynamics and experimental activities: A study on students' citizenship training

 <https://doi.org/10.56238/sevened2024.010-003>

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ABSTRACT

This article investigates the relationship between theoretical concepts in electrodynamics and experimental activities, focusing on the citizenship formation of students. Electrodynamics, a branch of physics that studies the movement of electrical charges in circuits, is often considered abstract and distant from everyday reality. The teaching of science, in particular electrodynamics, often faces the challenge of making theoretical concepts accessible and relevant to students, as well as promoting a citizenship education that prepares them to face the challenges of the contemporary world. In this context, the central question arises: how does the integration of experimental activities in the teaching of electrodynamics influence students' understanding of theoretical concepts, their ability to apply these concepts in everyday situations, and their development as critical and responsible citizens? The general objective is to: analyze how students relate theoretical concepts to experimental activities and everyday circumstances, collaborating for their citizenship formation and, specifically: to investigate the performance of experimental activities in electrodynamics; evaluate the students' application and analyze the impact of integration. The methodology adopted in this study was based on the application of data and used a qualitative method. UD (Didactic Units) were used, which consist of a series of orderly, structured and articulated activities, carried out to achieve the proposed objectives. Activities included oral reading of the dissemination text, group discussions, and knowledge tests. The results reveal that students need more interlocution to be able to develop with more intimacy to the knowledge of Physics and, as a conclusion, students interact with the systems. Activities whose accomplishment evidenced the investigation procedures and the way science is developed, socioeconomic-culturally contextualized, were provided with the opportunity to provide students with the appropriation of the procedures they used to create the numerous physical theories, in order to understand in the same way how science is done.

Keywords: Theoretical Concepts, Didactic Unit, Electrodynamics, Citizenship training.

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INTRODUCTION

By exploring how students relate the theoretical concepts of electrodynamics to experimental activities and everyday situations, and how this integration contributes to their citizenship formation. And, by conducting classroom observations and interviews with students, teachers use it to investigate how they apply the concepts learned in everyday situations, such as the operation of electrical appliances, environmental and technological issues.

According to Santos (2023), the teaching of science, in particular electrodynamics, has been the target of growing interest from educators and researchers due to its importance in the academic and civic education of students.

Electrodynamics, a branch of physics that studies the movement of electric charges in circuits, presents particular challenges for educators, since many theoretical concepts in this area are complex and abstract, becoming distant from the everyday reality of students.

According to Lima & Heidemann (2023), the integration of experimental activities in the teaching of electrodynamics has been widely explored as a strategy to bring theoretical concepts closer to practice, promoting a deeper and more meaningful understanding of scientific principles.

Conducting experiential activities contributes to the development of cognitive and social skills in students, including critical thinking, problem-solving, and ethical decision-making.

In addition to the academic benefits, it is important to consider the role of experiential activities in the citizenship formation of students. Citizenship training involves not only the development of technical knowledge, but also the promotion of ethical values, social responsibility and environmental awareness.

The teaching of science, in particular electrodynamics, often faces the challenge of making theoretical concepts accessible and relevant to students, as well as promoting a citizenship education that prepares them to face the challenges of the contemporary world. In this context, the question arises: how do students relate the theoretical concepts in electrodynamics to experimental activities and everyday circumstances, contributing to their citizenship education?

The central question is: how does the integration of experimental activities in the teaching of electrodynamics influence students' understanding of theoretical concepts, their ability to apply these concepts in everyday situations, and their development as critical and responsible citizens?

The general objective is: to analyze how students relate theoretical concepts to experimental activities and everyday circumstances, collaborating for their citizenship formation. And the specific objectives are: to investigate how the realization of experimental activities in electrodynamics influences the students' understanding of theoretical concepts, analyzing whether practical experimentation facilitates the internalization of scientific principles; evaluate how students apply the concepts learned in experimental activities in everyday situations, examining whether they can



establish connections between the theory studied in the classroom and everyday practice, and analyze the impact of the integration of experimental activities on the development of students' citizenship education, verifying whether the reflection on ethical issues, environmental and social issues related to electrodynamics contribute to their awareness and engagement as responsible citizens.

The justification lies in the need to better understand how the relationship between theoretical concepts in electrodynamics and experimental activities can contribute to the citizenship formation of students. By investigating this relationship, one can identify teaching strategies and practices that promote not only the understanding of scientific principles, but also the development of values such as responsibility, respect, collaboration, and environmental awareness.

It is relevant to investigate how students relate theoretical concepts in electrodynamics to experimental activities and everyday circumstances, and how this integration can contribute to their citizenship formation.

This study adopted a qualitative approach to investigate the relationship between theoretical concepts in electrodynamics and experimental activities, focusing on students' citizenship education. The research was conducted in a high school, involving final-year students.

The structure of the article is composed of an introduction that highlights the points of equivalence to the instructive commands of the study, followed by the theoretical foundation, then the methodology with the description of the stages of the study, followed by the results and discussions, final considerations and references.

THEORETICAL CONCEPTS IN ELECTRODYNAMICS AND EXPERIMENTAL ACTIVITIES

The conceptual relationship in electrodynamics and experimental activities seeks to establish the connection between the theoretical concepts studied in this area of physics and the experimental practices carried out in the classroom.

Knype (2021), highlights that through experimental activities, students have the opportunity to experience the principles of electrodynamics in practice, allowing a more complete and deeper understanding of the concepts covered.

The experimental activities also help in the development of practical skills, such as handling equipment and taking measurements, contributing to a broader citizenship education and providing students with an experience closer to reality.

According to Pereira (2022) and Da Silva & Lira (2022), this relationship between theoretical concepts and experimental activities aims to enrich the teaching-learning process, making it more meaningful and promoting the integral development of students.



The students' learning and the difficulties encountered in teaching electrodynamics are factors that deserve to be highlighted. For this, according to Siqueira (2022), it is necessary to explore various theoretical and practical perspectives, with the aim of understanding the learning processes of students in this area of Physics.

By discussing the main difficulties faced by students, such as lack of familiarity with theoretical concepts, difficulties in problem solving and low motivation to study the subject.

Silva (2023) points out that by investigating students' previous conceptions about electrodynamics, to identify possible obstacles in the learning process, it leads to fundamental reflections to support the construction of more efficient pedagogical strategies that are appropriate to the needs of students

Citizenship education in the educational context demands a reflection on the expectations of teaching. In this sense, Pereira (2022) emphasizes that it is essential to consider the importance of developing skills and competencies in students that make them active and critical citizens.

Through the teaching of theoretical concepts in electrodynamics and experimental activities, it is possible to promote the citizenship training of students, providing them with scientific and technological knowledge necessary to understand and act in society.

According to Máximo (2022), it is expected that the teaching of Physics will also contribute to the formation of values, such as ethics, social responsibility, and sustainability, preparing students to face present and future challenges.

The relationship between citizenship education and education expectations is fundamental for the construction of a more just and egalitarian society.

De Carvalho et al (2022) highlight that Physics plays a fundamental role in the creation and modeling of new methodologies for access to electrodynamics.

Through the application of the theoretical concepts of the discipline, it is possible to develop innovative approaches that allow a deeper and more meaningful understanding of electrical and magnetic phenomena.

According to Batista (2023), these methodologies may involve the use of technological resources, such as computer simulations and virtual experiments, which provide students with the opportunity to explore and interact with concepts in a practical and visually stimulating way.

Physical modeling allows the construction of simplified representations of phenomena and the elaboration of hypotheses and predictions, contributing to the development of students' scientific thinking.

These new approaches not only facilitate the understanding of concepts in electrodynamics, but also promote the active participation of students and stimulate critical and creative thinking.



Innovation and inclusive education have been increasingly relevant themes in the teaching of Physics. Innovation seeks to use new pedagogical approaches, technological resources and methodologies that can arouse the interest and participation of all students, promoting a more meaningful and pleasurable learning.

Picanço et al (2021), cite that inclusion is a fundamental principle, as it aims to ensure the participation of all students, including those with disabilities or learning difficulties.

When considering innovation and inclusive education in Physics, it is necessary to think of strategies that enable the adaptation of content and activities, making them accessible to all students.

Batista & Ustra (2021) points out that creating a welcoming and inclusive environment is crucial for students to feel valued and motivated to actively participate in Physics classes, contributing to their citizenship education.

THE STUDY OF ELECTRODYNAMICS IN HIGH SCHOOL

In basic education in public and private schools, the teaching of physics content, such as electrodynamics, has many deficiencies, for example: the number of courses available is small, the training and remuneration of teachers are low, and the irrefutable lack of resources. Of course, this situation usually promotes the development of education without motivation and is far from the recommendations of the PCN:

[...] The study of electricity should focus on concepts and models of Electrodynamics and electromagnetism, making it possible, for example, to understand why appliances that serve to heat consume more energy than those used for communication, to size and execute small residential projects, or even to distinguish a generator from an engine. It will also be essential to understand where the electrical energy we use comes from and how it propagates in space (BRASIL, 2002, p. 24).

Taking into account that a significant portion of the current discourses on science teaching are focused on the following themes: student-centered teaching, shortening of theory and practice, use of technical resources in the field of education, problematic teaching, interdisciplinary nature, etc.

According to Moreira (2013), part of the classroom is based on traditionalist methods, that is, based on the use of textbooks.

Therefore, when teaching the content of electrodynamics, because the number of physics classes is small, this is not always possible, so it is basically the teacher who teaches the content verbally and classifies the exercises in the textbook, this causes the teaching to be unmotivated, boring and little used, this factor is determinant in the student's demotivation with physics.



THE STUDY OF ELECTRICAL CIRCUITS BY MEANS OF THE PHYSICAL QUANTITIES OF ELECTRODYNAMICS

The field of physics responsible for the study of electric charges in motion is electrostatics. Therefore, in order to conduct such research, it is necessary to understand the basic concepts of electrostatics, as electrostatics is built around them.

The broad field of electrodynamic research covers almost all electrical phenomena that people experience every day. Therefore, it was decided to perform this work through the understanding and manipulation of four quantities: current, potential difference, resistance and Ohm's law.

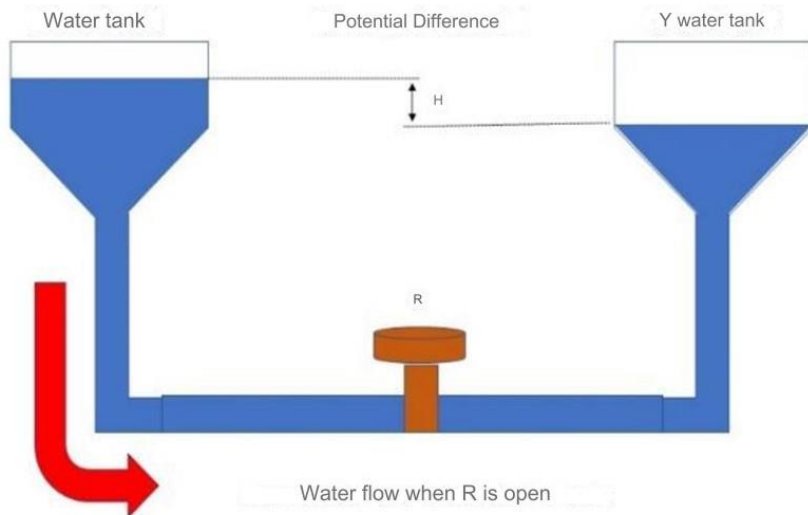
The reason for this choice lies in the theoretical orientation on which the behavior is based, since the selected content allows a diversity of activities that not only provide learning through the socialization of knowledge, such as debates about problematic situations, in the school environment and in the behavior of high school students.

Electric Current

The electric current must be understood as the ordered flow of the charge carriers, moreover, for this flow to occur, there must be a potential difference between the terminals of the network. However, not every flow of electrical charge will produce current. For example, free electrons or conductive electrons within a metal conductor move randomly and continuously in various directions. However, when you look closely, you can see that there is no orderly movement of the load in the defined direction, that is, when you study the lateral area inside the conductor, you will see that their number is about the same. Electrons crossing the plane in a certain direction and in the opposite direction cannot establish an orderly motion of charges.

One way to better understand the current is to analyze the following analogy: As shown in Figure 1, design a hydraulic system composed of two water tanks "X" and "Y" interconnected by pipes, with a register "R", you can open or close the connection between the water tanks. It is observed that in the water tank, there is a difference between the water level "h", that is, there is a difference in the gravitational potential energy between the water tanks, if the "R" register is opened at this time, then the water flow from the water tank "X" to "Y" will be established, and the water flow will be established until the water level is equal, that is, until the gravitational potential is no longer different (HEWITT, 2015).

Figure 1 - Hydraulic system composed of two water tanks and connected to each other by a pipe.

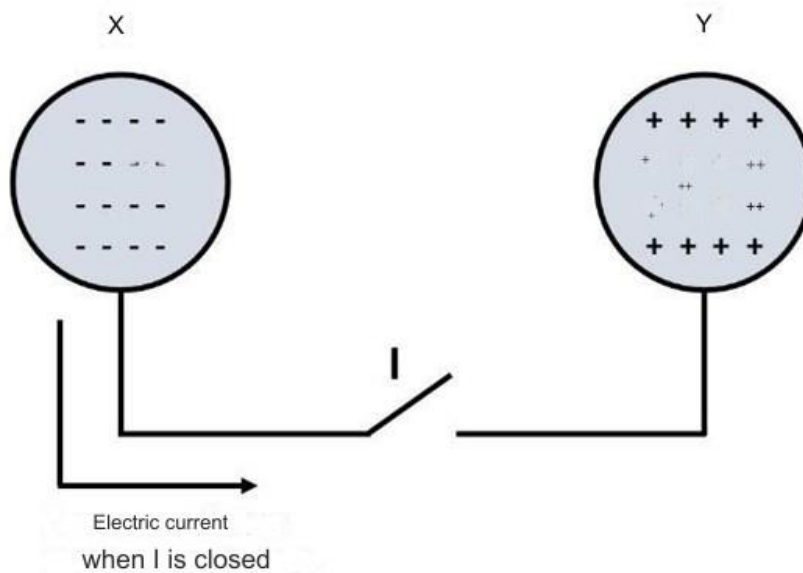


Source: Oliveira (2020).

Figure 2 shows a system consisting of two spheres X and Y. These are loaded. X is positively charged and Y is negatively charged. So there is a potential difference between the balls.

The wire connects the two spheres via an I-switch, allowing the connections to be established and undone. When the I switch is closed, i.e. when a connection is established between the spheres, the charged particles, which in this case are electrons, flow immediately from sphere X to sphere Y, thus establishing the stability of the current to the potential (HEWITT, 2015).

Figure 2 - System composed of two spheres charged and connected to each other by a conductive wire.



Source: (2020)

By analyzing the systems in Figures 1 and 2, it can be pointed out that there are some similarities between the two, so that the concept of current can be verified. The motion of water



molecules moved by the gravitational potential difference forms a water flow, and the motion of charged particles moved by the potential difference forms an electric current.

In metal conductors, the particles that move around the charge are electrons because they are fixed inside the atom, the proton, and together with the neutron establish the nucleus. In this context, they are called conduction electrons or free electrons, since in conductive fluids, the charges are charged by ions.

Although this analogy is used, it is necessary to emphasize the importance that, in this case, students need to be aware of the difference between these examples, in order to avoid making conceptual errors.

In early electrical research, it was speculated that positive particles moved from a higher potential to a lower potential to form an electric current. However, it is now known that it refers to the movement of negative particles from a smaller potential to a larger potential. However, traditionally, the first idea related to the current direction continues to be used, because according to Halliday, Hesnck and Walker (2016, p. 139),

We can use this convention because, in most situations, assuming that positive charge carriers are moving in one direction has exactly the same effect as assuming that negative charge carriers are moving in the opposite direction. (In cases where this is not true, we abandon convention and describe the movement as it actually happens.) (HALLIDAY; HESNICK; WALKER, 2016, p. 216).

However, in some cases, if well understood, the process needs to be described as it actually happens (HALLIDAY;HESNICK; WALKER, 2016). For example, the behavior of certain semiconductor components is analyzed.

Current (i) can be defined as the charge (dq) moving in the reta part of the conductor, whose load (dq) passes through that part in the time interval (dt) (HALLIDAY, HESNICK and WALKER, 2016).

$$i = \frac{dq}{dt} \quad (1)$$

The International System of Units (SI) defines the unit of current as the Coloumb (C) per second (s), called ampere (A). The ammeter is the tool used to perform the current measurement.

$$1A = \frac{C}{s} \quad (2)$$

In conductive materials, the actual motion of free electrons is arbitrary. However, when a potential difference is applied to these materials, it will be noticed that the electrons tend to move towards their own tissue and move towards the maximum potential.

In addition, it can be observed that when passing through the body of the material, the current produces some effects that can be observed in it or around it. Therefore, the main effects are:

- a) chemical effects, which are mainly caused by chemical reactions caused by currents;
- b) Magnetic effects, which are generated by the magnetic field generated by the current passing through the conductors;
- c) Physiological effects, commonly known as electric shock; d) Thermal effect, namely Joule effect, usually seen/acted upon in electric showers.

In addition, current can be classified as direct current (DC) or alternating current (AC). The first is the motion that moves the load in a single direction. Secondly, the electron first moves in a certain direction and then moves in the opposite direction, alternating left and right around the set position, as shown in Figure 3 (HEWITT, 2015).

Figure 3 - Graphs of DC and AC currents as a function of time.



Source: Oliveira (2020)

According to Hewitt (2015, p. 436), "the main use of electric current, whether DC or AC, is to transfer energy from one place to another quickly, flexibly, and conveniently."

Current Density

Based on the study by Halliday and Hesnick (1996), when one is interested in studying the current i in a conductor in a more specific way, that is, when studying the flow of charge through the straight part of the conductor at any point in the circuit, it is necessary to use the density of the current J that is used to describe this flow; and if the charge is positive, it has the same direction and the same direction as the velocity of the charge that constitutes the current; If the charge is negative, the direction is opposite.

For each component of the straight part, the modulus J of the current density is equal to the current divided by the area of the component. The current flowing through the area component can be written as: $J \cdot dA$; where dA is the area vector of the component, perpendicular to the component. Therefore, the total current flowing through the surface is

$$i = \int \vec{J} \cdot d\vec{A} \quad (3)$$

If the current is uniform across the surface and parallel to $d\vec{A}$, then \vec{J} it will be in the same way uniform and parallel to $d\vec{A}$. Therefore, the previous equation will become

$$i = \int J dA = J \int dA = JA, \quad (4)$$

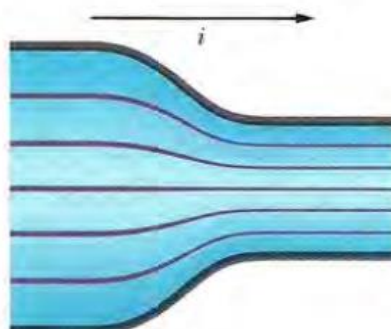
Therefore

$$J = \frac{i}{A} \quad (5)$$

Where A is the total area of the conduction surface. Based on the previous equations, the unit of current density in the SI is the ampere per square meter (A/m^2).

As is well known, electric fields can be represented by field lines, because the higher their concentration, the greater the strength of the electric field. Figure 4 shows that current density can also be represented by lines commonly referred to as current lines.

Figure 4 - Representation of current density.



Fonte: Halliday e Hesnick (1996).

The left-to-right chain in Figure 4 transitions from the widest conductor on the left to the tapered conductor on the right. Once the load remains in the channel, the amount of charge and current cannot be changed. In this case, what changes is the current density, which is higher in

conical conductors. In addition, the spacing of the chain lines is inversely proportional to the current density.

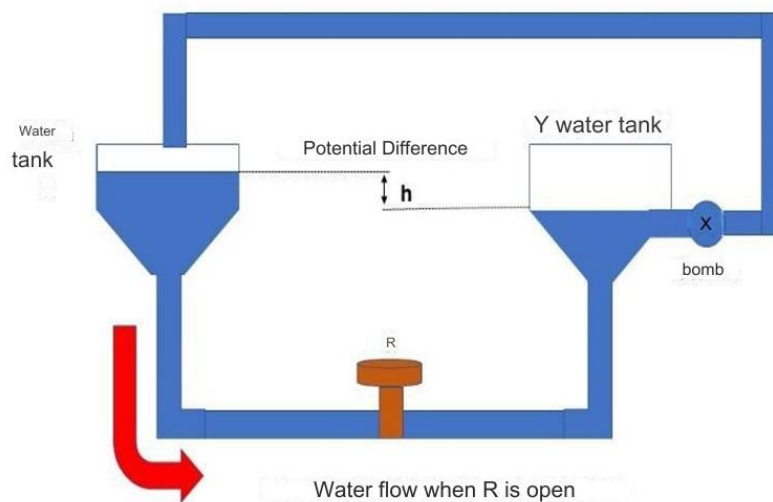
Potential Difference

The potential difference, also commonly referred to as voltage, is the difference in potential energy per unit load. The International System of Units (SI) defines volts as a unit of measurement for potential differences, which is a respect to Alessandro Volta, the coiner of the term voltage, to describe the same magnitude. A voltmeter is a tool used to measure voltage.

By analyzing the hydraulic system in Figure 2.1 again, it can be determined that the water tank will remain at the same level in a short time, that is, there will no longer be a difference in gravitational potential between them. However, if there is a pump that drains the water from tank Y and dumps it into tank X, as shown in Figure 4, by accurately measuring the amount of water entering tank Y, the potential difference and the water will be maintained and its existence will continue.

In this case, the function of the pump will become a potential source as it increases the gravitational potential energy of the water while keeping the system running.

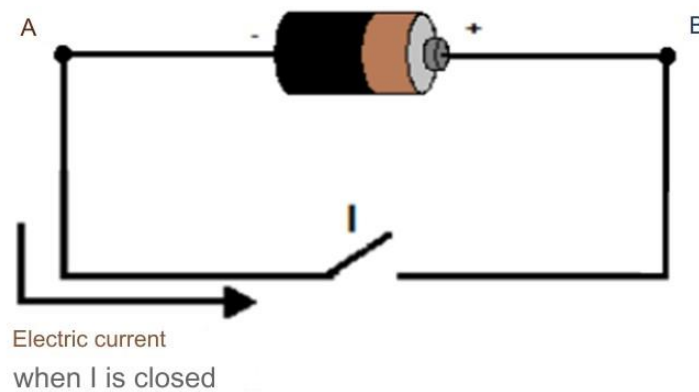
Figure 5 - Hydraulic system using a pump to maintain the unevenness between the water tanks and the current in the pipes.



Source: Oliveira (2020)

According to the hydraulic system analyzed in the past, it needs a device, i.e., a pump, which can increase the gravitational potential energy of the water, i.e., it can generate a gravitational potential difference to keep the hydraulic current of the system flowing in the system as shown in Figure 6. A suitable device, a battery that can generate a potential difference, is needed to maintain the flow of current.

Figure 6 - Electrical system using a battery to produce a potential difference and, consequently, electric current in the conductor



Source: Oliveira (2020)

The equipment used to generate the potential difference is usually referred to as a voltage generator, voltage source, or even voltage source. For example, there are batteries, electromagnetic generators, and various types of batteries. The task of such tools is to move negative charges away from positive charges (HEWITT, 2015).

Just like current, voltage can also be divided into continuous and alternating. A signal generated by a signal source that does not change its polarity over time is called a continuous signal, and a signal signal generated by a signal source whose polarity is constantly reversed is called an alternating signal.

As shown in Figure 6, a system that provides a path for current flow is called a circuit. However, in Figure 6, this circuit is not represented correctly because it still requires another size of interference, called resistance, which will be analyzed in the next section.

Electrical Resistance



When an equal potential difference is applied to the ends of two bars of the same size, very different results are obtained, one bar is conductive and the other is insulating. Therefore, it can be said that resistance is the aspect that establishes this difference in results. Therefore, in order to measure the resistance between two points of the conductor, it is necessary to apply a potential difference between these two points and measure the resulting current i . According to Halliday and Resnick (2016), resistance R is

$$R = \frac{V}{i} \quad (6)$$



According to equation (6), the unit of resistance in the SI is the volt per ampere. The incidence of this arrangement is so common that the ohm (Ω), which is a special unit, ends up being used to represent it. Like so

$$\begin{aligned} 1 \text{ ohm} &= 1\Omega = 1 \text{ volt por ampère} \\ &= 1 \text{ V/A.} \end{aligned} \quad (7)$$

A resistor is a conductor whose task in a circuit is to insert a resistor. In electrical circuit diagrams, a resistor is represented with the symbol  or . When you write equation (6) in the form

$$i = \frac{V}{R} \quad (8)$$

It should be noted that in fact the name "resistance" is a great choice. The current will be, for a given potential difference, to the extent that the resistance is greater. The resistance of a conductor depends on the way the potential difference is applied.

According to Halliday and Resnick (2016), it is always necessary to use prisms instead of equipment to focus more on the materials. Therefore, the focus is not on the potential difference V between the two ends of a given resistor, but on the electric field E , which is a vector field composed of vector distributions, one at each point in the area around the electric field.

Therefore, one works with the current density instead of dealing with the current \vec{j} in the resistor, at the point under analysis. Instead of dealing with the resistance R of a device, it deals with the **resistivity** ρ of a material, since it is a measure of the opposition of a material to the flow of electric current:

$$\rho = \frac{E}{J} \quad (9)$$

Based on equation (8), by combining the units E and J , we obtain the ohmmeter (Ωm), for unit of ρ :

$$\frac{\text{unidade de } (E)}{\text{unidade de } (J)} = \frac{\text{V/m}}{\text{A/m}^2} = \frac{\text{V}}{\text{A}} = \Omega \cdot \text{m} \quad (10)$$

In addition, equation (8) can be written in a vector manner:

$$\vec{E} = \rho \vec{J}. \quad (11)$$

Equations (9) and (11) are only valid for isotropic materials, that is, materials that have properties that are identical in all respects.

In the same way, we can talk about the *conductivity* σ of a material, which is the inverse of resistivity:

$$\sigma = \frac{1}{\rho} \quad (12)$$

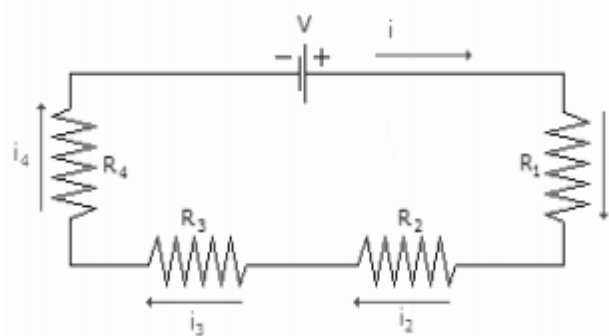
In SI the unit of *conductivity* is the corresponding ohmmeter, $(\Omega \cdot m)^{-1}$. At times, this unit is called mho per meter. Using the definition of σ (12), equation (11) can be written in the form:

$$\vec{J} = \sigma \vec{E}. \quad (11)$$

Association of resistors in series

A series connection is formed when two or more resistors are associated in which the electric current is the same at the time it is moving through them.

Figure 7 - Schematic representation of a circuit connected in series.



Source: Oliveira (2020)

In image 7, resistors R1, R2, R3, and R4 are connected in series. Since there is no accumulation of charge at any point in the conductive material, under the action of a constant current, if the charge ΔQ passes through R1 within a certain period of time, there is no other direction to go except to move continuously through R2 in the above time interval, then continuously through R3, and so on. In this case, the resistor will conduct the said current i .

As long as it is swapped out for a resistor, which has an equivalent resistance R_{eq} , circuit analysis with resistors in series can be simplified, by carrying the same current i , this will result in a similar voltage drop.

By adding up all the voltage drops of each resistor, the absolute voltage drop can be obtained as follows:

$$V = i.R_1 + i.R_2 + i.R_3 + i.R_4 = i.(R_1 + R_2 + R_3 + R_4) \quad (12)$$

$$V = i.R_{eq}$$

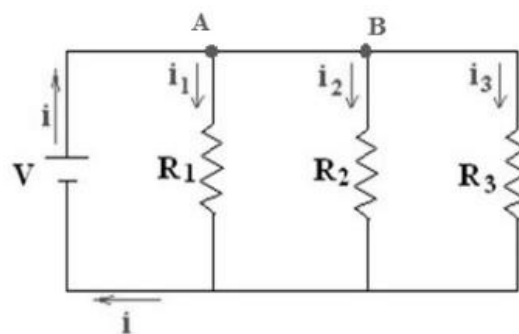
Therefore, it can be concluded that the equivalent resistance must be exactly equal to the sum of the values of the resistances of each resistor for the construction of a circuit with resistors in series.

$$R_{eq} = R_1 + R_2 + R_3 + R_4 \quad (13)$$

Association of resistors in parallel

Two or more resistors are connected in parallel at the moment when they cause a similar drop in potential.

Figure 8 - Schematic representation of a circuit connected in parallel.



Source: Oliveira (2020)

In image 8, it can be seen that the resistors at both ends are connected by negligible resistance wires. It is important to note that upon reaching point A, the current coming out of the voltage source will be interrupted, and upon reaching point B, the current will break again. Therefore, it can be concluded that all the circuit current derived from the voltage source is the sum of all the individual currents, all the resistors with parallel connections.

$$i_{total} = i_1 + i_2 + i_3 \quad (14)$$

Since one end of the parallel resistor is connected to the (+) terminal of the voltage source via a negligible resistance line, and the other end is connected to the (-) terminal of the same voltage

source via the same sequence of lines, it can be concluded that each resistor will have a voltage drop of the same value and similar to the voltage drop of the power supply.

Whereas:

$$i_{total} = i_1 + i_2 + i_3 \quad (15)$$

We have

$$i_{total} = ; ; ; \frac{V}{R_{eq}} i_1 = \frac{V}{R_1} i_2 = \frac{V}{R_2} i_3 = \frac{V}{R_3} \quad (16)$$

In exchange we will have:

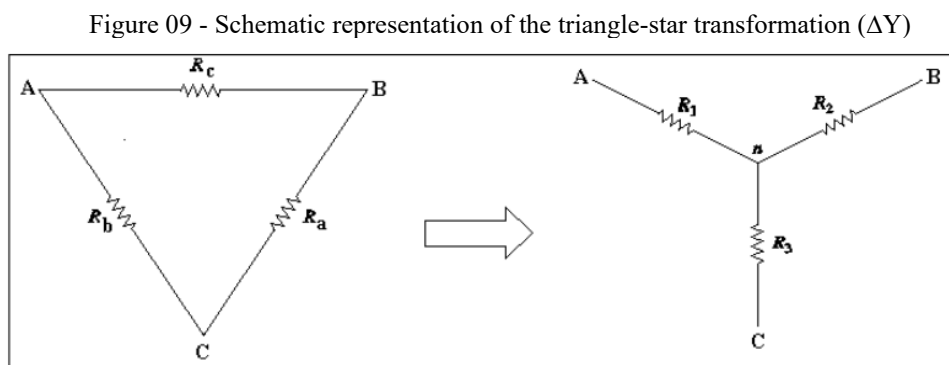
$$\frac{V}{R_{eq}} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3} \quad (17)$$

Thus, in each resistor the voltage drops are igauis, thus remaining the expression to calculate the value of the equivalent resistance of resistors associated in series as follows:

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \quad (18)$$

Triangle-star (ΔY) and star-triangle ($Y\Delta$) association

Figure 9, below, illustrates the triangle-star (ΔY) transformation:



Source: Oliveira (2020)

In order to establish the relationship between the resistors, it is possible to start by equating the following equivalent resistances:

$$R_{AB} = \frac{(R_a + R_b)R_c}{R_a + R_b + R_c} = R_1 + R_2 \quad (19)$$

$$R_{BC} = \frac{(R_b + R_c)R_a}{R_a + R_b + R_c} = R_2 + R_3 \quad (20)$$

$$R_{AC} = \frac{(R_a + R_c)R_b}{R_a + R_b + R_c} = R_1 + R_3 \quad (21)$$

By solving the system of equations that follow from 1 to 3, you can achieve:

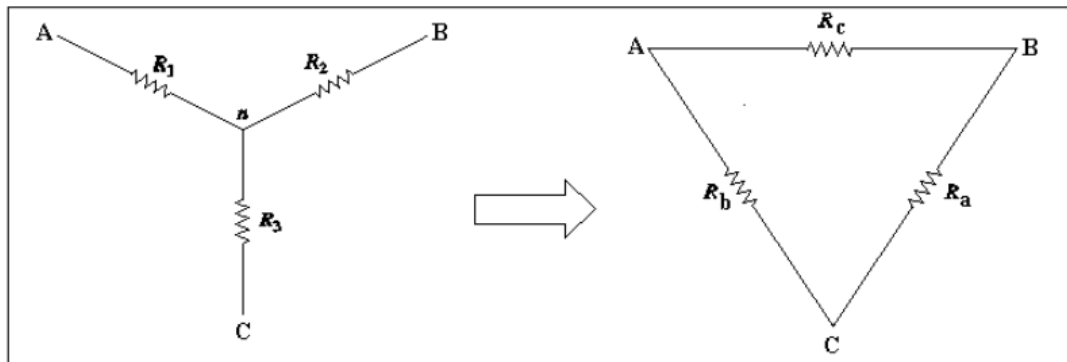
$$R_1 = \frac{R_b R_c}{R_a + R_b + R_c} \quad (22)$$

$$R_2 = \frac{R_a R_c}{R_a + R_b + R_c} \quad (23)$$

$$R_3 = \frac{R_a R_b}{R_a + R_b + R_c} \quad (24)$$

Figure 10, below, demonstrates how to do the opposite transformation, i.e., the star-triangle (Y Δ) transformation:

Figure 10 - Schematic representation of the star-triangle transformation (Y Δ)



Source: Oliveira (2020)

To put the function into an equation, we start in the same way, that is, as in the previous transformation (Δ Y), obtaining the following equations as a result:

$$R_a = \frac{R_1 R_2 + R_2 R_3 + R_1 R_3}{R_1} \quad (25)$$

$$R_b = \frac{R_1 R_2 + R_2 R_3 + R_1 R_3}{R_2} \quad (26)$$

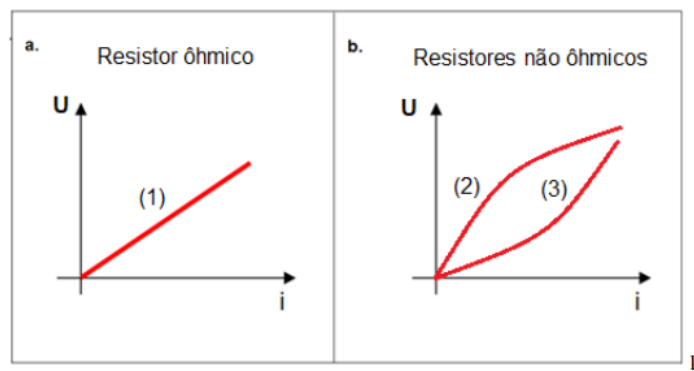
$$R_c = \frac{R_1 R_2 + R_2 R_3 + R_1 R_3}{R_3} \quad (27)$$

Lei of Ohm

According to Halliday and Resnick (2016), Ohm's law can be conceptualized as "the statement that the current through a device is always proportional to the potential difference applied to the device". However, today this position is correct only in certain circumstances, but for historical reasons, it is still called "law."

Figure 6 shows two diagrams. Figure 6.a shows the diagram of the difference between the electric potential of the resistor and the current according to Ohm's law; in Figure 6.b, in this regard, for the two resistors that do not obey Ohm's law, the same as before is noted. The graph is an ohmic resistance line, i.e., the resistance remains the same regardless of the current and voltage values.

Figure 11 - a. Graph $U \times i$ for one ohmic resistor; b. Graphs $U \times i$ for two non-ohmic resistors.



Source: Oliveira (2020)

Also according to Halliday and Resnick (2016), "If the resistance of a device does not depend on the absolute value or polarity of the applied potential difference, it must obey Ohm's law". Therefore, a much-repeated misunderstanding should be avoided that $V = iR$ is a mathematical expression of Ohm's law. In this case, in addition to being applied to any device that is allowed to conduct current (including devices that are not subject to Ohm's law), you also have an equation to determine the concept of resistance.

METHODOLOGICAL PROCEDURES

The research was conducted based on the formulation and implementation of Didactic Units (UD). According to Zabala (1998), UD are "a series of ordered, structured and articulated activities carried out to achieve certain educational objectives". The study aimed to explore the relationship between theoretical concepts in electrodynamics and experimental activities, with emphasis on the citizenship formation of students.

To this end, didactic units were structured based on Vygotsky's theoretical teachings on the zone of proximal development and Davidov's educational principles for the cognitive and moral



development of students. The activities were implemented in a private school in Manaus, Amazonas, using the didactic material of the integrated education system adopted by the institution.

The study involved a second-grade high school class of 23 students who participated voluntarily. The classes were held after the school, lasting fifty minutes each. The students were divided into five groups to carry out the activities, and each group remained together until the end of the UD. All students had access to the experimental equipment used in the activities.

The research adopted a qualitative approach, which considers the data presented and the understanding of the phenomena under analysis. The experimental field took place between December 2019 and December 2020. To assess whether the research objectives were achieved, the activities performed by the students during the use of the UD were analyzed, using as a data source the activities collected by the teachers and the field diaries recorded by the researchers.

Data analysis was performed using the content analysis method, as proposed by Bardin (1997). This method allowed a qualitative analysis of the meaning attributed by the students to each activity carried out in the UD, emphasizing the students' ideas and enabling the verification of the hypotheses established for the research.

RESULTS AND DISCUSSION

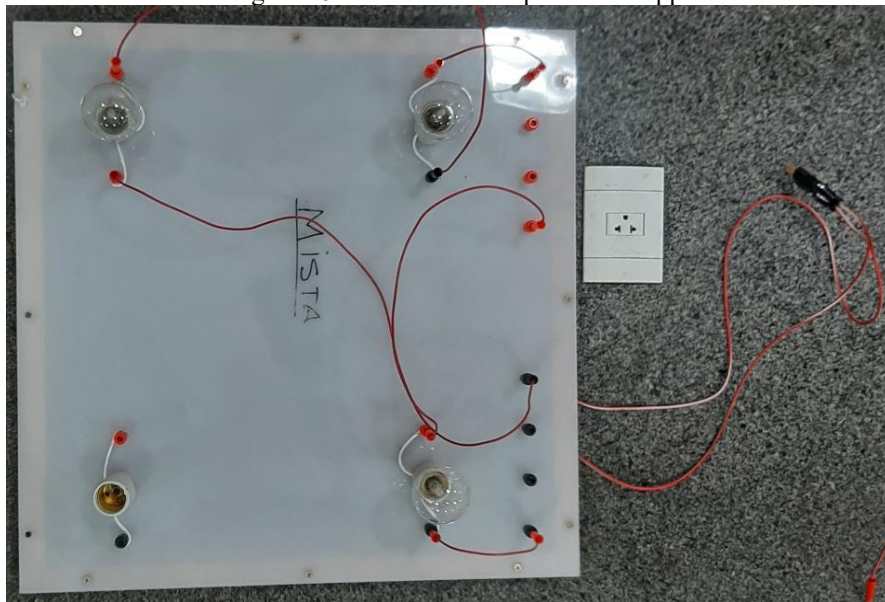
Experimental classes were carried out, here the mixed circuit experiment class stands out. **Mixed circuit experiments.** This class was organized with the second experimentation activity, focused on electrical circuits in parallel, in teams. Not only in this part of the experiment but also in the others, experimental activities were used that are categorized as laboratories with degree of freedom II, according to Carvalho (2010).

For this lesson, the following objectives have been established:

1. Identify if the students are able to recognize in the experimental activity the contents worked on in the previous classes.
2. Verify if students can relate the content worked with everyday situations.
3. Investigate how students behave in the face of experiments in the laboratory;
4. Discuss the results found by the teams about the problems proposed in the investigation script.

To achieve these objectives, an experiment was carried out over a time of 50 minutes, and this activity was carried out in five teams of no more than five students out of a total of twenty-two students who participated in this class. During this class, an experimental apparatus was used, consisting of a 50x50cm acrylic plate, with four 40W and two 60W incandescent lamps, four banana nozzles, 10mm cable, electrical tape, wire clippers, screwdriver and screws.

Figure 16 - Misto circuit experimental apparatus



Source: Oliveira (2020)

An investigation script containing six questions was used as a guide for the experiment, which are described and analyzed below.

During the class, the students were notified that they could not consult any materials other than those of the teacher's guidance, so that the verification of the answers concerning objectives 1 and 2 would not be difficult.

Tables are presented below with the students' responses to the investigative script of this experimental class. Table 1 shows the answer to question 1.

Table 1 - Answers to item (a) Use the materials on the workbench to set up an electrical circuit with two 40W bulbs in series and a third 40W bulb in parallel.

E1	You created the circuit correctly.
E2	You created the circuit correctly.
E3	You created the circuit correctly.
E4	You created the circuit correctly.
E5	Created the partially correct circuit.

Source: Oliveira (2020)

The results of this question were recorded in the teacher's field diary, in the face of an exploratory question focused on analyzing the independence of the teams in the assembly of the experiment. Therefore, it was noted that only the E5 team presented difficulties in assembling the experimental apparatus, requiring the help of the teacher.

In addition, it was clear that the teams became familiar with experimental lessons, absorbing the way the electric current behaves in the circuit, as well as the potential difference over the lamps. Table 2 shows the answers to item b.



Table 2 - Answers to item (b) Before we start the experiment, do you think the bulbs will show the same brightness? Try to justify it.

E1	No. Lamps in series will have less intense brightness than the lamp in parallel.
E2	No. The lamp in parallel will have greater brightness than the lamps in series.
E3	No. The brightness of the lamp in parallel will be greater because it will have greater electrical current.
E4	No. Lamps associated in series will have greater resistance, therefore lower electrical current. Therefore, lamps in series will have lower brightness than lamps in parallel.
E5	No. Lamps in series will shine less.

Source: Oliveira (2020)

The teams, without exception, correctly predicted the intensity of the lamps' brightness. However, it was noticed that there were minimal conceptual variations among the teams to justify their answers. The E3 team relied on the concept of electric current to explain the higher brightness of the lamp in parallel. On the other hand, the E4 team used the concept of resistor association and Ohm's law. On the other hand, the E5 team did not use any form of concept to explain their answer, which demonstrates that this team did not properly appropriate the concepts worked on in the previous classes. Table 3 shows the answers to item d.

Table 3 - Answers to item (d) Using the concept of electrical power, describe in detail what you observe when we connect the circuit set up on the bench.

E1	The lamps in series are not dissipating 40W.
E2	Lamps associated in series have lower brightness than those in parallel. Therefore, the lamps in series are not dissipating 40W and the lamp in parallel is.
E3	Lamps in series have lower brightness.
E4	Although all lamps are 40W, the lamp in parallel is dissipating an electrical power of 40W, while the lamps in series a lower value of 40W.
E5	The power in series lamps is lower.

Source: Oliveira (2020)

The teams, without exception, described in detail what they observed. It should be noted that the E3 team did not use the concept of electrical power to justify their observation, this shows that the team did not associate the brightness of the lamps with the power dissipated by them. It should be noted that the E5 team associated the brightness of the lamps with the concept of electrical power, since they use the term power to describe the brightness between the lamps in the circuit. Table 4 shows the answers to item e.



Table 4 - Answers to item (e) What are the voltage and current in a light bulb connected in parallel? And for the bulbs in series? Calculate.

E1	Parallel: Voltage =120V. Current = 0.33A. Series: 60V for each lamp and the current in both is 0.16A.
E2	The voltage across the lamp in parallel is 120V and its current is 0.33A. The voltage in the lamps in series is 60V each, having the same current of 0.16A.
E3	The voltage in the parallel association is 120V. And in series association, there are identical 60V lamps for each. The electric current in the lamp in parallel is 0.33A and in series association this current is half 0.16A.
E4	In the lamp connected in parallel, the voltage is 120V and the electric current is 0.33A. In series association, the electrical voltage is 60V in each lamp, and the electrical current is approximately 0.16A.
E5	The lamp in parallel has a voltage of 120V and the lamps in series have 60V. The lamp current in parallel is 0.33A and in series a lower value.

Source: Oliveira (2020)

When checking the justifications of the teams, it is noted that teams E1, E2, E3 and E4 obtained the correct values of what was requested in the question. However, it is observed that E5 did not present the value of the electric current in the series association, in addition, it should be noted that when presenting the value of the electrical voltage (60V) in the same association, the team failed to justify that this value would be that of each lamp, which could lead to later errors, such as calculating the electric current with wrong values. Table 5 shows the answers to item f.

Table 5 - Answers to item (f) Using the same circuit as in the previous question, what do you think will happen to the lamp in parallel, which is 40W, if we connect a third lamp, which is also 40W, in series? And what do you think will happen to the other 40W bulbs connected in series?

E1	The lamp in parallel continues with the same brightness. They will have less brightness than before.
E2	It will continue to dissipate the same power. The other lamps in series begin to dissipate an even lower power.
E3	Paralelo continues with the same shine as before. Series changes brightness, becomes smaller.
E4	If we associate a third lamp in series, it will not interfere with the brightness of the lamp in parallel. But in series association the resistance will increase and consequently the current will decrease, causing the brightness to decrease.
E5	This lamp will have the same brightness as before. The other lamps will lose brightness.

Source: Oliveira (2020)

It can be seen that all teams got the question right. However, it can be seen that the E2 team appropriated the concept of electrical power to justify the intensity of the brightness of the lamps. Thus, it was observed that E4 used the concept of association of resistors in series and Ohm's law to justify the difference in brightness (dissipated power) of the lamps in the circuit. Table 6 shows the answers to item g.



Table 6 - Answers to item (g) In which everyday situations do we find mixed associations?

E1	Electronic devices.
E2	Cell phone, video game, television.
E3	Electronic devices.
E4	Electronic devices.
E5	Cell phones.

Source: Oliveira (2020)

The teams, without exception, related the experiment to everyday situations. However, it was possible to notice that the examples given by the teams were the same as those provided by the teacher in the regular course classes.

According to Guimarães (2023), the study of mixed circuits in electrodynamics represents a fundamental integration between electrical and electronic components, providing a comprehensive understanding of the functioning and interaction of elements such as resistors, capacitors, and inductors.

Mixed-circuit analysis in electrodynamics is crucial for the integration between electrical and electronic devices, offering a thorough understanding of the behavior and interconnection of elements such as resistors, capacitors, and inductors.

According to Schettino (2016), mixed circuits are essential for the analysis of complex electrical systems, where direct and alternating current components coexist, allowing the application of theoretical principles of electrodynamics in real-world situations.

Mixed circuits play a key role in the evaluation of highly complex electrical systems, in which direct and alternating current components are present simultaneously. This makes it possible to apply the theoretical principles of electrodynamics in real-world scenarios in practical terms. Chart 1 highlights the categories according to the analysis of the responses.

Chart 4 - Categories drawn up according to the analysis of the teams' responses to the items in the investigative script for the first experiment.

	E1	E2	E3	E4	E5
They created the correct or partially correct circuit.	x	x	x	x	x
They made correct predictions and provided adequate justifications.	x	x	x	x	x
Presented appropriation of the concept of electrical power	x	x		x	x
They found the correct values.	x	x	x	x	
They correctly or partially predicted what would happen.	x	x	x	x	x
They related the experiment to some everyday event.	x	x	x	x	x

Source: Oliveira (2020)



The verification of the categories presented in Chart 1 shows that the objectives of the class were achieved. The students demonstrated independence in the organization of the experimental apparatus, although the E5 team had difficulty in this activity. In addition, it was noticed that the teams made correct predictions of the problems contained in the investigation process.

It was noted that the students appropriated the concept of electric power, with the exception of the E3 team, which showed difficulties in associating the brightness of the lamps with the power, which in turn led to a wrong answer to the question.

The teams, without exception, understood the meshes of the mixed circuit, as well as the appropriation of the concepts of electric current and electric voltage, to justify the values of the latter and the former. Thus, it is possible to notice that the students performed better when making predictions in the development of the experiment in this class.

CONCLUSION

The study on the relationship between theoretical concepts in electrodynamics and experimental activities revealed important contributions to the citizenship formation of students. By integrating theory and practice, it has been possible to provide a deeper understanding of scientific principles while promoting the development of ethical, social, and environmental values.

During the implementation of the didactic units, students demonstrated a high level of engagement and participation in the experimental activities, evidencing a broader understanding of the theoretical concepts when applied in practice. Reflection on ethical and social issues related to the experiments stimulated critical thinking and responsible decision-making.

Through the analysis of the collected data, it was possible to observe that the proposed educational objectives were achieved, with the students demonstrating not only a greater mastery of the electrodynamics contents, but also a greater awareness of the impact of their actions.

The research carried out on the influence of experimental activities in electrodynamics on students' understanding of theoretical concepts revealed significant results. Hands-on experimentation proved to be fundamental to facilitate the internalization of scientific principles, providing students with a deeper and more concrete understanding of the concepts covered in the classroom. Through the experimental activities, the students were able to experience the studied phenomena in practice, which contributed to a more effective and meaningful learning.

The analysis of the way students apply the concepts learned in experimental activities in everyday situations revealed the students' ability to establish connections between the theory studied in the classroom and everyday practice. Students demonstrated knowledge transfer skills, applying the principles learned in real-world contexts and recognizing the importance of electrodynamics in their daily lives.



The study also showed the positive impact of the integration of experimental activities on the development of students' citizenship education. Reflection on ethical, environmental and social issues related to electrodynamics contributed to the awareness and engagement of students as responsible citizens.

By promoting discussion on relevant topics, such as the sustainable use of energy and the environmental impacts of electricity, the experimental activities encouraged students to reflect on their role in society and to adopt more ethical and responsible behaviors.

Thus, it is evident that the integration of experimental activities in the teaching of electrodynamics not only improves the understanding of theoretical concepts, but also contributes to the development of conscious, critical citizens committed to collective well-being.




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Urinary incontinence in the elderly: A comprehensive review of epidemiology, biopathology, clinical manifestations, diagnosis, and treatment

 <https://doi.org/10.56238/sevened2024.010-004>

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ABSTRACT

This study presents a comprehensive review of geriatric urinary incontinence, addressing its subtypes, epidemiology, biopathology, causes in the elderly, transient considerations, functional urinary incontinence, clinical manifestations, diagnosis, and treatment options. The survey, conducted from November 2023 to February 2024, used a systematic approach across biomedical databases, including PubMed, Scopus, and Google Scholar. Relevant search terms were applied, such as "geriatric urinary incontinence", "urge incontinence", "stress incontinence", among others. There was no restriction of language or date of publication in the selection of studies. The literature review highlights that urinary incontinence, characterized by the involuntary extravasation of urine, predominantly affects women and increases with age. It is estimated that up to one-third of community-dwelling older adults and half of hospitalized patients suffer from transient incontinence. The associated costs in the U.S. exceed \$83 billion annually. In addition to the financial impacts, incontinence can lead to serious physical complications and emotional impacts, such as shame and social isolation. The biopathology of urinary incontinence in the elderly involves changes in the detrusor muscle, urethral changes, and prostatic obstruction in men, in addition to neurological factors. Overactivity of the detrusor muscle is the most common cause, followed by stress urinary incontinence and urethral obstruction in men. Functional urinary incontinence, associated with cognition and mobility deficits, is another relevant type. Diagnosis involves clinical evaluation, voiding diary and, in some cases, urodynamic evaluation for complex cases. Treatment encompasses behavioral therapy, pharmacotherapy, and surgical procedures. Behavioral therapy, including voiding habit re-education and pelvic floor exercises, is an essential approach. Medications, such as anticholinergics and mirabegron, are modestly effective but can have side effects, especially in the elderly. Surgical procedures, such as urethral sling and neuromodulation, are options for severe or refractory cases. This review highlights the importance of a comprehensive understanding of geriatric urinary incontinence, not only because of its prevalence and social impacts, but also because of the variety of causes and treatment options available. Future directions for research include further investigations into the efficacy and safety of existing therapies, especially in elderly populations.

Keywords: Geriatric urinary incontinence, Epidemiology, Biopathology, Diagnosis, Treatment.



INTRODUCTION

Urinary incontinence, characterized by the involuntary extravasation of urine in sufficient quantity to constitute a health or social problem, is a prevalent condition that significantly affects the quality of life and well-being of millions of people worldwide, especially the elderly population ². This condition encompasses several forms, including urge incontinence, stress incontinence, and mixed incontinence, each with its own characteristics and implications ⁷.

Urinary incontinence is more than twice as prevalent in women as in men, increasing with age ⁷. It is estimated that between 15 and 30% of older adults living at home, one-third of those seeking emergency care, and half of those living in long-term care facilities suffer from more persistent forms of this condition ⁶. In addition to the physical impact, urinary incontinence has significant emotional implications, affecting self-esteem, interpersonal relationships, and participation in daily activities ¹.

Associated with factors such as pelvic floor muscle weakness, detrusor muscle hyperactivity, and biopathological changes, urinary incontinence in the elderly presents considerable challenges for clinical practice ³. Stigma and the constant need to manage the problem can lead to feelings of shame and social isolation, highlighting the importance of effective interventions to offer comprehensive support to affected individuals ⁷.

This review aims to explore and synthesize the current knowledge on geriatric urinary incontinence, addressing epidemiological and biopathological aspects, causes in the elderly, clinical manifestations, diagnosis, and treatment options. Based on an extensive literature review, we seek to provide a comprehensive and up-to-date view of this condition, highlighting the importance of early identification, appropriate management, and therapeutic approaches to improve the quality of life of older adults affected by urinary incontinence.

By better understanding the complexities of this multifaceted condition, we hope to contribute to improving clinical practice and promoting the well-being of older adults, as well as highlighting the continued need for research and development of new therapeutic approaches. This article thus seeks to provide a solid foundation for healthcare professionals, researchers, and caregivers seeking to understand, treat, and improve the lives of those facing geriatric urinary incontinence.

METHODOLOGY

A literature review was conducted to address geriatric urinary incontinence, its subtypes, epidemiology, biopathology, causes in the elderly, transient considerations, functional urinary incontinence, clinical manifestations, diagnosis, and treatment options. The survey was conducted from November 2023 to February 2024, using a systematic approach across several biomedical



databases, including PubMed, Scopus, and Google Scholar. Relevant search terms were used, such as "geriatric urinary incontinence", "urge incontinence", "stress incontinence", "epidemiology of urinary incontinence", "causes in the elderly", among others. There was no restriction on language or date of publication during the selection of studies.

Initially, relevant articles were identified through electronic databases and consultation of specialized books on geriatric urology and geriatric medicine. After applying the exclusion criteria, which included duplicate studies, articles not directly related to geriatric urinary incontinence, and animal studies, the articles were selected for analysis. Studies addressing aspects related to epidemiology, biopathology, causes in the elderly, clinical manifestations, diagnosis and treatment of geriatric urinary incontinence were included.

During data collection, pertinent information was extracted on the epidemiology of urinary incontinence in the elderly, risk factors, clinical manifestations, biopathological aspects, diagnosis, and treatment options. Data were analyzed qualitatively to identify patterns, trends, and gaps in the literature related to geriatric urinary incontinence. Relevant findings were highlighted and key points were synthesized to provide a comprehensive overview of the different aspects addressed.

This study is a literature review and did not involve the collection of primary patient data, so no ethical review was required. The selection of articles and data analysis were carried out in a systematic manner, however, they are subject to possible selection biases.

LITERATURE REVIEW

Urinary incontinence, characterized by the involuntary extravasation of urine in sufficient quantity to constitute a health or social problem, encompasses several forms such as urge incontinence, stress incontinence and mixed incontinence³. In addition to the physical impact, this condition has significant emotional implications, affecting self-esteem, interpersonal relationships, and participation in daily activities⁵. Associated with factors such as pelvic floor muscle weakness and detrusor muscle overactivity, urinary incontinence is more prevalent in women, especially during and after pregnancy⁷. Stigma and the constant need to manage the problem can lead to feelings of shame and social isolation, highlighting the importance of effective interventions, such as behavioral therapies, medications, and surgeries, to offer comprehensive support to affected individuals⁷.

EPIDEMIOLOGY

Urinary incontinence is more than twice as prevalent in women as in men, increasing its incidence with advancing age. Surprisingly, at least 18% of female university students report some degree of urinary incontinence, indicating the extent of this condition⁷. Estimates indicate that between 15 to 30 percent of older adults living at home, one-third of those seeking emergency care,



and one-half of those living in long-term care facilities suffer from more persistent forms of the condition ⁶.

In addition to the financial aspects, urinary incontinence can lead to serious physical complications, such as perineal rashes, pressure ulcers, urinary infections, sepsis, falls, and fractures ⁹. Emotionally, it is linked to embarrassment, stigmatization, isolation, depression, anxiety, sexual dysfunction, and even the risk of institutionalization ¹⁰. For many critically ill older adults, incontinence is considered a worse outcome than death.

Despite its adverse consequences and high prevalence, geriatric incontinence continues to be widely neglected, both by patients themselves and by health professionals ¹¹. This lack of attention is especially worrisome because the increasing prevalence with age is more related to diseases and functional disabilities than to age itself ³. What is encouraging is that urinary incontinence is generally treatable and often curable in all age groups, including in frail older adults ⁷. However, the approach to elderly and frail patients should be more comprehensive than that used in younger patients, taking into account their specific conditions and needs ³.

BIOPATHOLOGY

Urinary continence at any age depends not only on the integrity of lower urinary tract function, but also on adequate mental activities, mobility, motivation, and manual dexterity ⁸. Although urinary incontinence in younger patients is rarely associated with deficits in these areas, it is common for it to occur in elderly patients, and can cause or aggravate urinary incontinence and influence therapeutic approaches ².

With advancing age, bladder capacity does not change, but bladder sensitivity and contractility decrease ⁶. At the cellular level, the detrusor (smooth) muscle develops a "dense band pattern", characterized by dense sarcolemma bands with depletion of caveoles ^{6,7}. This depletion contributes to the age-related decline in bladder contractility ⁶. In addition, an incomplete disjunction pattern develops, with scattered protrusion junctions, which may be the basis for the high prevalence of involuntary bladder contractions (detrusor overactivity) in elderly individuals of both sexes ³. Ischemia and/or inflammation of the bladder are also probable factors ⁷. In women, urethral length and sphincter strength decrease, while in most men the prostate increases in size, causing obstruction in about half of them ⁷. The post-void residual volume in the bladder also increases in both sexes, but typically to less than 100 mL ³.

In addition, the elderly often excrete most of their fluid intake during the night, even in the absence of venous insufficiency, kidney disease, congestive heart failure, or prostatism ³. This change in nocturnal fluid excretion is associated with increased sleep disturbances with age, leading



to most older adults having one or two episodes of nocturia per night ³. Although none of these alterations directly cause urinary incontinence, all of them predispose to it ³.

This predisposition, together with the increased likelihood of an elderly person suffering from further pathological, physiological, or pharmacological aggravation, explains the increased prevalence of urinary incontinence with age ^{3,7}. Therefore, the onset or exacerbation of urinary incontinence in an elderly individual is usually related to precipitating factors that go beyond the lower urinary tract and are amenable to medical intervention.

In addition, treatment of precipitating factors alone may be sufficient to restore continence, even in the presence of urinary system dysfunction ⁶. For example, an episode of hip arthritis in a woman with age-related detrusor hyperactivity may decrease mobility enough to convert urinary urgency into urinary incontinence ^{3,7}. Arthritis treatment, rather than involuntary contractions of the detrusor muscle, not only restores continence, but also relieves pain and improves mobility ¹². Due to its frequency, reversibility and association with morbidities other than urinary incontinence, transient precipitating causes should be addressed as a priority ¹².

TRANSIENT URINARY INCONTINENCE IN THE ELDERLY: CAUSES AND CONSIDERATIONS

Transient urinary incontinence affects up to one-third of community-dwelling older adults and up to half of acutely hospitalized patients ¹³. Although most transient causes are outside the lower urinary system, three points deserve to be highlighted. First, the risk of transient urinary incontinence increases when there are not only physiological but also pathological changes in the lower urinary system ⁷. Anticholinergic agents are more likely to cause overflow urinary incontinence in individuals with weak or obstructed bladders, while excess urine output may lead to urge urinary incontinence in people with detrusor overactivity or impaired mobility ^{6,11}. Secondly, these transient causes can persist if left untreated and should not be ignored just because urinary incontinence is long-standing ⁷. Third, identifying the most common cause is of little value, as causes vary between individuals, and geriatric urinary incontinence is rarely the result of a single factor ^{3,7}.

CAUSES OF URINARY INCONTINENCE IN THE ELDERLY

The causes of established urinary incontinence related to the lower urinary system are diverse and have significant implications for clinical management ³. Overactivity of the detrusor muscle, also known as involuntary contraction of the bladder or overactive bladder, is the most common cause of dysfunction of the lower urinary system in incontinent older adults, accounting for approximately two-thirds of cases ¹⁰. From a histological point of view, detrusor muscle hyperactivity is associated with the complete disjunction pattern, characterized by widening of the intercellular space, reduction



of normal (intermediate) muscle junctions, and formation of new protrusion junctions and very close pillars that connect the cells in chains⁷. These connections can facilitate the change of cell coupling from a mechanical mechanism to an electrical mechanism, resulting in involuntary contraction of the bladder⁷. Other potential causes include ischemia, abnormalities in suburothelial myofibroblasts, and alterations in the structural and functional control mechanisms of the central nervous system⁶.

There are important implications for detrusor muscle overactivity, which can occur in two distinct forms in the elderly, one with preserved contractile function and the other with contractility impairment. Firstly, patients with weakened bladder due to detrusor hyperactivity with compromised contractility often develop urinary retention, which may mimic conditions observed in cases of outlet obstruction and underactivity of the detrusor muscle^{7,9}. Secondly, even in the absence of retention, this condition can mimic other causes of urinary incontinence of the lower urinary system⁷. For example, if involuntary contraction of the detrusor muscle occurs during stress maneuvers without a weak contraction being detected, detrusor hyperactivity with impaired contractility may be misdiagnosed as stress urinary incontinence^{6,7}. In addition, this condition may be associated with urinary urgency, frequency, weak urinary flow, high amount of residual urine, and bladder trabeculation, which may mimic prostatic obstruction in men^{3,7}. Treatment with anticholinergics for this condition may result in urinary retention due to other urinary conditions, requiring alternative therapeutic approaches⁷.

Stress urinary incontinence, which is the second most common cause of urinary incontinence in older women and the predominant one in middle-aged women, usually reflects urethral hypermobility associated with some degree of sphincter weakness^{3,7}. On the other hand, stress urinary incontinence is rare in men, except when resulting from sphincter injury after radical prostatectomy⁷. Urethral obstruction is the second most common cause of urinary incontinence in older men, although most men with obstruction are not incontinent³. When obstruction is associated with urinary incontinence, it usually manifests as urge urinary incontinence due to the associated detrusor muscle overactivity; Overflow urinary incontinence is uncommon¹². Outflow obstruction is rare in women, but may occur due to suspension of the bladder neck or urethral fold associated with a large cystocele^{7,12}.

Underactivity of the detrusor muscle is usually idiopathic and, when it causes urinary incontinence, is associated with overflow urinary incontinence (in less than 10% of urinary incontinence cases)⁶. Damage to the innervation of the lower urinary system can result in several types of dysfunction⁷. A brain injury can lead to detrusor muscle overactivity, while a spinal cord injury above the sacral level can cause detrusor muscle overactivity and detrusor-sphincter dyssynergia, leading to bladder outlet obstruction and hydronephrosis^{6,7,12}. On the other hand, a spinal cord injury below the sacral level can result in hypoactivity of the detrusor muscle and/or



weakness of the sphincter ⁷. Damage to peripheral and autonomic nerves can also cause additional complications ¹².

FUNCTIONAL URINARY INCONTINENCE: CAUSES AND IMPLICATIONS

"Functional" urinary incontinence, often considered a distinct type of geriatric urinary incontinence, is associated with deficits in cognition and mobility ¹². This term suggests that urinary system function is normal, however, even in continent elderly, normal urinary function is rare and uncommon in incontinent older adults ^{11,12}. It is important to note that urinary incontinence is not inevitable, even in cases of dementia or immobility ³. In institutionalized older adults with more severe dementia, about 20% are continents; Among those who have the ability to transfer from bed to chair, almost half are continent ³.

Patients with functional impairment are more susceptible to factors that cause transient urinary incontinence ⁹. The diagnosis of functional urinary incontinence may arise from failure to identify these reversible causes ³. In addition, if these individuals with functional impairment also have urethral obstruction or stress urinary incontinence, they may benefit from specific treatments ^{4,5}. However, it is important to note that functional impairment often contributes to urinary incontinence ⁵. An approach that investigates both the causes of functional urinary incontinence and those of transient urinary incontinence can sufficiently improve the condition, avoiding the need for further investigations ².

CLINICAL MANIFESTATIONS

The manifestations of transient urinary incontinence can vary depending on the underlying condition. In established urinary incontinence, detrusor overactivity usually results in urge urinary incontinence ⁷. This is characterized by urine leakage that follows a sudden or intensified urge to urinate, moderate to large urine volume loss, increased urinary frequency (more than 8 extravasations/day), nocturia, and urinary incontinence during the night ^{3,6}. However, some patients with detrusor muscle overactivity may not have symptoms of urinary urgency ⁶.

On the other hand, stress urinary incontinence results in urine leakage that coincides instantaneously with the onset and cessation of coughing or another cause of increased abdominal pressure, and is rare during the night ². Some patients may report both types of urinary incontinence, known as mixed urinary incontinence, but it is helpful to determine which component is more bothersome to the patient ⁷. In men with sphincter injury after radical prostatectomy, involuntary urine leakage can be described as similar to intermittent dripping from a faucet ¹. Occasionally, patients present with urinary incontinence, which is more difficult to characterize clinically without additional testing ⁷.



DIAGNOSIS

Targeted clinical assessment along with the use of a voiding diary plays a crucial role in understanding and treating urinary incontinence⁷. The voiding diary can offer valuable diagnostic insights and guide the treatment plan⁷. For example, identifying specific patterns of urinary incontinence can reveal important information. For example, the occurrence of urinary incontinence only between 8 a.m. and 12 p.m. may be related to the use of a loop diuretic taken in the morning¹². Similarly, overnight urinary incontinence in a man with dementia and congestive heart failure, but not during a period of napping in his wheelchair, is likely linked to nocturnal diuresis associated with heart failure, rather than dementia or mobility difficulty^{6,12}.

Another example is the case of a woman with volume-dependent stress urinary incontinence, who may experience urine leakage only on the way to the bathroom after a night's sleep when her bladder is fuller, usually more than 400 mL. These detailed patterns can provide valuable clues for diagnosis and treatment. In addition, the assessment of post-void residual volume is essential, as urinary retention can be difficult to detect with physical examination alone^{1,8}. Post-void residual volume should be routinely assessed, except in young women with a classic picture of stress urinary incontinence who seek only behavioral therapy^{7,10}.

Regarding urodynamic evaluation, it is generally recommended in situations where diagnostic certainty is required, such as before surgical procedures in elderly patients, or when there is suspicion of a serious underlying cause of urinary incontinence, such as brain injury, bladder or prostate carcinoma, among others^{6,7}. Urodynamic evaluation comprises a series of tests designed to evaluate the lower urinary system during the filling and emptying phases of urination⁷. The choice of tests depends on the specific clinical picture and the questions to be answered⁷. For example, measuring detrusor muscle pressure and urine flow during urination can detect urethral obstruction, while monitoring bladder and urethral pressures during bladder filling and coughing can be useful for patients with an atypical mixed urinary incontinence⁶.

TREATMENT

The comprehensive treatment of urinary incontinence requires a multifactorial approach, considering the transient causes, underlying clinical conditions, functional disabilities and changes in the urinary system itself^{5,6}. Sanitary napkins and diapers play a role as adjuvants, but they are not a substitute for a more specific treatment^{4,5}.

Behavioral Therapy

Behavioral therapy is an important pillar in the treatment of urinary incontinence. This includes guidance on proper urination habits, the use of a voiding diary to monitor patterns,



adjustments in fluid and caffeine intake, weight loss for women with overweight and stress urinary incontinence, adequate physical activity, and the use of aids such as urinals ^{7,12}. Bladder and pelvic floor retraining exercises are also essential to strengthen the muscles involved ⁶. Studies show that behavioral therapy is comparable to pharmacotherapy for urge urinary incontinence ^{8,10,11}. For stress urinary incontinence, behavioral therapy has been shown to be more effective than medications, although it is less effective than surgery ⁷.

Pharmacotherapy

FDA-approved medications for urge urinary incontinence, known as bladder relaxants, have been shown to be modestly effective ⁷. These drugs include anticholinergics and the β 3-adrenergic agonist mirabegron ⁶. Although anticholinergics are effective, they can cause side effects such as xerostomia, constipation, and mental confusion, especially in elderly patients with cognitive deficits ^{7,12}. The choice of medication depends on the individual characteristics of the patient ⁹. Desmopressin is discouraged in the elderly due to its adverse effects ⁷. It is essential to start with a low dose and gradually increase to minimize side effects ⁷. The combination of behavioral therapy and drugs for urge urinary incontinence may be more beneficial than using treatments alone ^{11,13}.

Surgical Procedures

Surgery is an effective option for stress urinary incontinence and mixed incontinence in women of all ages, including the elderly ⁷. Procedures such as urethral sling and urethral tape suspension have long-lasting results ⁶. For more complex cases or in men after radical prostatectomy, an artificial sphincter may be an option ⁷. Periurethral injections of bulking agents are useful in mild cases of stress urinary incontinence ¹². For urge urinary incontinence, surgical interventions such as neuromodulation, tibial nerve stimulation, and onabotulinum toxin injections are considered as third-line options ⁷. However, these procedures have similar efficacy to pharmacotherapy and may not be as effective in elderly patients, who are also at higher risk of urinary retention and infections ⁷.

RESULTS AND DISCUSSION

A review of the literature revealed a significant prevalence of urinary incontinence in the elderly, being more than twice as common in women as in men ⁷. It is estimated that between 15 to 30% of older adults living at home, one-third of those seeking emergency care, and one-half of those living in long-term care facilities suffer from more persistent forms of the condition ⁶. These figures highlight the breadth and relevance of geriatric urinary incontinence as a public health problem.

The impact of urinary incontinence on the quality of life of the elderly is significant, affecting not only physical health, but also emotional and social aspects ^{1,5}. Studies show that incontinence is



associated with decreased self-esteem, social isolation, depression, and anxiety¹⁰. In addition, the constant need to manage the problem can lead to a reduction in participation in daily activities and interpersonal relationships^{1,5}.

Understanding the biopathology of urinary incontinence in the elderly is crucial for the development of effective therapeutic strategies³. Histological studies have shown that, with advancing age, changes occur in the detrusor muscle, such as the development of a "dense band pattern" characterized by dense sarcolemma bands and depletion of the careolas^{7,12}. These changes contribute to the age-related decline in bladder contractility and to the prevalence of involuntary bladder contractions (detrusor overactivity) in the elderly^{3,12}.

In addition, in elderly women, a shortening of the urethral length and a reduction in sphincter strength are observed, while in men, the increase in the size of the prostate can cause obstruction in about half of the cases⁷. These anatomical changes contribute to stress urinary incontinence and urethral obstruction, respectively, in both sexes.

Urinary incontinence in the elderly is also associated with disorders in neurological control of the bladder⁶. Brain and spinal cord injuries can lead to detrusor muscle overactivity, while peripheral nerve damage can result in varied voiding dysfunction^{6,7}. Understanding these pathophysiological mechanisms is critical to directing appropriate treatment.

Overactivity of the detrusor muscle is the most common cause of urinary incontinence in the elderly, accounting for approximately two-thirds of cases^{7,12}. This phenomenon is associated with histological changes, such as the complete disjunction pattern, which can mimic other causes of urinary incontinence of the lower urinary system (Yokoyama et al., 2013; Abrams et al., 2003). In addition, detrusor muscle underactivity, although less common, is associated with overflow urinary incontinence and may be idiopathic or related to neurological damage (Gammie et al., 2013).

The diagnosis of urinary incontinence in the elderly involves a systematic approach, which includes a detailed clinical history, symptom assessment, physical examination, and specific tests^{1,8}. Voiding diaries are useful tools for recording voiding patterns, while bladder ultrasound can be used to assess residual post-urination and structural abnormalities⁷. Urodynamics is considered the gold standard for assessing bladder and urethral function, aiding in the differential diagnosis between different forms of urinary incontinence^{3,6}.

The treatment of urinary incontinence in the elderly is multifaceted and should be customized according to the underlying cause, individual characteristics of the patient, and the severity of symptoms. Non-pharmacological interventions, such as pelvic floor exercises and behavior modification, are often recommended as first-line treatment^{5,6}. Studies show that pelvic floor training can significantly improve symptoms in elderly women with stress urinary incontinence⁶.



In addition, assistive devices, such as pads and external catheters, may be useful for managing urinary incontinence in older adults with limited mobility or in cases of severe incontinence^{4,5}. For more complex cases, pharmacological therapy may be considered, including the use of antimuscarinics for urge incontinence and alpha-adrenergic agonists for overflow incontinence⁷. However, it is important to consider the side effects and potential drug interactions in frail older adults^{3,7}.

In selected cases that are refractory to conservative treatment, surgical interventions, such as urethral sling for stress urinary incontinence in women or prostate reduction surgeries in men, may be recommended⁷. The choice of surgical intervention should be carefully evaluated, taking into account the patient's general health, expectations, and associated risks⁷.

This review highlights the complexity and relevance of geriatric urinary incontinence, a condition that significantly affects the quality of life and well-being of older adults. Understanding the biopathology, causes, clinical manifestations, and treatment options is critical for an effective and personalized therapeutic approach. Integration of non-pharmacological, pharmacological, and surgical interventions, where appropriate, can offer significant improvements in patients' symptoms and quality of life.

However, it is essential to acknowledge the limitations of this review, including the lack of specific data on subgroups of older adults, heterogeneity in the included studies, and the possibility of selection bias. Future research should continue to explore new therapies, prevention strategies, and multidisciplinary approaches to improve the management of geriatric urinary incontinence. Collaboration between healthcare professionals, researchers, and caregivers is key to addressing this public health challenge and improving the quality of life for older adults affected by urinary incontinence.

CONCLUSION

Geriatric urinary incontinence represents a significant public health challenge, affecting the quality of life and well-being of millions of older adults worldwide. This review addressed several aspects related to urinary incontinence in the elderly, including its epidemiology, biopathology, causes, clinical manifestations, diagnosis, and treatment options. The results highlight the complexity of this condition, which is influenced by a complex interplay of anatomical, physiological, and neurological factors.

The considerable prevalence of urinary incontinence in the elderly, especially in women, highlights the importance of effective prevention and treatment strategies. The impact on the quality of life of affected older adults, including decreased self-esteem, social isolation, and impairment of daily activities, underscores the need for holistic and personalized approaches.



Understanding the underlying biopathology, which includes changes in the detrusor muscle, shortening of urethral length in women, and urethral obstruction in men, is critical for differential diagnosis and therapeutic planning. The diversity in clinical manifestations, ranging from urge incontinence to stress incontinence, requires a careful and multidisciplinary approach.

The available treatment options, which include non-pharmacological interventions, pharmacotherapy, and surgical procedures, offer a variety of approaches to managing urinary incontinence in older adults. However, it is crucial to consider the individual characteristics of the patient, the risks and benefits of each intervention, as well as the potential side effects, especially in frail older adults.

Ultimately, this review highlights the ongoing need for research and collaboration between healthcare professionals, researchers, and caregivers to advance the field of geriatric urinary incontinence. More effective prevention strategies, new therapies and multidisciplinary approaches are essential to improve the management of this condition and thus improve the quality of life of affected older adults.

Therefore, to address this public health challenge, it is critical to continue to explore new therapies, prevention strategies, and multidisciplinary approaches to improve the management of geriatric urinary incontinence. Collaboration between healthcare professionals, researchers, and caregivers is crucial to identify better treatment strategies, improve the quality of life for affected older adults, and reduce the overall impact of this condition.




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Control of revenue waiver by the Federal Court of auditors in the light of the principle of effectiveness

 <https://doi.org/10.56238/sevened2024.010-005>

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ABSTRACT

Revenue waivers, or tax expenditures, are as old as taxation itself. The objective is to carry out a theoretical debate on the control of revenue waiver by the Courts of Auditors in the light of the principle of effectiveness. For this, a bibliographic study was carried out in order to understand the different theoretical dialogues of the authors who deal with the theme in question. For this, articles, books, thesis, dissertations, in the databases of Google Scholar, SciELO, CAPES thesis and dissertation database and the TCU platform were consulted. Revenue waiver is the act in which the public manager grants incentives or benefits of a tax, financial and credit nature to citizens. Since the waiver of revenue is justified by the intention to move the action of the agents who choose to adopt this or that conduct, taking into account, among other factors, the reduction of the tax burden that would normally be imposed on them, the efficiency of the tax policy depends on the capacity of the measure to, in practice, induce the behavior of individuals. It is concluded that despite the benefits reaped by the rulers, they must observe that the act of renouncing revenues must be accompanied by the compensatory legal measures provided for this purpose, under penalty of such act not being validated by the national legal system.

Keywords: Courts of Auditors, Resignation, Revenue, Principle of effectiveness.

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INTRODUCTION²

The State uses taxation to collect the necessary resources for activities of public interest. In this sense, taxation can also represent a fundamental instrument for the promotion of other actions, through norms that have different functions parallel to collection, such as the inductive function, which aims to provoke certain behaviors as a response to impulses conveyed by the norm itself, which will directly influence the economic and social order. called extra-taxation (Souza, 2020).

Taxation is, therefore, a means of implementing economic and social policy or granting a tax benefit to an individual. The so-called indirect tax expenditures define the extra-fiscal tax rules that are introduced to grant exemption or reduction of the tax burden levied on a specific sector of the economy with the purpose of achieving economic policy. In other words, indirect tax expenditures are justified by revenue waivers (Queiroz, 2019).

Thus, governments apply public resources basically according to two major aspects: public expenditure, which represents the most well-known way of using the revenues earned, and the renunciation of revenue, which is characterized, in essence, by the intentional refusal of the government to exercise its collection power (Mendes, 2012).

Revenue waivers, or tax expenditures, are as old as taxation itself. However, the Brazilian legislation, from a normative point of view, has not established a concept for tax benefit or revenue waiver. For the purposes of law enforcement, the rule that came closest to this topic was the Fiscal Responsibility Law (Complementary Law 101/2000), which presents in paragraph 1 of article 14 an exemplifying list of items that are considered as revenue waivers (Oliveira, 2020).

In this sense, the waiver of revenue can be understood both as a remission of subsidy, amnesty, and exemption from credit, as well as a change in the tax rate or modification in the calculation basis – which generates a reduction in fees and contributions. When applied responsibly, revenue waivers can be considered a public policy (Nóbrega; Figuerêdo, 2002; Oliveira, 2020).

In addition, the Federal Court of Auditors will be able to verify whether the revenue waiver has achieved its purpose, which is to achieve a social benefit, in general, if the volume of revenue actually waived at the end of the period corresponds to the projected volume and if this amount compromises public accounts (Mendes, 2012; Souza, 2020).

The Federal Court of Accounts was created in 1891, during the Republic, so it has more than a century of existence. This institution, due to federative symmetry, was initially designed to monitor the budget execution carried out by public managers (Grosser, 2019).

Thus, renouncing revenue linked to federal taxes is a competence of the Union that can only be exercised through constitutional or legal provisions, and the basis on infra-legal norms is

² Garcia, F. A. M. (2024). CONTROL OF REVENUE WAIVERS BY THE FEDERAL COURT OF AUDITORS IN THE LIGHT OF THE PRINCIPLE OF EFFECTIVENESS. REVISTA FOCO, 17(4), e4736. <https://doi.org/10.54751/revistafoco.v17n4-078>.

prohibited. The other political entities competent to institute taxes (states and municipalities) also have the legitimacy to renounce revenues arising from their own tax impositions, but this type of waiver is not the object of this work, which will be limited to the federal sphere (Almeida, 2001).

Considering the importance of the subject in question, which is also addressed throughout the Brazilian legal framework: constitutional, legal and infra-legal, it is evident the need for studies as a way to offer new possibilities of information in this area. It is also essential to mention that the Federal Constitution of 1988, in its articles 70 and 165, § 6, establishes control over revenue waivers, with the clear objective of promoting the financial balance of the union, states and municipalities (Almeida, 2001; Oliveira, 2020).

In the case of legal norms, effectiveness consists in the ability to achieve the objectives expressed therein, which ultimately become the realization of the legal dictates intended by the legislator. That is why it is said that the legal effectiveness of the norm designates the quality of producing, to a greater or lesser extent, legal effects, by regulating, from the outset, the situations, relationships and behaviors that it envisages. In this sense, effectiveness refers to the applicability, enforceability or enforceability of the rule, as a possibility of its legal application (TCU, 2019).

In this sense, the effectiveness can be technical, social or legal. Technical effectiveness refers to legislative technique, i.e. when one standard depends on another to be applied or when certain equipment is required. In the event that the additional standard is missing or the equipment does not exist, the standard lacks technical effectiveness. Social efficacy or effectiveness refers to the production of the consequences desired by the elaborator of the norms, which is verified when the conduct contained in the prescriptions of the norm is complied with by the addressee. As for legal effectiveness, this is the property of the legal fact of causing the intended effects in the prescriptions of the norm, that is, if the fact described in the hypothesis of the norm occurs, the effects cannot fail to occur automatically and infallibly (at least in terms of language) (TCU, 2019).

However, it is worth mentioning that the effectiveness of a standard may suffer limitations or even depend on another standard to be realized. This is the case of rules of limited effectiveness, which, despite erecting a provision for conduct, assert that a certain concept or factor will be dictated by a complementary rule, or under the terms of the law, when the law has not yet been enacted (TCU, 2019).

In view of the contextualization of the theme presented so far, the discussions carried out in this article aim to seek a theoretical debate on the control of revenue waiver by the Federal Court of Accounts in the light of the principle of effectiveness.

For this reason, the article was prepared using a bibliographic study in order to understand the different theoretical dialogues of the authors who deal with the theme in question, consulting articles,

books, thesis, dissertations, in the databases of Google Scholar, SciELO, CAPES thesis and dissertation database and the TCU platform.

The syntheses of the studies that were read in full are available in the discussion below, highlighting the most relevant points that are consistent with the proposed objective of this study.

COURT OF AUDITORS OF THE UNION: CONCEPTS AND LEGAL SYSTEMS

The Federal Court of Accounts is the external control body of the federal government and assists the National Congress in the mission of monitoring the country's budgetary and financial execution and contributing to the improvement of Public Administration for the benefit of society. To this end, it aims to be a reference in the promotion of an effective, ethical, agile and responsible Public Administration (Brasil, 2016).

The Court of Auditors is responsible for the accounting, financial, budgetary, operational and patrimonial supervision of the country's public bodies and entities regarding legality, legitimacy and economy. In addition to the constitutional and exclusive competences of the TCU, article 71 of the CF/88, in turn, establishes the role of the Federal Court of Accounts as an auxiliary body of the National Congress with regard to the function of external control, whose inspection activities cover, in the words of Law 8,443/92 (article 1, § 1), revenue waivers (Brazil, 2016).

Revenue waiver is the act in which the public manager grants incentives or benefits of a tax, financial and credit nature to citizens. The first refers to indirect government expenditures resulting from the tax system itself (Brasil, 2021).

Regarding the concept of revenue waiver, Nóbrega and Figueiredo (2002) state that:

To renounce revenue is to stop receiving amounts that could be used to carry out expenses aimed at various rights and the implementation of public policies, hence the need to be limited, so that they are carried out only when necessary in the public interest. Article 14, § 1 of the Fiscal Responsibility Law lists the modalities of revenue waivers, namely, amnesty, remission, subsidy, presumed credit, exemption on a non-general basis, change in the tax rate or modification in the calculation basis that generates a discriminated reduction of taxes and contributions, in addition to other benefits that correspond to differentiated treatment. It is understood that the list present in article 14, § 1 is only illustrative, since any differential treatment resulting from a benefit is also considered a waiver of revenue, as it may affect the balance between revenues and expenses (Nóbrega; Figueiredo, 2002, p. 40).

Still on this subject, the TCU states that:

The waivers of tax revenues constitute a relevant portion of public resources allocated to meet economic and social objectives, either by encouraging economic sectors or geographic regions, or by compensating taxpayers in the face of insufficient state action. As it is a source of funding for public policies, like the budget, it deserves due attention from the Legislative Branch regarding its correct allocation and application (TCU, 2021, p. 4).

Thus, a piece of information that is always important to mention is the fact that, when the revenue waiver is applied responsibly, it is considered public policy. Revenue waiver is an

instrument that has been applied in several countries as a way to improve the economy through tax incentives (Nascimento, 2012). In this direction:

[...] instruments available to the Government to promote the development of the economy and enable the increase of jobs in a certain area of the territory where they are applied. They imply a reduction in the amount owed by the taxpayer who has the status of beneficiary, through exemption, amnesty, remission and other concessions allowed by law (Nascimento, 2012, p.115).

So, as a way to ensure the generation of more jobs, and consequently improve the economy, tax incentives are granted from the renunciation of revenues. However, such benefits are often suspected that the expenses are not satisfactorily justified, which compromises revenue management (Queiroz, 2019).

The waiver of revenue is, therefore, a mechanism that stimulates economic behaviors aimed at social interests, not representing a threat to public finances. On the contrary, when applied responsibly, it is positive, however, its indiscriminate and impersonal concession can be harmful to the public coffers and public purposes. The damages resulting from indiscriminate concessions of tax incentives were recurrent in Brazil in the 90s with the so-called tax war, with the lack of cooperativism among the entities of the Federation, mainly States and Municipalities, which, through horizontal competition, sought resources, encouraging the installation of industries in their territories, based mainly on the granting of tax benefits (Nóbrega; Figuerêdo, 2002, p. 28-29).

THE CONTROL OF REVENUE WAIVERS BY THE FEDERAL COURT OF ACCOUNTS

Since the waiver of revenue is justified by the intention to move the actions of the agents who choose to adopt this or that conduct, taking into account, among other factors, the reduction of the tax burden that would normally be imposed on them, the efficiency of the tax policy depends on the capacity of the measure to, in practice, induce the behavior of individuals (Queiroz, 2019).

Another issue to be highlighted concerns the absence of prior evaluation when creating or extending tax benefits, with the objective of analyzing the best format for public policy, considering the defined objectives, the administrative and regulatory structure available and the cost to society. In other words, in general, *no ex ante evaluation is carried out* to verify whether it would be more appropriate to promote public intervention through the public budget or via tax waivers (Oliveira, 2020). Moraes et al (2024, p. 9) define that "the public budget reflects the priorities and political options of government officials towards the various agents existing in the political community".

Recently, the TCU responded in Ruling 2692/2021 to a query formulated by the Federal Senate on the rules of the Fiscal Responsibility Law regarding the waiver of revenue and its effects on the Annual Budget Law (TCU, 2021).

Basically, in item 9.3.1 of the ruling, it clarifies that, if the waiver is instituted based on item I of article 14 of the Fiscal Responsibility Law (as provided for in the LOA and without affecting the fiscal targets established in this law), the offset of item II is only dispensable if the budgetary-

financial effects of the waiver occur as of the exercise of the LOA. For example, if a waiver is created in year X1, whose budgetary-financial impacts were considered in the LOA of year X2 and do not impact the fiscal targets of year X2, X3, X4, etc., such waiver does not need to be offset. Item 9.3.2 of this judgment states that, once it is proven that the waiver was considered in the LOA and that it will not affect the fiscal result targets, no compensation measures are required (TCU, 2021).

Taking into account only the year 2020 in Brazil, there are 120 items of tax expenditures in force, that is, more comprehensively, there are several tax expenditure mechanisms in the Brazilian context. Thus, public policies financed through tax waivers that aim to meet economic, social or regional development objectives. Examples of these policies are: the incentive to research, development and innovation, created by Law 8.248/1991, known as the Information Technology Law; the National Program for Cultural Support (Pronac), object of Law 8.313/1991, known as the Rouanet Law; University for All Program (Prouni), created by Law 11.096/2005; and the certification of charitable social assistance entities (Cebas), regulated by Law 12,101/2009 (Oliveira, 2020).

However, in the case of revenue waivers, the Government no longer receives certain amounts to which it would be entitled. If, on the one hand, such a measure can be justified for reasons of specific public policies, there is no denying, on the other hand, that such waiver implies, at first, a limitation of the State's financial capacity to meet other demands of society arising from the need to satisfy other rights (Oliveira, 2020).

Regarding the effectiveness of the rule specifically, Law 13,606/2018 provides the following express provision:

Art. 38. The Federal Executive Branch, with a view to complying with the provisions of item II of the *caput* of article 5 and article 14 of Complementary Law No. 101, of May 4, 2000 (Fiscal Responsibility Law), shall estimate the amount of the tax waiver and the costs arising from the provisions of item II of the *caput* of article 2. in item II of the *caput* of article 3, and in arts. 14, 15, 18, 19, from 20 to 24, from 26 to 28, from 30 to 33 and 36 of this Law, shall include them in the statement that accompanies the annual budget bill, pursuant to paragraph 6 of article 165 of the Federal Constitution, and shall include in the subsequent budget proposals the amounts related to said waiver (TCU, 2020).
Sole paragraph. The benefits contained in item II of the *caput* of article 2, item II of the *caput* of article 3 and arts. 14, 15, 18, 19, from 20 to 24, from 26 to 28, from 30 to 33 and 36 of this Law will only be granted if the provisions of the *caput* of this article are met, including the demonstration by the Federal Executive Branch that the waiver was considered in the revenue estimate of the annual budget law, in the manner established in article 12 of Complementary Law No. 101, of May 4, 2000 (Fiscal Responsibility Law), and that it will not affect the fiscal result targets provided for in the annex to the budget guidelines law (TCU, 2020).

The control of revenue waivers is a major challenge for the recovery of fiscal stability, assuming an increasing trajectory in relation to GDP from 2006 onwards, reaching levels above 4% of GDP from 2014 onwards. The analysis of the compliance of the institution or expansion of tax revenue waivers considers the provisions of article 14 of Complementary Law No. 101/2000 (TCU,

2020).

Article 150, § 6, of the Federal Constitution requires that revenue waivers be granted only by a specific law that exclusively regulates the matter or the respective tax. At the same time, article 113 of the ADCT requires that the legislative proposal that creates or alters revenue waivers must be accompanied by an estimate of its budgetary and financial impact. In the same vein, article 14 of the LRF establishes that the granting or expansion of a tax benefit must be accompanied by an estimate of the budgetary-financial impact in the year in which it begins to take effect and in the two following years and must comply with the provisions of the Budget Guidelines Law (LDO) (TCU, 2020).

In addition, it requires the demonstration that the waiver has been considered in the revenue estimate and that it will not affect the fiscal targets provided for in the LDO or, alternatively, the indication of compensation measures, in the form of an increase in revenue from the increase in rates, expansion of the calculation basis, increase or creation of a tax or contribution (TCU, 2020).

Federal revenue waivers in 2017 reached the projected amount of R\$362.9 billion, which corresponds to 31.4% of net primary revenue and 5.5% of GDP. Of this amount, R\$278.7 billion refers to tax benefits (4.3% of GDP) and R\$84.2 billion to financial and credit benefits (TCU, 2018).

In 2018, total benefits reached the projected amount of R\$314.2 billion, corresponding to 25.6% of net primary revenue and 4.6% of GDP. There were R\$ 292.8 billion in tax benefits (4.3% of GDP) and almost R\$ 21.4 billion in financial and credit benefits (TCU, 2019).

Regarding the regionalization of federal revenue waivers in 2018, the figures show that the distribution followed the same pattern as in previous years, with the highest participation in the Southeast region, with 48.7% of the total waivers in 2018, while the Midwest region had the lowest participation, in the percentage of 10.0%, as shown in the following table (TCU, 2019).

Also referring to the year 2018, tax exemptions were instituted, whose estimated impact on collection, according to the calculation of the Federal Revenue Service of Brazil (RFB), reached the amount of R\$ 4.2 billion. The estimates for the waivers to be instituted in the coming years are: R\$ 10.4 billion in 2019, R\$ 10.0 billion in 2020 and R\$ 5.3 billion in 2021 (TCU, 2019).

In 2019, federal revenue waivers reached the projected amount of R\$348.4 billion, which corresponds to 25.9% of net primary revenue and 4.8% of GDP, of which R\$308.4 billion in tax benefits and R\$40 billion in financial and credit benefits. Regarding the regionalization of federal revenue waivers in 2019, there was a greater participation of the Southeast Region, which accounted for 48.7% of the total waivers, while the North and Midwest Regions had the lowest participation in the total benefits, with a percentage of 11.2% each (TCU, 2021).

Federal revenue waivers reached the projected amount of R\$343.2 billion in 2020, which corresponds to 28.5% of net primary revenue and 4.6% of GDP, of which: R\$317.2 billion in tax

benefits and R\$26 billion in financial and credit benefits. Regarding the regionalization of federal revenue waivers in 2020, there was a greater participation of the Southeast region, which accounted for 48.7% of the total waivers, while the Midwest region had the lowest participation in the total benefits, with a percentage of 10.2% (TCU, 2021).

The per capita distribution of tax benefits indicates a low impact of revenue waivers on the reduction of regional and social disparities, or even a negative impact, accentuating them. This can be attributed, essentially, to the mechanism of generating tax waivers, usually associated with production and income, resulting in a lower participation of economically less developed regions. Thus, this system is not in line with the purpose of reducing regional and social inequalities, established both as a fundamental objective of the Republic and as a principle of the economic order, as provided for in arts. 3rd, item III, and 170, item VII, of the Federal Constitution (TCU, 2021).

It should be noted that regarding the granting and expansion of revenue waivers instituted with a view to confronting the pandemic, the validity of the measures is restricted to the duration of the state of calamity (TCU, 2021).

FINAL THOUGHTS

It was possible to observe during the course of the theme that the renunciation of revenues has as its main purpose the promotion of the economic and social development of certain areas and activities where it is implemented.

Through this mechanism, governments encourage the creation of new companies, or expand existing ones, increasing the supply of jobs and the *per capita* income of the population, in order to reduce social inequalities, relieving the low-income population.

Its purpose is to promote and provide a financial basis for the realization of programs, projects and activities of interest to society, aimed at promoting the balance of socioeconomic development in the different geoeconomic regions of the country, the development of strategic economic segments and the favoring of certain groups of taxpayers, among other relevant public objectives.

Thus, the act of renouncing public revenue is, in essence, a government policy like all others implemented with the objective of performing the functions inherent to the political entities that constitute the different spheres of government, whether federal, state or municipal.

Despite the benefits reaped by the rulers, they must observe that the act of renouncing revenues must be accompanied by the compensatory legal measures provided for this purpose, under penalty of such act not being validated by the national legal system.

Although the TCU has analyzed the measures adopted for revenue waivers, it has not evaluated their effectiveness in the face of the budgetary and financial impact.


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Design & aging: Challenges and urgency for the quality of life of a changing society

 <https://doi.org/10.56238/sevned2024.010-006>

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ABSTRACT

This article aims to analyze the impact of population aging on society and was guided by the conviction of the fundamental role that Social Design can play in promoting the quality of life and well-being of the elderly. The ageing of the population is a global reality that brings with it significant challenges and opportunities for public policies, the economy and society as a whole.

With the increase in life expectancy and the decrease in the birth rate, the demographic profile of societies is changing rapidly, with an increasing number of long-lived people. This phenomenon presents new challenges, such as the need to adapt health, social security, and urban planning systems to meet the specific needs of seniors.

In addition to structural challenges, older people face barriers such as age-based discrimination and social exclusion. The stigma associated with old age often limits this group's opportunities for participation and contribution in society, which can lead to further isolation and deteriorating mental and emotional health. In this context, Social Design emerges as a powerful tool to promote inclusion and respect for the elderly, facilitating active participation in community life, promoting group connection, a sense of belonging, valuing the contribution of the elderly to society with dignity. Social Design can and should be an essential tool in this process, helping to build a more inclusive and sustainable future for all generations.

Keywords: Social design, Population aging, Elderly, Quality of life.

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INTRODUCTION

Worldwide, the process of population aging is evident, with those over 60 years of age constituting the fastest growing portion of the population. It is estimated that by 2050 our planet will have a higher number of seniors than children. We will be two billion people over the age of 60, representing 20% of the world's population. A population becomes older as the proportion of elderly individuals increases and a lower fertility rate occurs. We are living, and will live, longer than until recently was the case in the whole world.

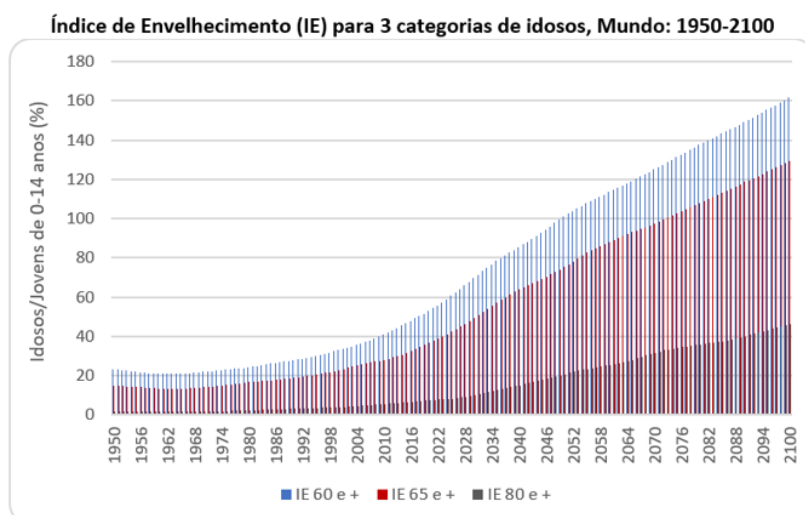
Currently, in Brazil, we can experience a new demographic paradigm with accelerated aging and an increase in life expectancy. Our country is in a transition stage, both in terms of fertility and mortality, bringing about a change in age distribution and population size. While the population of elderly people over the age of 60 is increasing at an accelerated rate, the young population is decreasing. Over time, the base of the age pyramid narrowed due to the reduction in fertility, and this change in the shape became visible from the 1990s onwards, clearly losing its pyramidal shape from 2000 onwards, where young people belonged to a wide base of the pyramid and the elderly at the top with a smaller number of representatives.

Several factors have been evidenced for this change in the context of the elderly population worldwide: changes in diet with healthier habits, lifestyle with exercise, improvements in technology and medicine, disease prevention through vaccination campaigns, as well as chronic disease prevention programs resulting in an increase in the life expectancy of this group.

In the book "Young Country with White Hair" (VERAS, 1994), he points out that in Brazil there is an urgent need for more reliable information about its own elderly population. He also warns us that although the country already has a large population of elderly people, very little is known about them and states that the demographic data still present many peculiarities that need to be considered in greater depth. In the same work, Professor of Psychogeriatrics, Eliane Murphy clarifies that Brazil is today a country that undergoes enormous changes, where we need to be aware of the urgent need to plan for a future in which the problems of old age will be increasingly important, and it is essential to carry out surveys of the general population to clarify their needs.

We can no longer omit the importance and participation of these long-lived people in the current and future context of society. They are people with a positive view of aging, active, who value opportunities and possibilities for new achievements and mainly concerned with living longer and better.

Figure 1: Prospecção of the elderly population in the world.



Source: <https://population.un.org/wpp2019>, 2019.

METHODOLOGY

Using an exploratory and descriptive qualitative research, this article sought to understand the meaning that individuals or groups attribute to the social problem of aging. The research was based on the interpretation of the world and on data collected from bibliographic and documentary sources, predominantly descriptive.

The main focus of the study was Social Design and its relationship with the social inclusion of older adults through the creation of accessible, functional and pleasant public and social spaces. The interdisciplinary and participatory approach to design played a fundamental role, demonstrating the possibility of exchanging ideas, knowledge, experiences and experiences between different generations.

AGEING POPULATION

The new paradigm of population aging and the longevity revolution is becoming increasingly evident around the world, with a significant increase in people's life expectancy and a decrease in the birth rate. This has led to a change in the age structure of populations, with an increase in the number of elderly people compared to young people. With this continued growth, by 2050, for the first time in history, the planet will have more elderly people than children under the age of 14.

In developed countries, the increase in life expectancy has been going on for many years. In the period from 2010 to 2015, this life expectancy increased from 78 years, while in developing countries it increased to 68 years. The projection is that from 2045 to 2050 this picture will change to 83 years in developed regions and 74 years in developing ones. The increase in the number of elderly people is a worldwide phenomenon that happens at a rapid pace, driven by the aging of the population and advances in medicine and quality of life.



Population aging is a concept that measures the proportion of elderly people in the population, while longevity, according to the Houaiss dictionary, means "longer than ordinary life span". Etymologically, the word longevity derives from the Latin term "longevitas", the ability to live many years. Both terms have aroused increasing interest in contemporary society. According to the criterion established by the United Nations (UN), individuals over 65 years of age in developed countries and over 60 years of age in developing countries are considered elderly. However, it is important to note that longevity can be influenced by a number of factors, such as genetics, lifestyle, environment, diet, physical activity, and general health conditions. In his speech at the Second World Assembly on Ageing, promoted by the UN, in Madrid from April 8 to 12, 2002, the then Secretary-General of the United Nations, Kofi Annan, highlighted the importance of addressing and understanding longevity as a complex and multifaceted phenomenon.

Older people are not a separate category. We will all grow old someday if we have that privilege. So let us not consider the elderly as a separate group, but rather as ourselves in the future. And let us recognize that all older people are individuals, with particular needs, and not a group in which everyone is equal because they are old. (KOFI ANNAN, 2003, p.13)

The Americans coined the phrase "agequake," which we could translate as "demographic earthquake." (MAZZAFERRO, BERNHOEFT, 2016, p.1). Indeed, longevity is an unprecedented phenomenon for humanity. We are living and will live longer than we have recently in the whole world, and this reality is one of the greatest achievements of humanity.

For Kalache, a physician specializing in the study of aging and President of the International Longevity Center Brazil (ILC-Brazil), we will live 30 years longer than our grandparents and what has been happening is indeed a revolution – the Longevity Revolution (KALACHE, 2015).

Revolution is the collapse of the social order in favor of a new system... The longevity revolution forces us to abandon the existing notions of old age and retirement. This social construction is simply unsustainable in the face of the increase of 30 years of life (KALACHE, 2015, p.14).

We have reached a stage where we definitely need to abandon stereotypes of the elderly as sick, dependent, vulnerable, and useless. We can no longer identify the elderly with an extremely pejorative view. Pictograms with frail figures bent over walking sticks are unacceptable.

Senate Bill No. 126 of 2016 amends Law No. 7,045, of November 12, 1985, to provide for the symbol devoid of pejorative character in the identification of the elderly.



Source: <https://www12.senado.leg.br/subjects> > 2018/04/25 Accessed on 07/26/2023

Mirian Goldenberg, anthropologist and researcher, points out the positive aspects and gains in the longevity process and demonstrates that old age can be a period marked by freedom and happiness. He states that this phase of life can no longer be treated as losses, but mainly as achievements, achievements, new experiences and projects. (GOLDENBERG, 2013)

According to the author, we are free to choose and build our own life project. We have the freedom to modify it at different times of our existence, with the aim of giving it an adequate, productive meaning and with a better quality of life even in our old age. Goldemberg emphasizes the importance of the whole society preparing itself to receive this new profile of the elderly, with respect and without prejudice.

THE NEW BRAZILIAN DEMOGRAPHIC PARADIGM

According to the document "Aging in the 21st Century: Celebration and Challenges" (2012), the population is classified as aging when older people become a proportionally larger share of the total population. However, VERAS (1994) warns us that the aging of the population is not only due to the reduction in mortality, but also to the decrease in fertility rates. Life expectancy has increased due to the social, economic, and health development of nations, which has resulted in the prevention of many deaths caused by infectious and parasitic diseases.

Through the Census carried out in 2022, we verified the significant increase in the older population. The aging index considering the population aged 60 years and over reached 80.0, with 80 elderly people for every 100 children aged 0 to 14 years. In 2010, this index corresponded to 44.8. The Census brought us the reality of people aged 60 and over reaching 15.6% of the population, an increase of 56.0 in relation to 2010, when it was 10.8, as well as the increase in life expectancy by an average of 75.5 years.

In this scenario, we have observed changes in the Brazilian demography in recent decades, notably regarding the inversion of the age pyramid, with the prevalence of a greater number of elderly people. Over time, the base of the age pyramid has narrowed, also due to the reduction in the

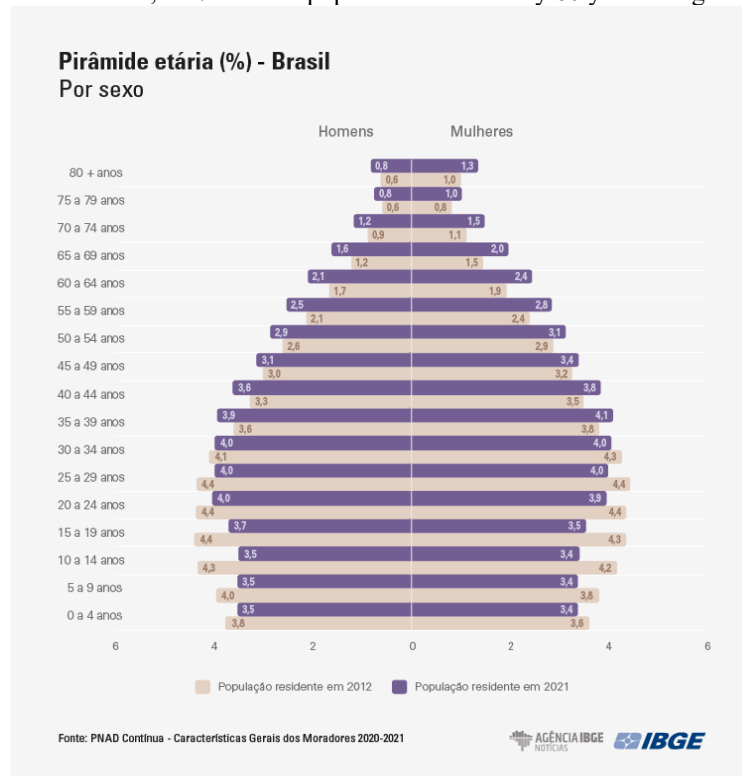
birth rate. From the 1990s onwards, this change became more visible and the age pyramid in Brazil clearly lost its pyramidal shape from 2000 onwards.

The last Census, carried out in 2022, portrays evidence pointed out for a long time by scholars in the area, such as Ana Amélia Camarano, whose line of research is demography with an emphasis on population aging and in her book "Far beyond 60" already predicted that the 60+ would reach 28.5 million in 2020. The author already warned of the consequences of this increase in the elderly population, where challenges would appear for the State, society and the family.

(...) It is known that there is still a lot of room for a decline in mortality among the elderly and an increase in life expectancy. For example, if all preventable causes of death in the elderly are eliminated, life expectancy at age 60 would increase by about 7.2 years. This means that at 60 years of age, a man may live another 29.2 years and a woman 30.9 years (CAMARANO, KANSO, 2010, p.95).

According to the Brazilian Institute of Geography and Statistics (IBGE), in absolute numbers, the contingent of elderly people went from 22.3 million to 31.2 million, growing 39.8% between 2012 and 2021. In 1980, life expectancy was 62.6 years, jumping to 76 years in 2018. Add to this the fact that we are experiencing a gradual reduction in the fertility rate: from 4.1 in 1980 to 1.7 in 2015, with an estimate that by 2030 there will be more elderly people than children. "In less than 50 years, for the first time in history, the world will have more people over 60 than people under 15." (PESSINI, 2005, p.38 – 39).

Figure 2: In Brazil, 14.7% of the population is currently 60 years of age or older.



Source: IBGE https://biblioteca.ibge.gov.br/visualizacao/livros/liv101957_informativo.pdf Accessed on 03/05/2024.

We are at a time when the aging of the population and the increase in life expectancy challenge taboos in relation to old age and the new relationships of the elderly with society. In our country, the need for information, services and projects for the elderly population is fundamental and urgent. Although we already have a large population of elderly people, we know little about this and many researches, mistakenly, still consider Brazil as a country of young people.

Brazil is a country without memory. It devalues the past and its trajectory. And he continues to believe that it is a country of young people, reinforcing the myth of eternal youth, far removed from reality. We are one of the three countries that is aging the fastest in the world and the one that practices denialism the most. The country has maintained the sad record of being the world champion in cosmetic surgeries since 2019 (CASTRO, CASTRO, 2022, p. 141).

Therefore, it is crucial to recognize the magnitude of population aging and the transformations it entails. There is a need to invest in areas such as health, well-being, infrastructure, the labour market and social inclusion in order to ensure a sustainable and quality future for older generations. The path to deal with this demographic revolution is challenging, but by adopting an integrated and humanized approach, we can transform population aging into an opportunity for growth, inclusion and development for the whole society.

CHALLENGES OF THE NEW AGING PATTERN

According to Camarano and Medeiros (1999), the aging of an individual is associated with a biological process of decline in physical capacities, related to new psychological and behavioral fragilities. So, being healthy is no longer related to chronological age. For the authors, aging comes to be understood as the physical and psychological capacity and motivation to continue in the pursuit of goals and new achievements. Getting older doesn't necessarily mean getting sick. Unless there is an associated disease, aging is related to a good level of health. According to the WHO (World Health Organization), the aging of the population is one of the greatest triumphs of humanity and also one of the great challenges to be faced by society: *Although it seems obvious, the recognition of increased longevity is one of the greatest social achievements of this century* (WHO, 2005).

For Dr. Margaret Chan, then Director-General of the World Health Organization (2015), the loss of skills commonly associated with aging is actually only loosely related to people's chronological age. There is no such thing as a "typical" senior. The health needs of adults, such as the diversity of their capacities, occur throughout the life course and are often modifiable, emphasizing the importance of understanding the aging process. She warns us that, although most adults have multiple health problems over time, advanced age does not imply dependence. (CHAN, M., WHO - Aging and Health, 2015, p.3)



Ageing needs to be examined more closely in the context of other important trends, such as urbanisation, globalisation, migration, technological innovation, as well as climate and environmental change. In addition, growing inequality, between and within regions, needs to be addressed more comprehensively in the context of population ageing. (International Longevity Center Brazil – ILC-Brazil – 2015).

As we know, the European continent, in relation to Brazil, had more time and better conditions to prepare for demographic change in relation to the aging of its population. Development, urbanization, and good levels of schooling have been significant for improvements in quality of life, which has provided this continent with a region with the highest rates of life expectancy at birth. According to data from the World Bank, among the 10 countries with the best average life expectancy, 5 are European. Although it has occurred simultaneously with economic and social development, the transition in Europe towards a fairer society for all ages still presents significant challenges.

In relation to Brazil, we are facing much more challenging issues, where the age transition took place in a short period of time without economic, social and health development, with an aggravating factor, because as we know, Brazil has a remarkably unfair distribution of both income and social services. "In a city where people live in overcrowded slums, old age will be a different experience compared to a city with adequate services and comfortable housing." (VERAS, 1994, p.26)

We must consider many difficulties in relation to this huge contingent of elderly people that we will have in society. We will face problems in the health and social security systems. Although we have already achieved advances in the field of medicine, in relation to technology with more accurate examinations and diagnoses, we know that it is in old age that diseases and problems due to age arise. In this sense, the need for a continuous and multidisciplinary care organization is fundamental in relation to the health system, ensuring the implementation of actions and services that promote safety, quality of life and the well-being of the elderly population in a comprehensive and permanent manner.

Health systems will have to cope with a growing demand for procedures, diagnostics and therapeutics of chronic non-communicable diseases, especially cardiovascular and neurovegetative diseases, and an even greater demand for physical and mental rehabilitation services (LIMA and VERAS, 2003). Another important aspect is prevention, since preventive actions are effective at any stage of life, including the most advanced stages. Therefore, "a model of health care for the elderly that intends to be effective and efficient must strengthen all levels of prevention." (VERAS, 2009). "It is essential to invest in preventive actions throughout life, as they have the potential to solve challenges of today as well as the future." (KALACHE, 2008).



It is important to emphasize that, in addition to health professionals, the State and society must be involved and direct actions with a comprehensive focus in relation to housing, education, social security and culture, since the role of the elderly in today's society is different.

According to Debert (1999), it is important to adopt a critical stance in relation to the positive views associated with aging in society. She argues that it is possible to view the aging process as a phase of life that can be pleasurable and rewarding, providing the opportunity to carry out projects and achieve personal ambitions. And as he clarifies (MAZZAFERRO and BERNHOEFT, 2016), awakening critical thinking is essential for our individual construction, to understand our roles, facing the challenges proposed, not preventing us from carrying out new life projects.

Only with a universal view of the need for resources and services for the elderly will we be able to promote active aging. As argued by the World Health Organization (WHO, 2015), active and healthy older adults consume fewer resources. Active ageing is related to a healthy, participatory and socially secure life.

It is also relevant to highlight the issue of the difficulty of insertion of the elderly in the labor market. According to Simone de Beauvoir, a French writer and philosopher, the competitive modern society, which values the functionality and beauty of bodies, is responsible for the distancing of the elderly from the labor market. In his book "Old Age" published in 1970, he denounced the way in which the elderly were discriminated against, making us reflect that despite the prejudices of society, the elderly still felt the same passions as the youngest. "We live in a society in which the value of the adult individual is measured by his or her output." (MAZZAFERRO, BERNHOEFT, p. 84, 2016).

Today, when we turn 60 years old, we are active, creative, with dreams and desires, but we belong to the world of the "old", "elderly", "third age" or any of the nomenclatures by which they are recognized in Brazil and in the world. And the fear is born from this: How to be labeled as non-productive in modernity where what counts is high productivity? How will we be happy when we are not only not highly productive, but also excluded from the world of production? (MAZZAFERRO, BERNHOEFT, p. 85, 2016)

Table 1: Percentage of unemployment. Source: IBGE - National Household Sample Survey 2014. Note: no estimate for people over 70 years old.

Table 1: Unemployment percentage. Source: IBGE - National Household Sample Survey 2014. Note: no estimate for the over-70s.

<i>Estimated percentage of unemployed population (unemployed people looking for work) by age group and sex. BRAZIL, 2014</i>			
<i>Age range</i>	<i>Male</i>	<i>Female</i>	<i>Total</i>
<i>15 to 19 years old</i>	<i>18,6</i>	<i>27,9</i>	<i>22,5</i>
<i>20 to 24 years old</i>	<i>10,3</i>	<i>16,8</i>	<i>13,2</i>
<i>25 to 29 years old</i>	<i>5,8</i>	<i>11,5</i>	<i>8,3</i>
<i>30 to 34 years old</i>	<i>4,0</i>	<i>8,1</i>	<i>5,9</i>
<i>35 to 39 years old</i>	<i>3,3</i>	<i>6,3</i>	<i>4,7</i>
<i>40 to 44 years old</i>	<i>2,9</i>	<i>5,7</i>	<i>4,1</i>
<i>45 to 49 years old</i>	<i>2,7</i>	<i>4,0</i>	<i>3,3</i>
<i>50 to 59 years old</i>	<i>2,5</i>	<i>3,2</i>	<i>2,8</i>
<i>60 to 69 years old</i>	<i>1,8</i>	<i>2,0</i>	<i>1,9</i>
<i>Total</i>	<i>5,2</i>	<i>8,7</i>	<i>6,7</i>

According to Paes, Mendonça and Santos (1999), with the Brazilian population made up of about 54 million people aged 50 and over, 26% of the population, we cannot speak of a future of work related only to youth. Society and public authorities need to be open to a new look at the elderly who want and need to enter the labor market in a dignified way and without prejudice. Characteristics such as productivity and employability decline with age from a certain point in the life cycle, which usually occurs around the age of 60. It is also observed that after the age of 45 the chances of getting a job as an executive are minimal. According to Terzian (2006), for executive functions, advanced age can be discriminated against and there is an "expiration date" (emphasis mine).

Despite its variants and specificities, working for the elderly can mean a higher income, as well as physical and mental autonomy and greater social integration. According to a study by FGV (Fundação Getúlio Vargas), it is estimated that in 2040, 57% of the country's workforce will be 45 years old or older. In this sense, it is essential that society, public authorities and companies are prepared for the future of the labor market and for the promotion of intergenerational relationships within organizations. By recognizing the benefits of including people over 50 and promoting the unity of different generations, we will avoid future problems of labor shortages. In addition, this generational diversity brings with it valuable knowledge and experience, which can contribute to greater efficiency and effectiveness in the workplace.

It is essential, therefore, to invest in inclusion policies and in recycling and training programs for more experienced professionals. Flexible work opportunities that are adaptable to the needs of older adults should also be considered in order to ensure the permanence and engagement of these



professionals in the labor market. "Employers could value the elderly as consultants and trainers, who would have the opportunity to pass on their experiences to younger people" (FRANCE, 1999, p.15). In short, by recognizing and valuing the potential of older workers, we will not only be providing individual benefits, such as income and autonomy, but also contributing to the economic and social development of the country. Generational diversity is an advantage that needs to be explored and cultivated by all stakeholders to create a more inclusive and resilient labour market.

AN APPROACH TO DESIGN AND AGING

Because design is interdisciplinary, it incorporates concepts, methods, and approaches from several different areas, such as art, science, technology, psychology, sociology, anthropology, among others. Aging design is an area of design that focuses on creating specific solutions to meet the needs of older people. With the aging of the population in many countries, it becomes increasingly important to design products, services, and environments that are inclusive and accessible for older adults.

The designer must be attentive to the elderly audience not only because they are growing and present clear opportunities for action, but also to be aware of the needs and desires of this growing group in our society. Creating products that meet the needs of the elderly, such as medical devices, mobility equipment, ergonomic furniture, and assistive technologies, should not be a design-only concern. We know that design, through its experiences and visions, has the ability to collaborate for more comprehensive and integrated solutions to contemporary problems and challenges. As Damazio, Ceccon and Pina (2017) point out.

Design has the potential to meet the demands of all kinds of people over 60 years of age and must act urgently. To this end, it is crucial to combine qualitative research techniques in order to identify what this diverse and growing audience is looking for. It is also crucial to consult them and involve them in the ideation, construction and evaluation of all stages of the design process. (DAMAZIO, CECCON, PINA, 2017, p. 46)

Still on the authors' work, "Emotional design for people over 60: contributions to living longer and better", we can highlight seven guidelines of emotional design in favor of the quality of life of the public over 60 years old: Design for affirmation of identity; Design for the renewal of sociability; Design for the revitalization of citizenship; Design for well-being; Design for self-care (or resilience); Design for fun and Design for learning.

The importance of uniting Design with other areas of knowledge, such as sociology and psychology, relating them to aging is of paramount importance to explore the need for representation of the elderly in society and the stereotypes and prejudices associated with age, as well as to understand the problems faced by this group in relation to physical and cognitive changes. Dorea,

20202, tells us that ageism, implicit or explicit, permeates various sectors of our society, preventing us from seeing the elderly as an active and representative part of our life course.

Vitor Papanek (1985), in his work "Design for a Real World", defended the idea that designers had the duty to improve the quality of life of man. Projects should be designed according to the real needs of the individual, the community and society. In practical terms, responsible design means designing for people's needs rather than their wants. It stated that designers should apply their technical knowledge and creative skills to improve people's quality of life, rather than just creating beautiful, commercial objects. By questioning the ethics of traditional design, Papanek paves the way for a new approach in which design is not only about creating aesthetically pleasing products, but rather about promoting inclusivity, sustainability, and social well-being, making a significant contribution to the debate about the role of design in building a better and more just world. In turn, Kuyper (1995) argues that design is a social art that was born as a new profession, separating the art of giving form from the art of making things and concludes that without the social context design does not exist.

Ezio Manzini (2008) argues for social innovations based on participatory and collaborative contexts and states that design specialists should provide favorable conditions for social actors to collaborate in the development of solutions suited to their needs. According to the author, this collaborative and user-centered approach is key to ensuring the effectiveness and relevance of design projects. In addition, he highlights the importance of considering the different perspectives and contexts of users during the creation process, in order to ensure inclusion and diversity in these solutions. In this way, the participatory and user-centered design proposed by Manzini emerges as an innovative and indispensable approach for the creation of meaningful and impactful solutions in this area. In his book "Design for Social Innovation", Manzini describes:

Collaborative services are services where end users are actively involved, taking on the role of co-designers and co-producers of services. Some examples are: a home where elderly people of different ages live in a community sharing resources and adapting them to their different needs and lifestyles: a service that facilitates the co-division between the elderly and young students, providing the latter with cheap and familiar shelter and the former with company, help and financial support (MANZINI, 2008, p. 70-71).

In Frascara's (2000) conception, the designer's social responsibility is an extremely important theme. In his book *Diseño Gráfico para la Gente*, the author shows us that visual communication design aims to be a means to address social problems and points out four distinct areas of responsibility: professional, ethical, social and cultural. It exposes that design is not concerned with objects, but with the impact those objects have on people.

It leads us to reflect that the designer as an identifier of problems and dedicated to improving people's well-being needs a program based on the participation of several areas, creating a productive

dialogue especially in Sociology, Anthropology, Educational Sciences and Marketing. In this sense, Frascara's work highlights the need for designers to act responsibly and consciously, considering not only the aesthetic beauty of their projects, but also their social and cultural impact. By understanding and valuing these different areas of responsibility, designers can make a significant contribution to building a fairer and more inclusive society.

In view of the above, it is important to understand that Design stands out as a field of possibilities in a complex world, which instigates us to reconsider old concepts and seek innovative solutions. Faced with the impact of population aging, it is essential to rethink and seek innovative solutions to ensure an adequate quality of life for this significant portion of society. As such, design has the power to address these challenges and seize the opportunities guiding us towards a more inclusive and sustainable future.

CONCLUSION

Faced with the important phenomenon of population aging, the change in the age structure of the population brings with it new social, political and economic demands and challenges. Life expectancy has increased in Brazil and worldwide, making people over 60 years of age more concerned with health and healthy aging. With the new model of aging, we observe that the senior public has modified the old pattern of being old. Despite the wear and tear of the physiological systems, the elderly need to develop and express interests, experiencing affection and exchanges through socialization opportunities. Therefore, it is crucial to deal comprehensively and in a planned manner with the impacts of aging in order to ensure an adequate quality of life for this significant portion of the population. Social and health projects and policies should be designed to sustain and encourage active and participatory aging, ensuring possibilities of remaining in the labor market, sufficient pensions for a dignified life, and access to continuing education to keep the elderly active and independent. We can no longer hide ageing by showing the whole of society the possibility of activities, services and programmes for lifelong learning in a safe way, creating opportunities for new life projects.

In relation to design, we can see its potential to assist and propose useful, appropriate and desirable activities for the well-being of the elderly. Age-centred services can bring benefits to society as a whole, raising new and provocative questions in public and private debate.

The theme of population aging and its impact on social design is still little explored, which motivates us to believe in the possibility of stimulating more reflections and research in this area. We believe that it is essential to address this issue to promote an old age with quality of life and well-being for the elderly population. We hope that our contributions can arouse interest and encourage further studies and analyses on the subject, aiming to improve the living conditions of the elderly.



In this sense, it is necessary for the designer to consider not only the aesthetic and functional issues, but also the social impact of their projects. It is important to keep in mind that design goes far beyond the creation of objects, it is a form of expression that influences attitudes and values in society. It is essential that designers are aware of their role as agents of transformation and contribute to the construction of a more inclusive and sustainable environment.

However, it is unfortunate that the relationship between design and the elderly is still little explored and recent. We believe that design, because it is interdisciplinary and multifaceted, has the potential to bring together actions aimed at the aging population, bringing contributions to live longer and better.


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Historical context of social, environmental and corporate governance (ESG) and its impacts on organizations: A literature review

 <https://doi.org/10.56238/sevned2024.010-007>

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ABSTRACT

The objective of this research was to explore the historical development of social, environmental and corporate governance and its impacts on organizations. To this end, a bibliographic research was carried out through the survey of articles on the SciELO, Google Scholar and Scopus platforms. As a result, it was found that social, environmental, and corporate governance (ESG) has emerged as a crucial paradigm in contemporary business management, reflecting a transformation in societal expectations about the role of organizations. This literature review addressed the historical development of ESG governance and its impacts, from the emergence of the corporate social responsibility movement to its expansion to include environmental and governance issues. It was evidenced that ESG governance profoundly influences financial performance, brand reputation, risk management, and stakeholder engagement in organizations, promoting greater resilience, attracting investors and conscious consumers. It is crucial for organizations to recognize the importance of ESG governance and incorporate it into their operations and strategies, benefiting not only themselves but also contributing to the sustainable development of society. Despite the benefits, challenges such as the lack of standardization in the disclosure of information and the need for robust metrics still persist, requiring collaborative efforts between companies, investors, regulators, and other stakeholders. In summary, ESG governance is essential for long-term value creation, enabling companies to contribute to a more just, equitable, and sustainable world by embracing its principles.

Keywords: Social, Environmental and Corporate Governance (ESG), Sustainability, Environment.

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INTRODUCTION

Social, environmental, and corporate governance (ESG) has emerged as a crucial area of concern in recent decades, reflecting a significant shift in societal expectations regarding the role of organizations in the contemporary world. In historical context, concerns about corporate governance practices date back to the early days of modern capitalism, when shareholders sought to ensure that their holdings were managed ethically and responsibly. However, it is only in recent decades that corporate governance has evolved to encompass not only financial aspects, but also social and environmental issues, giving rise to the overarching concept of ESG (COSTA; FERREZIN, 2021).

Growing awareness of the impacts of business activities on the environment and society drove the rise of the corporate social responsibility (CSR) movement in the 1960s and 1970s. Companies began to come under pressure to adopt more sustainable and ethical practices, as society demanded greater transparency and accountability. This movement gradually expanded to include environmental considerations, leading to the development of environmental reporting standards and carbon emission reduction initiatives (LIMA et al., 2024; LIMA et al., 2024).

At the beginning of the 21st century, with the increase in awareness of climate change, the scarcity of natural resources, and growing social inequalities, the focus on ESG issues has gained even more relevance. Investors, consumers, and regulators began to demand that companies not only maximize profits but also make a positive contribution to society and the environment. This has led to a greater recognition that ESG practices are essential to ensure long-term business sustainability and to mitigate financial and reputational risks (IRIGARAY; STOCKER, 2022).

In this context, this literature review seeks to explore the historical development of social, environmental and corporate governance and its impacts on organizations. Through a critical analysis of pre-existing studies, it is intended to comprehensively understand how historical ESG perspectives have influenced the evolution of business practices and how they have translated into tangible changes in organizational strategies. Through this investigation, it seeks not only to elucidate the main concepts and theories related to ESG, but also to identify gaps in knowledge and areas for future research.

DEVELOPMENT

HISTORICAL CONTEXTUALIZATION OF SOCIAL, ENVIRONMENTAL AND CORPORATE GOVERNANCE (ESG)

The historical contextualization of social, environmental, and corporate governance (ESG) goes back to the origins of modern capitalism and the emergence of the first concerns about companies' responsibility to society and the environment. However, it is only in recent decades that



this approach has gained prominence and become an integral part of business strategies (IRIGARAY; STOCKER, 2022).

In the late twentieth century, the corporate social responsibility (CSR) movement began to emerge as a response to growing concerns about the impacts of business activities on society. During this period, businesses were urged to consider not only their profits but also their role in promoting social welfare and preserving the environment. CSR initiatives have included voluntary actions to support local communities, promote diversity and inclusion, and implement environmentally sustainable practices (RIBEIRO; LIMA, 2022).

At the beginning of the 21st century, the discussion around ESG governance has gained even more relevance, driven by a number of factors. Awareness of climate change, scarcity of natural resources, and growing social inequalities have led to increased pressure on businesses to adopt more sustainable and ethical practices. In addition, corporate scandals, such as the collapse of Enron and the BP oil spill in the Gulf of Mexico, have highlighted the importance of transparency and accountability in companies (RIBEIRO; LIMA, 2022).

The growing influence of institutional investors has also played a major role in the rise of ESG. Many investors have begun to recognize that ESG factors can have a significant impact on companies' long-term financial performance. As a result, they have come to integrate ESG considerations into their investment decisions, pushing companies to adopt more responsible practices (NAGAI, 2021).

Today, ESG governance is considered an essential component of modern business management. Companies around the world are taking more holistic approaches to governance, considering not only the interests of shareholders but also the impacts of their operations on stakeholders and the environment. As awareness of ESG issues continues to grow, the role of these principles in corporate governance is expected to be further broadened and refined (BELINKY, 2021).

SOCIAL, ENVIRONMENTAL AND CORPORATE GOVERNANCE (ESG) CONCEPTS

Social, environmental, and corporate governance (ESG) is a business management approach that focuses on three main areas: social, environmental, and governance. Each of these pillars describes different aspects of companies' responsibility and performance in relation to not only financial, but also social and environmental issues (RIGON; DEGENHART; RIBEIRO, 2023).

Social governance (S) involves companies' commitment to social responsibility and its impact on the communities in which they operate and society at large. This includes policies and practices related to diversity and inclusion, human rights, fair and safe work, workplace health and safety, employee well-being, community investment, and corporate social responsibility (CSR). Companies



that prioritize social governance often adopt corporate social responsibility (CSR) programs to demonstrate their commitment to social welfare (BELINKY, 2021).

Environmental governance (E) focuses on companies' practices in relation to environmental sustainability and the responsible management of natural resources. This includes measures to reduce the environmental impact of the company's operations, such as reducing carbon emissions, conserving water and biodiversity, efficient waste management, sustainable use of natural resources, adopting renewable energy, and complying with environmental regulations (BELINKY, 2021).

Finally, corporate governance (G) refers to the systems and processes used to direct and control companies, ensuring transparency, accountability, equity, and management ethics. These include the composition and independence of the board of directors, the structure of executive compensation, the disclosure of financial and non-financial information, risk management, regulatory compliance, and shareholder participation in corporate decisions (COSTA; FERREZIN, 2021).

Effectively integrating ESG principles into companies' operations and strategies can generate a range of benefits, including increased risk resilience, attracting and retaining talent, improving brand reputation, accessing capital and financial markets, and creating long-term value for all stakeholders. As a result, ESG governance is becoming increasingly important for companies, not only as a matter of ethics and responsibility, but also as a key strategy for sustainable business success (MACHADO; CHECON, 2023).

IMPACTS OF SOCIAL, ENVIRONMENTAL, AND CORPORATE GOVERNANCE (ESG) ON ORGANIZATIONS

One of the most significant impacts of ESG governance on organizations is its potential to positively influence long-term financial performance. Companies that adopt responsible practices regarding social and environmental aspects often become more resilient to financial and operational risks. Investments, for example, in energy efficiency can result in reduced operating costs over time, while diversity and inclusion policies can lead to a more engaged and productive workforce by reducing costs associated with employee turnover and hiring (IRIGARAY; STOCKER, 2022).

Additionally, ESG practices can have a significant impact on brand reputation and market perception of a company. Companies that are perceived as socially and environmentally responsible tend to attract ethical investors and conscious consumers, which can result in a competitive advantage in the market. A company's reputation for corporate social responsibility (CSR) can directly affect customer trust, brand loyalty, and consequently revenues and market share (RIBEIRO; LIMA, 2022).

Another important aspect of ESG governance impacts is risk management. Organizations that incorporate social and environmental considerations into their operations are better positioned to



identify and mitigate risks related to issues such as regulatory changes, litigation, reputational damage, and supply chain disruptions. This can result in significant cost savings and increased operational resilience in the face of unforeseen challenges (NAGAI, 2021).

Additionally, adopting ESG practices can contribute to better stakeholder engagement and satisfaction, including employees, customers, investors, suppliers, and local communities. Companies that demonstrate a genuine commitment to social and environmental issues are more likely to attract and retain skilled talent, ensure customer loyalty, and secure local community support for their operations (NAGAI, 2021).

Thus, it can be seen that the impacts of ESG governance on organizations are diverse and wide-ranging, affecting everything from financial performance to brand reputation and stakeholder engagement. By taking a holistic approach to business management that considers not only the bottom line but also the social and environmental impacts of its operations, organizations can gain a sustainable competitive advantage and contribute to a more sustainable and inclusive future.

FINAL THOUGHTS

Social, environmental, and corporate governance (ESG) represents a crucial paradigm in contemporary business management, reflecting a significant shift in societal expectations regarding the role of organizations in the modern world. Throughout this literature review, we explore the historical development of ESG governance and its impacts on organizations, from the origins of the corporate social responsibility movement to its evolution to encompass environmental and governance issues.

It has become evident that ESG governance profoundly influences financial performance, brand reputation, risk management, and stakeholder engagement in organizations. Companies that adopt responsible practices regarding social, environmental, and governance aspects tend to be more resilient to financial and operational risks, attracting ethical investors and conscious consumers and improving their reputation in the market. Additionally, the effective integration of ESG principles can lead to more efficient risk management and increased stakeholder engagement and satisfaction.

Given this, it is critical for organizations to recognize the importance of ESG governance and incorporate these principles into their operations and business strategies. Implementing responsible practices not only benefits the organizations themselves, but also contributes to the sustainable development of society and the preservation of the environment.

However, it is important to note that there are still challenges to overcome, such as the lack of standardization and transparency in the disclosure of ESG information, as well as the need for more robust metrics to assess the ESG performance of companies. Therefore, it is crucial for companies,



investors, regulators, and other stakeholders to work together to foster a stronger and more comprehensive ESG governance culture.


In short, ESG governance is an essential part of modern business management and plays a key role in creating long-term value for organizations and society as a whole. By recognizing and embracing ESG principles, companies can not only ensure their own sustainability and success but also contribute to a more just, equitable, and sustainable world.



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Social, environmental, and corporate governance (ESG): Historical perspectives and key changes in organizations

 <https://doi.org/10.56238/sevned2024.010-008>

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ABSTRACT

The objective of this research was to analyze the historical perspectives of social, environmental and corporate governance (ESG) and the main changes in organizations. This was an integrative literature review. Data were collected through a survey of the Google Scholar and Scielo databases, using specific keywords and search criteria in conciliation with the descriptors "AND" and "OR". Analyses of corporate sustainability and environmental compliance show their growing importance in the contemporary business scenario.

Environmental compliance emerges as an essential tool to ensure compliance with environmental standards, mitigate legal risks and promote ethical management. These approaches reflect a paradigm shift in business practices, prioritizing social and environmental impact. By taking a holistic view, businesses can improve their financial performance and contribute to sustainable development. Despite the challenges in implementing compliance and sustainable practices, the benefits are evident, strengthening credibility, attracting investors aligned with corporate values and ensuring long-term success in an increasingly conscious context on social and environmental issues.

Keywords: Social, Environmental and Corporate Governance (ESG), Sustainability, Management.



INTRODUCTION

Concern about the environmental issue has become increasingly pressing in the face of the challenges faced by the planet. Climate change, biodiversity loss, and ecosystem degradation have led to a growing awareness of the need to adopt sustainable practices across all sectors of society. Companies and organizations are being called upon to assume their environmental responsibility, seeking to reduce their ecological footprint, minimize the waste of natural resources, and adopt cleaner and more efficient production practices (LIMA et al., 2024; LIMA et al., 2024).

In this context, the ESG (Environmental, Social and Governance) concept has gained prominence as a comprehensive approach to evaluating the performance of companies in relation to environmental, social and corporate governance issues. ESG considers not only the environmental impacts of an organization's activities, but also its role in society and the quality of its internal management. Companies that adopt an ESG approach seek not only to maximize their profits, but also to contribute positively to the environment and the communities in which they operate, while maintaining high ethical and transparency standards in their operations (RIGON; DEGENHART; RIBEIRO, 2023).

In organizations, ESG integration can manifest itself in a variety of ways, from implementing robust environmental and social policies to diversifying boards of directors to ensure more inclusive and accountable governance. In addition, companies are increasingly incorporating ESG metrics into their financial reporting and adopting responsible investment strategies, considering not only the financial return, but also the social and environmental impacts of their activities (MACHADO; CHECON, 2023).

In a global scenario marked by the urgency of environmental and social issues, ESG is becoming an essential tool for organizations seeking to remain competitive and sustainable in the long term. By integrating ESG considerations into their strategy and operations, companies can not only reduce their risks and costs, but also strengthen their reputation, attract investment, and cultivate stronger relationships with customers, employees, and other stakeholders (DOUEK; ANGELO, 2022).

In view of the above, the objective of this research was to analyze the historical perspectives of social, environmental and corporate governance (ESG) and the main changes in organizations. It is hoped that the results of this research will contribute to the advancement of academic and practical knowledge on the topic, offering useful guidance for companies, investors, regulators, and other actors interested in promoting more sustainable and socially responsible business practices.

METHODOLOGY

The research was conducted through an integrative literature review, an approach that allows for the synthesis and critical analysis of pre-existing studies on a given topic. This methodological choice was justified by the need to compile and examine a variety of information sources to gain a comprehensive understanding of the historical perspectives of social, environmental, and corporate governance (ESG) and their implications for organizations.

To collect the necessary data, a survey was carried out in the Google Scholar and Scielo databases, using specific keywords and search descriptors such as "corporate governance", "corporate sustainability" and "ESG", combined with the Boolean operators AND and OR to refine the results.

Strict inclusion criteria were applied to select relevant studies. The research focused exclusively on scientific articles published between 2018 and 2023, written in Portuguese and available for free and in full. In addition, only Brazilian studies directly associated with the ESG theme were considered, while other types of documents, such as theses, abstracts, and reports, were excluded to ensure the quality and relevance of the data.

Data analysis was conducted in two distinct stages. In the first stage, the abstracts and titles of the articles were reviewed to identify those that met the inclusion criteria and were aligned with the research objective. In the second stage, the selected articles were read in full and subjected to a detailed analysis to extract relevant information about the historical perspectives of ESG and its implications for organizations. At the end of the process, a sample of three scientific articles was chosen to compose the basis of analysis and discussion of this research.

RESULTS AND DATA ANALYSIS

Through this integrative review, it was possible to select 3 scientific articles that met the inclusion criteria.

Environmental compliance emerges as a crucial tool for corporate environmental management, protecting the environment and generating value for companies. By seeking a harmonious coexistence between the economy and the environment, compliance contributes to the environmental preservation and economic security of organizations. Despite the challenges, such as the case of Samarco, compliance plays an important role in the search for an ecologically balanced environment, reducing risks and promoting corporate responsibility.

Authors	Objective	Methodology	Conclusion
Carvalho et al. (2019)	Analyze business competitiveness under a triple helix, addressing the main impacts of ESG on organizations	Research is applied, descriptive and quantitative	The proposed study uses an approach based on multi-criteria analysis to evaluate corporate sustainability in companies in B3's non-cyclical sector, considering financial aspects, corporate governance and sustainability. By analyzing secondary data over three years, eleven quantitative and qualitative indicators were compiled for comparative analysis. The results show a correlation between corporate governance practices, social responsibility and financial performance of the companies studied. These findings corroborate the existing literature by suggesting a direct and positive relationship between financial performance and corporate governance, as well as indicating the influence of sustainability on the economic results of organizations. The importance of a comprehensive approach to analyzing business performance is highlighted, considering not only financial aspects, but also governance and sustainability practices.
Santos e Liebl (2020)	Treat the Compliance Program and corporate governance as strategies for companies to achieve socio-environmental management	Inductive method	The compliance program, especially in the environmental sphere, appears as a crucial tool for companies to ensure transparency and compliance with environmental standards, avoiding fines and building credibility in the market. In addition to administrative and business responsibility, socio-environmental responsibility is emphasized, reflecting the search for a change in the mentality of business directors towards more ethical management and committed to environmental and social issues. Faced with corporate scandals and growing concern about environmental damage, it is imperative that companies adopt more conscious and transparent practices, seeking solutions that benefit the environment and society in general. However, current legislation alone is not enough to encourage the voluntary implementation of compliance programs, requiring greater awareness from managers about the importance of complying with legal standards and preventing illegal acts, such as money laundering. Corporate governance plays a crucial role in creating a positive image of the company in the market, helping to attract investors and business partners. Therefore, an effective compliance program, combined with solid governance, not only benefits the company that implements it, but also the entire community and the environment, promoting sustainable development.
Ribas e Costa Junior (2019)	Reflect on the importance of environmental compliance for companies as an instrument of corporate environmental management	Literature review	Environmental compliance emerges as a crucial tool for corporate environmental management, protecting the environment and generating value for companies. By seeking a harmonious coexistence between the economy and the environment, compliance contributes to environmental preservation and the economic security of organizations. Despite challenges, such as the case of Samarco, compliance plays an important role in the search for an ecologically balanced environment, reducing risks and promoting corporate responsibility.

Source: Survey data (2024).

The study conducted by Carvalho et al. (2019) adopts an approach based on multicriteria analysis to assess corporate sustainability in companies in the non-cyclical sector of B3. This methodological choice allows for a detailed analysis, considering different aspects, such as financial, corporate governance and sustainability. The use of secondary data over three years provided a solid basis for benchmarking, ensuring a consistent assessment over time.

The researchers compiled a total of eleven quantitative and qualitative indicators, allowing for a comprehensive and holistic analysis of the companies studied. This wide range of indicators provided a more complete view of business performance, going beyond purely financial aspects and including governance and sustainability practices. Such an approach reflects the current trend of considering not only financial profit but also the social and environmental impact of companies.

The results obtained by the study show a significant correlation between corporate governance practices, social responsibility and financial performance of the companies analyzed. These findings are in line with the existing literature, which suggests a direct and positive relationship between companies' financial performance and the quality of their corporate governance, as well as with their sustainability practices. This finding reinforces the importance of business management that takes into account not only the financial aspect, but also the social and environmental dimensions.

It also highlights the relevance of a comprehensive approach to the analysis of business performance, considering not only financial indicators, but also aspects related to corporate governance and sustainability. This broader perspective allows for a more holistic understanding of the role of business in society and the environment, promoting more responsible and sustainable management. In sum, the study by Carvalho et al. (2019) contributes significantly to the body of knowledge on corporate sustainability, providing valuable insights for researchers, managers, and decision-makers.

The study conducted by Santos and Liebl (2020) highlights the importance of the compliance program, with special emphasis on the environmental aspect, as a fundamental tool for companies to ensure transparency and compliance with environmental standards. By avoiding fines and building credibility in the market, environmental compliance becomes a crucial strategy for mitigating legal and reputational risks associated with environmental infractions. The approach highlights not only the administrative and corporate responsibility, but also the social and environmental responsibility of companies, reflecting a change in mindset towards a more ethical management and commitment to environmental and social issues.

The contemporary context, marked by corporate scandals and a growing concern about environmental damage resulting from human activities, highlights the urgent need for more conscious and transparent business practices. Companies are urged to seek solutions that not only comply with current legislation but also promote the well-being of the environment and society at large. In this sense, the compliance program emerges as a key instrument to ensure legal compliance and prevent the occurrence of illegal activities, such as money laundering.

In addition, the study highlights the fundamental role of corporate governance in promoting a positive image of the company in the market. Solid governance not only strengthens the company's



credibility but also contributes to attracting investors and business partners. The combination of an effective compliance program and robust corporate governance not only benefits the company itself, but also the community and the environment as a whole by promoting sustainable development.

Ribas and Costa Junior (2019) highlight the fundamental role of environmental compliance as an essential tool for the environmental management of companies. By focusing on the search for a harmonious coexistence between economic activity and the preservation of the environment, compliance emerges as a crucial mechanism to ensure compliance with environmental regulations and promote corporate responsibility. The analysis highlights that environmental compliance not only protects the environment, but also generates value for companies, contributing to their economic security.

The study highlights that in the face of environmental challenges and growing concern about damage to the environment, environmental compliance plays a crucial role in promoting more conscious and transparent business practices. By preventing environmental violations and ensuring compliance with regulations, compliance not only protects companies from financial and legal risks, but also strengthens their reputation and image in the market.

However, the study recognizes that there are significant challenges associated with the effective implementation of environmental compliance, as illustrated by the case of Samarco. Despite these challenges, the research emphasizes that environmental compliance remains a relevant tool in the quest for an ecologically balanced environment. By reducing environmental risks and promoting corporate responsibility, compliance contributes not only to environmental sustainability but also to the sustainable economic growth of companies.

FINAL THOUGHTS

The analyses carried out on corporate sustainability and the role of environmental compliance reveal the growing importance of these approaches in the contemporary business context. Through methodologies such as multicriteria analysis, it is possible to comprehensively evaluate the performance of companies, considering not only financial aspects, but also governance and sustainability practices. In turn, environmental compliance emerges as a crucial tool for ensuring compliance with environmental standards, mitigating legal and reputational risks, and promoting more ethical and responsible management.

These approaches reflect a paradigm shift in business practices, where concern with the social and environmental impact of activities is gaining more and more relevance. By taking a holistic view of their role in society, businesses can not only improve their financial performance but also contribute to sustainable development, promoting the well-being of communities and preserving the environment.




Despite the challenges associated with implementing environmental compliance and adopting sustainable practices, the benefits are evident. Conscientious and transparent business management not only strengthens the company's credibility but also attracts investors and business partners who share the same values. Therefore, investing in sustainability and environmental compliance is not only an ethical choice but also a smart strategy to ensure the long-term viability and success of businesses in a world that is increasingly concerned about social and environmental issues.



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Rainfall as a risk factor for flooding in the Hulene B neighbourhood in Maputo City

 <https://doi.org/10.56238/sevened2024.010-009>

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ABSTRACT

This article aims to analyze the risk of flooding resulting from rainfall in the neighborhood of Hulene "B" in Maputo City. The analytical perspective focuses on the social scope of the risk, taking into account its impact on the population residing in that area.

The study will privilege the mixed method with a focus on bibliographic research based on literary works that address the same theme. During the study, it was found that the forecast for the occurrence of precipitation advanced by INAM for the period from October 2022 to March 2023 is for the occurrence of rainfall with a trend from normal to above normal. Thus putting a good part of the "Hulene B" neighborhood at risk of flooding.

Keywords: Precipitation, Risk, Flooding.

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INTRODUCTION

Currently the themes related to climate change have been gaining space in several debates, one of the most addressed topics has to do with tropical cyclones and floods whose effects are felt in the population in all cyclonic seasons. Economic development affected.

There is considerable focus on the impact of climate change and especially on the increase in sea surface temperature, causing the frequency of tropical cyclones to be felt over coastal regions (Goldenberg et al, 2001; Mann and Emanuel, 2006).

The city of Maputo is located in the south of Mozambique, west of Maputo Bay, where the Tembe, Umbeluze, Matola and Infulene rivers flow, in a region vulnerable to extreme inventions resulting from climate change that manifests itself through urban flooding.

The intense and prolonged rains during the months of the rainy season in Mozambique can lead to negative consequences for some cities when added to the lack of infrastructure and the absence of urban planning, since these areas become vulnerable, increasing the risks of damage and losses to the population because when there is a rise in the level of the rivers, In general, there are floods. (Marcelino et al. 2004).

The present work aims to evaluate rainfall as a risk factor for flooding in the city of Maputo, specifically in the Hulene "B" neighborhood, located in the KaMavota Municipal District, with rural characteristics.

OBJECTIVES

GENERAL

- To evaluate Rainfall as a Risk Factor for Flooding in Maputo City.

SPECIFIC

- Define the concepts of Precipitation, Risk and Floods;
- Discuss the factors leading to flooding in the Hulene "B" neighborhood;
- Describe the socio-environmental implications of flooding in the Hulene "B" neighborhood.

METHODOLOGY

In order to succeed in the elaboration of this scientific article, on precipitation as a risk factor for the occurrence of floods, the following methods were privileged: Qualitative and bibliographic consultation of works that address the theme under analysis.

Scientific research is a fundamental tool for solving collective problems. (Marconi; Lakatos 2002). Selltiz et al. 1965 argued that it was the definition and respect for the application of the methods that could really bring results that were not always satisfactory, but certainly reliable.

- Qualitative Method - Qualitative research is one that works predominantly with qualitative data, that is, the information collected by the researcher is not expressed in numbers, or else the numbers and the conclusions based on them play a minor role in the analysis. (RICHARDSON, 1989).
- As these are phenomena that involve human beings, where it is believed that the best understanding is through people's perspectives, qualitative research, combined with data collection techniques to ensure greater reliability of the results as stated by Bogdan & Blikien (1994), stating that the fundamental issue is the process, as well as the product and the final result, Data should be analysed inductively, delving into the details and specific aspects of the data to uncover important categories, dimensions and interrelationships.

THEORETICAL FRAMEWORK

Precipitation is any particle of water, solid or liquid, that falls from the atmosphere and reaches the ground, coming from clouds, and occurs when cloud droplets grow until they reach sufficient dimensions to fall by the effect of gravity. Precipitation is a fundamental vector of the hydrological cycle, uniting the atmosphere with the other subsystems of the climate system. AYOADE, (1986)

Precipitation is a fundamental vector of the hydrological cycle, uniting the atmosphere with the other subsystems of the climate system. It has a wide variety of forms (drizzle, rain, snow, wet snow, hail, hail, showers, icy snow) and its classification generally depends on the mechanism involved in the cooling that led to cloud formation (convective, orographic, convergence, frontal). Rainfall is expressed as rainfall height, duration, frequency and intensity of rainfall. The amount of precipitation in a given time interval (rainfall height) is the

Quantity $R = v/s$ where v is the volume of water collected from a hydrometer, in a container with a horizontal mouth and area s (hydrometer or rain gauge). It is expressed in millimetres (= litres per square metre).

The duration of precipitation is the period of time counted between the beginning and the end of the rainfall (measured in hours, minutes or days). Frequency is the number of occurrences per year for a given downpour or, the number of years required for a given downpour to occur. The intensity of precipitation R is relatively Δ measured by the variation in the amount of precipitation (t) in which it fell. Δ to the time interval (Precipitation is a central climatic (or meteorological) element in the



variation of the weather and in the characterization of the climate of a given place. It occurs as a consequence of the evolution of synoptic systems and, together with temperature, is a central element of empirical climate classifications. (Andrade and Bash, 2000).

Is rain the water in the atmosphere? Is water vapor also rain? What is the difference between rain and cloud? Rain is part of one of the most important cycles for life on the planet: the water cycle. According to Silveira (2004), the energy that produces the water cycle comes from the Sun, which begins by causing the evaporation of lakes, seas, and rivers.

The evaporated water (water vapor) accumulates in the air, which expands as it rises due to the decrease in atmospheric pressure. The expansion causes the cooling of the air that loses its ability to contain moisture (water vapour), initiating the process of returning to a liquid state (condensation) in the form of small water droplets. This process results in clouds, when it occurs at altitude, and fog (sawmill), when close to the ground.

For the formation of a single raindrop, it is necessary, on average, approximately one million water droplets formed by condensation (slow process) or capture (fast process). (VIANELLO and ALVES, 2000). With the formation of raindrops, precipitation occurs, which can occur in a liquid (rain) or solid (hail or snow) state. Taking into account the mutliplicity of the rainfall formation process, there are several types, namely:

TYPES OF RAINFALL AND THEIR FORMATIONS

According to the way the air rises, rain can be classified into three main types (AYOADE, 1998):

- **Convective rain:** it is related to convective instability, that is, the vertical movement of air results from the process of heating of the Earth's surface by the Sun, causing ascending columns of air (air that rises to the upper troposphere). This process results in the formation of **cumulunimbus** clouds, which have a high vertical development and a typical mushroom shape. Generally, these rains are intense and short-lived, occurring more frequently in the summer, in the afternoon.
- **Orographic rainfall:** occurs when the elevation of humid air is caused entirely or mainly by high ground, initiating a process of forced convection (orographic effect). The air is forced to rise, expanding, forming clouds and then orographic rain. This precipitation occurs practically to the windward of the slope, while to the leeward it usually receives no rain.

It is from this process that the high incidence of cloudiness and rain near the high slopes of the mountains arises.

- **Frontal rain:** these are precipitations from the circulation associated with frontal systems. Cold fronts can cause heavy rainfall, which may be accompanied by thunderstorms, hail, gales and tornadoes. Warm fronts cause continuous rain of lesser intensity.

Floods are an extreme and temporary natural phenomenon caused by moderate rainfall for long periods or by short but high intensity rainfall. (INGC, 2016).

Floods are treated as a risk from the fact that they cause losses i.e. damage to the exposed elements of the Hulene "B" neighborhood, such as residential infrastructure and businesses. During the rainy season, this neighborhood suffers drastically from the effects of rainwater. It should be noted that floods are part of the risks from the moment they affect the population causing a high degree of loss.

Floods consist of the process of occupation of the plains by water, that is, it is when water overflows from the river channel (KOBİYAMA et al., 2006). Thus, in order to originate an episode of flooding, it is necessary to manifest a pluvial event that, in turn, linked to urban hydrological processes, promotes the overflow of the river that has spatial repercussions on societies. The impacts resulting from floods are complex and, in some situations, destabilize systems, with relevant social, economic and environmental losses (SILVEIRA, et al., 2009).

Floods occur mainly by the natural process in which rivers, streams and urban canals overflow into their larger bed, due to the sudden or gradual increase in the flow of water in the lower bed. This type of event is due to natural processes of the hydrological cycle, being observed in both urban and rural spaces. (TUCCI, 2012).

The frequency of flooding changes due to changes in the watershed. Plate (2002) stated that the pressure exerted by population growth results in the exclusion of the poorest part of the population, who start to live in the floodplain. This type of problem is commonly witnessed in urban areas. Thus, new concepts and practices must be introduced for a better coexistence with this phenomenon.

Flooding, popularly referred to as flooding, is the increase in the level of rivers beyond their normal flow, with the overflow of their waters over the areas near them. These flat areas near rivers over which water overflows are called floodplains. When there is no overflow, although the river is practically full, there is a flood and not a flood. For this reason, in the scientific world, the terms "flood" and "flood" must be used interchangeably.

According to Castro (2003), gradual floods occur when the water rises slowly and predictably, remains in a flood situation for some time, and then gradually drains. Citing the Amazon, Nile, and Mississippi rivers as examples, the same author mentioned that this type of flooding has a seasonality (periodicity). Apparently, this flood is not that violent, but its impact area is extensive.

On the other hand, popularly known as flooding, flash flooding occurs due to intense and concentrated rainfall, especially in regions of rugged relief. The rise in flows is sudden and their flow is violent. It occurs at a time close to the rain event that causes it. The rising waters occur suddenly, causing more deaths, although the impact area is much smaller than gradual flooding. (CASTRO, 2003). This is in the case of the Hulene "B" neighborhood.

However, flooding occurs when a large amount of water is not sufficiently absorbed by the soil because of waterproofing or occupation of areas that formed river floodplains, invading marginal avenues, and streets, residences and buildings (InfoBibos, 2010).

Floods are historical phenomena on our planet with occurrences older than the existence of man himself. However, the frequency and magnitude of their occurrences have become increasingly greater throughout the world, resulting in massive economic losses and loss of human lives. (Genovez. 2009). It is precisely because of this postulate that floods are considered a risk that the conceptual approach to it is made below.

CONCEPTUAL APPROACH TO RISK RISK

The approach to risk is new, although it is now known that man has always lived and will live with uncertainty (risk)

Risk is a situation or a condition. At first sight, the concepts of threat and vulnerability may present some similarity with the concepts of probability and consequence (components of the expression $R = P \times C$), but they end up translating risk situations more faithfully, especially due to the way they are treated, maintaining deep dependence on each other and thus presenting a fear and reductionism. (Marandola Jr. and Hogan. 2004).

The expression $R = P \times C$ can cause an error of interpretation, offering a distorted view that probability and consequence can be multiplied simply by mathematical logic. In fact, the relationships between the components of the risk situation are much more complex than an arithmetic operation. (Campos.1999).

According to Bley (2007), risk perception is the individual's ability to identify hazards and recognize risks, attributing meaning to it at work, in traffic and in the air. Risk perception is influenced by health status, attention and emotional status.

Risk, a social object, is defined as the perception of danger, of possible catastrophe, and therefore it exists only in relation to an individual, a social group, a society that apprehends it and coexists with it through specific practices. Thus, according to the author, there is no risk without a population or individual who perceives it and who could suffer its effects.

He also adds that the risk and the perception of it cannot be focused on without considering the historical context that produced it and, especially, the relations with the geographical space, the modes of occupation of the territory and the social relations characteristic of the time. (Veyret. 2007).

According to Veyret (2007), the occurrence of the *allege* (possible event and its probability of realization) can affect more or less strongly the functioning of human societies and that socio-economic factors often increase the vulnerability of threatened populations.

The imprecision of the terminology used in the concept of risk is further fueled by the different translations of the English "*hazard*", quite common in North American literature. For (Marandola Jr. and Hogan. 2003): "The truth is that there is no corresponding word in Portuguese (or in other Latin languages, such as Spanish and French) that expresses the true meaning of this word." In Portuguese, the authors of *Geografi* have interpreted the term *hazard* sometimes as risk, sometimes as accident. (Xavier. 1996) sought to adopt it as a synonym for risk, whereas (Monteiro. 1991) opted for the translation as accident.

Employing other words, (Marandola Jr. and Hogan. 2003) endorse the previous explanation: "what is it to be at risk? It is to be susceptible to the occurrence of a hazard." Therefore, the term *hazard* can be understood as synonymous threat or danger, while "*risk*" refers to the joint existence of threat (or danger) and vulnerability, approaching the proposal of Campos (1999), Lavell (1999) and Cardona (2001).

Based on this definition and knowing the difference between *hazard* and *risk*, we can infer that the expression environmental risk refers to a situation of environmental threat (physical, technological and even social) acting on a population that is known to be vulnerable.

Therefore, risks must be treated as a result of the intricate relationship between threat and vulnerability, which are deeply dependent on each other. The notion of risk is established on the basis of the conflicting relationship between man and his environment, in a process of mutual influence. Therefore, one must also try to reject the Manichean idea of the existence of an aggressor natural event acting on a society that, in turn, is seen as a victim. (Gilbert. 2002).

The research carried out by the above-mentioned authors leads to a reflection that the perception of risk varies from individual to individual, is influenced by internal and external factors.

In the modern concept of risk, two characterizations are considered: the REALISTIC and CONSTRUCTIVIST models, where in the realistic model, the risk is constructed by the elements that compose it itself, being independent of the observer or whoever is subject to him. Thus, if we assess the risks of a nuclear power plant in a certain region, for example, we would be doing empirical and scientific research. (Aquino et al, 2017).

In the case of Mozambique, cities have played a very strong role in the perception of environmental risk, to the extent that the population ignores or cohabits with the environmental risk.



The low-income population without purchasing capacity or power has in urban centers sectors of basic activities such as: Employment, School, Transport, Markets and others. These factors cause the population to settle in areas vulnerable to flooding.

CAUSE OF FLOODING IN MAPUTO

The rapid growth of the population in the city of Maputo and the search for better living conditions, make the population of the remote areas abandon their places of origin to the outskirts of the city because they are close to the means of survival, settling in areas without observance of the basic principles of territorial planning, sanitation of the environment, lack of resources for the construction of decent housing, thus placing this population in areas at risk of flooding as is the case of the Hulene neighborhood

Floods cause risks as the land is occupied inappropriately and represent a serious problem not only for public authorities, commerce and industries, but mainly for the population living in low-lying areas and risk areas, causing, in most cases, enormous damage, many of them irreparable as loss of human life. objects of personal value and works of historical value. (TUCCI et al 1995).

The disorderly occupation of non-inhabitable areas or areas close to the banks of rivers modifies the process of water infiltration into the soil and promotes the sealing of the watershed. As a result, during the rains, water runoff through the surface increases, raising flows above the capacity of the drainage network, causing flooding in areas occupied by humans. (TUCCI 1995).

The urbanization process is highlighted as a main cause of flooding in developing and underdeveloped countries. It is a set of actions that have worrisome consequences, both social and environmental (OLIVEIRA, 2004).

Urban growth in developing countries has been carried out unsustainably with deterioration of the quality of life and the environment. Urbanization is spontaneous, urban planning is carried out only for the part of the city occupied by the middle and high-income population, while for low-income areas the process takes place irregularly or clandestinely (WORLD BANK, 2007).

According to the World Bank's Global Fund for Disaster Reduction and Recovery, urban flooding represents a real threat to populations, especially in peripheral areas where there is a lack of sewage collection and treatment, as the population comes into contact with contaminated water, contributing to the spread of diseases such as leptospirosis. (GFDRR. 2014).

It is important to highlight the causes linked to floods that can come from natural phenomena that probably cannot be anticipated, such as the occurrence of tsunamis, soil compaction and sealing, dam rupture associated or not with adverse meteorological phenomena, destruction of vegetation cover, slopes and banks, increasing soil runoff and erosion and increasing environmental pollution that is reflected in the seas and rivers (BANK MUNDIAL, 2007).

In cities, river floods and, consequently, floods are caused by precipitation and surface runoff generated by soil sealing. Urban aquatic waters are fluid through the drainage systems of the water bodies that, even in periods of greater flow, occupy their largest bed or, even, the flood slopes. However, when a population occupies the flood extensions, the problems are frequent and the consequences are disastrous. (TUCCI. 2012).

SOCIO-ENVIRONMENTAL IMPACT OF FLOODS

Hulene B is a peripheral neighborhood of the city of Maputo that is located specifically in the Kamavhota municipal district, this neighborhood suffers from flash floods annually in the rainy season due to rapid population growth, urban expansion, soil degradation, lack of territorial planning, disorderly constructions by residents.

In this city, every rainy season of the year from October to March, residents suffer from flood risks resulting from the rainfall in the reference period. The population leaves their homes for other areas or for the resettlement centres provided by the INGD where they can continue with their day-to-day activities.

During this period, the population faces several risks, from the loss of their property, the loss of human lives and the proliferation of diseases resulting from the precipitation developed by mosquitoes of the anopheles genus that is responsible for the spread of malaria. There is also the development of cholera, a disease caused by various bacteria that thrive in places with serious sanitation problems.

There is occurrence of leptospirosis which is closely related to environmental factors. The most common ways to acquire the disease is in situations of floods and floods, when the urine of rats, present in sewers and manholes, mixes with the runoff and mud of floods. (Genovez. 2009).

In addition to water-borne diseases, the population has suffered theft of their property from their homes because when they leave their homes, they are unable to take all their property with them.

After the rainy season, the population returns to their homes and resumes their normal life, but as the area is characterized by the approach and saturation of the water table, the population lives with the waters in their backyards, adopting adaptation measures for survival, such as the placement of bags containing area at the entrances and stones.

Floods disrupt the lives of the affected populations and cause significant deterioration in the quality of life, as well as material damage, both for civil society and for the public authorities, not to mention the irreparable damage such as loss of human lives and physical buildings of historical value and consequently, of their constant summer rains, these types of phenomena are very impactful, both for the natural and social environment According to TUCCI 1995).

Although there are technological means that can minimize the effects of floods, the consequences of these are still, in some cases, quite harmful to Man and, several times, to Nature (WORLD BANK, 2007).

The urban environment is an open system, where the city is the result of the interrelations between natural and man-made elements. From this perspective, the environment in which the city is inserted is the result of human action on a certain feature of the earth's surface. The urban environment - also understood as an urban ecosystem - is, therefore, a product of human action in interface with a certain natural dynamic or even with the elements of the physical environment, such as, for example, an urban agglomeration that is established along the banks of a main river and between the meanders of its tributaries (BRANDÃO. 2006).

Floods cause immediate and long-term impacts on the health of the affected population, resulting from displacement and degradation of living conditions. health risks from floods can be stratified as a function of time, (Paterson et al. 2018).

FLOOD MITIGATION MEASURES

The Hulene B neighbourhood is an area at risk of flash floods resulting from rainfall and the approach of the water table, without the water drainage system, without the urban sanitation system, in order to reduce the impacts of the floods that devastate that population, it is necessary to adopt mitigation measures that refer to an "action to reduce the sources or factors that cause floods". (Bulkeley. 2010). such as, zoning of the flood risk area to assess the real dimension of the problem, environmental education that consists of raising awareness about the responsibility they have over the environment they live in, demonstrating the degree of importance that the community has in cleaning and in the various activities, structural and non-structural measures such as, the installation of a water drainage system, which consists of the construction of open drainages for water drainage. Flood control measures can be classified as structural, when man modifies the risk, and non-structural, when man lives with the risk (REIS BARBOSA, 2006).

In the first case, there are control measures through hydraulic works such as dams, dikes and plumbing, among others. In the second case, there are preventive measures, such as zoning of flood areas, an alert system linked to Civil Defense and insurance.

It cannot be assumed that preventive measures will be able to fully control floods, since preventive measures are always aimed at minimising their consequences. In order to control flooding efficiently, it is necessary to combine structural and non-structural measures, in order to guarantee the population the least possible damage, in addition to enabling a harmonious coexistence with the environment (REIS BARBOSA, 2006).



CONCLUSION

The factors leading to the risk of flooding in Bairro Hulene "B" are linked to social and environmental vulnerability, combined with the lack of territorial planning, characterized by sporadic occupations, that is, settlements that do not obey any occupation rules.

With each rainy season, vulnerability increases in the Hulene "B" neighborhood, as demographic and infrastructure growth grows and flood risk mitigation measures are far from responding positively to the wishes of the population. The mapping of areas susceptible to flooding would be one of the measures to be implemented to ensure that populations do not settle in risk areas.

Given that rainfall is concentrated at a certain time of year, it would be important for the authorities to establish a flood risk response plan based on rainfall forecasts.

Based on the current state of climate emergency, caused by several factors, the immediate development of viable flood mitigation and adaptation mechanisms is of utmost importance. This article reflects on rainfall as a risk factor for flooding in the Hulene "B" neighborhood, identifying some main strategies to deal with flood risks, such as: zoning of the area under study, construction of drainages, environmental education.


It is important to clarify that there is no definitive solution to address flood risks, all technologies and techniques must be combined and deployed to reduce impacts. Therefore, alternative flood reduction or mitigation measures cannot be ignored as the neighbourhood in question is located in an area at risk of flash flooding.



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The classification of distances and groupings of various musical elements through three methods of evaluation of similarities developed in cognitive psychology: Contrast Model, Structural Alignment and Transformation

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

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ABSTRACT

The study aims to use three methods of evaluation of similarities developed in cognitive psychology in the classification of distances and groupings of diatonic chords in major and minor keys, taking into account the four tonal scales (Ionian, Aeolian, Harmonic Minor and Melodic Minor), of the twenty-four tonalities, also taking into account the four tonal scales, of the forty-eight series of Alban Berg's Violin Concerto and of some sets representing scales in music theory. The methods employed are: the Contrast Model, which weights the common and distinct characteristics between the objects compared (Tversky 1977); the Structural Alignment, which classifies similarities by distinguishing between two types of differences and two types of commonalities (Gentner; Markman 1995, 1997; Goldstone 1994; Markman; Gentner 1990, 1993a, 1993b, 1993c, 1996); and Transformation, which evaluates similarities through the number of operations required to transform one object into another (Chater; Hahn 1997; Hahn; Chater; Richardson 2003; Hahn; Richardson; Chater 2001).

Keywords: Similarities, Distances, Groupings.

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Interconnections of Knowledge: Multidisciplinary Approaches

The classification of distances and groupings of various musical elements through three methods of evaluation of similarities developed in cognitive psychology: Contrast Model, Structural Alignment and Transformation



INTRODUCTION

One of the important questions in psychology is to investigate how people judge similarities in order to try to understand the functioning of various cognitive processes, such as categorization. According to the similarity view, when new items appear, their characteristics are compared with the already stored characteristics of other items or of a representative prototype of the category (e.g., Goldstone 1994b; Hampton 1995; Nosofsky 1986; Reed 1972; Rosch 1975; Rosch; Mervis 1975; Smith; Medin 1981). In choice situations, decisions can be made based on similarities with previous situations (e.g., Kahneman; Tversky 1984; Lindemann; Markman 1996; Markman; Medin 1995; Medin; Goldstone; Markman 1995; Slovic; Macphillamy 1974; Smith; Osherson 1989; Tversky 1972). In problem-solving situations, new problems can be solved using procedures used in previous problems (e.g., Bassok 1990; Gick; Holyoak 1980; Novick 1990; Ross 1987, 1989). Three methods developed in cognitive psychology that attempt to predict and explain how people make judgments of similarities are the Contrast Model, Structural Alignment, and Transformation.

Psychologists who have formulated methods to try to understand how people make judgments of similarities point out that these theories must be tested in various domains of human knowledge in order to evaluate their effectiveness in terms of what they propose. Hahn, Chater, and Richardson (2003, p.26), for example, "recommend the transformational approach for further study and they suggest that the development of more detailed transformational models of similarity might be worthwhile." Later, Hahn, Chater and Richardson (2003, p.28) comment that "a general theory of similarity cannot restrict itself to demonstrations in any single context. Consequently, future research must also seek to apply the transformational approach to different domains." For Hodgetts, Hahn and Chater (2009, p.76), "to be useful as a cognitive account, a transformational account such as RD will need to be validated in a wide range of domains."³ For Hahn, Richardson and Chater (2001, p.398), "another potentially interesting area is to apply the approach to different domains, particularly those that appear to require structured representations where RD can be utilized in a straightforward way." According to Markman and Gentner (1993c, p.464), "the mechanism that determines psychological similarity is a natural and seemingly effortless process that can operate across a wide range of stimulus types." A similar point of view can also be found in Gentner and Markman (1994, p.157). Thus, this article proposes to apply the three methods of evaluation of similarities developed in cognitive psychology in the classifications of distances and groupings of diatonic chords in both major and minor keys, taking into account the four tonal scales, of the twenty-four major and minor keys, also taking into account the four tonal scales, of the forty-eight series of Alban Berg's Violin Concerto and of some sets representing scales.

³ RD is short for *Representational Distortion*, which is one of the names given in English to the transformation model.

METHODS EMPLOYED

Tversky (1977) proposed that similarities between objects should be classified according to a principle of weighting their common and distinct characteristics that he called **the Contrast Model**. The Contrast Model is based on a three-argument equation that measures the similarity between objects A and B, expressed by $S(A, B)$, as follows:

$$S(A, B) = \theta f(A \cap B) - \alpha f(A - B) - \beta f(B - A)$$

$(A \cap B)$ means the characteristics shared by A and B (see fig.1)

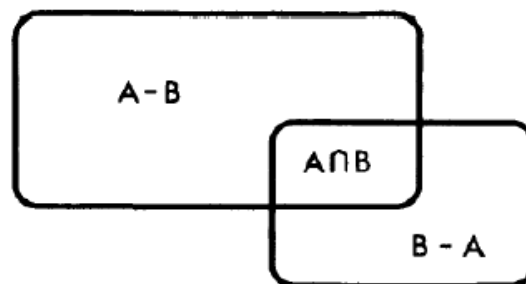
$(A - B)$ means the characteristics of A that B does not possess

$(B - A)$ means the characteristics of B that A does not possess

θ, α, β are parameters that represent their common and distinct characteristics

f is a measure of the salience of the features

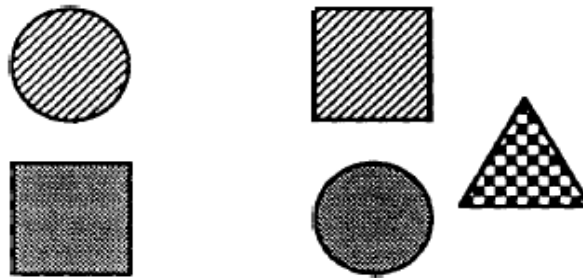
Figure 1 (Tversky 1977, p. 330, fig.1): $(A \cap B)$ means the characteristics shared by A and B; $(A - B)$ means the characteristics of A that B does not possess; $(B - A)$ means the characteristics of B that A does not possess.



Structural alignment (Markman; Gentner 1990, 1993a, 1993b, 1993c, 1996; Gentner; Makman 1995, 1997; Goldstone 1994) classifies the similarities between objects by distinguishing between two types of differences called alignable and non-alignable differences (Markman; Gentner 1993a), and two types of commonalities called *Match in Place (MIP)* and *Match out Place (MOP)* (Goldstone 1994). Alignable differences are those attributes or characteristics that two objects have that are different, but that correspond through some relationship. Non-alignable differences are those attributes or characteristics that only one object has and the other does not, that is, that do not correspond relationally. For example, if the two settings (left and right) of fig.2 are matched based on the "above" relationship, the fact that there is a circle at the top of one image and a square at the top of the other is considered an alignable difference because they are different elements based on the same relationship. The same can be said about the "below" relationship between the bottom square and circle. On the other hand, the

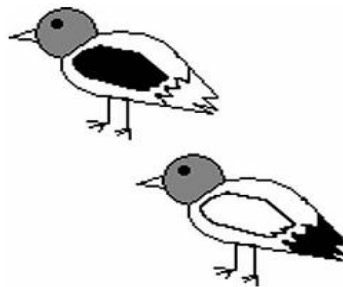
triangle on the right side, which doesn't correspond to anything on the left side, is a non-alignable difference because there is no corresponding element.

Figure 2 (Markman; Gentner 1993a, p. 683, fig.1): example of alignable and non-alignable differences.



Match in *Place* (MIP) is a feature shared by the compared objects that is in exactly the same place, i.e., as shown in fig.3, the gray color of the birds' heads is in the same place, i.e., in the heads, an MIP, while the black color of the wing and tail is an out-of-place match. i.e. a MOP (*Match out Place*).

Figura 3: (Hodgetts; Hahn; Chater 2009, p. 63, fig.1): exemplo de MIP e MOP.



According to Hahn, Richardson and Chater (2001, p.393), Chater and Hahn (1997) relied on a branch of mathematics called Kolmogorov's Complexity Theory to measure the transformations that evaluate psychological similarities (Li; Vitányi 1997). According to this theory, the complexity of a representation is measured by the length of the computer program that distorts one representation into another. The representations that can be generated by shorter programs are simple, and those that are generated by longer programs are complex (Chater 1999). Therefore, Kolmogorov's complexity theory serves as a measure of similarity. The degree to which two representations are similar is determined by how many instructions must be followed to transform one representation into another.

The **transformation method**, therefore, evaluates similarities through the number of operations required to transform one object into another. In the case of the two sequences XOOO and OXOO, to transform the first into the second, simply move the X one position to the right. In the case of the two sequences XOOO and OOXO, in order to transform the first into the second, in addition to moving the X one position to the right, it is necessary to reverse the order. Thus, the two



sequences in the first example are more similar than the two sequences in the second example because it took only one operation to transform one into the other. The operations generally used in the transformation process are reversal, deletion, insertion, mirroring, and phase change (see Imai 1977).

ASYMMETRY IN SIMILARITY ASSESSMENTS: REFERENCE POINT VERSUS NON-REFERENCE POINT

According to Rosch (1975), some objects have a different psychological status in perception. These are called reference points and are prototypes against which the other members of the set are compared and evaluated. Rosch demonstrated in his 1975 paper *Cognitive Reference Points* that colors, horizontal, vertical, and diagonal lines, and numbers multiples of 10 can play the roles of reference points. Referential colors such as red were prototypes in relation to which the other colors when compared were less red or not red. Horizontal, vertical, and diagonal lines were prototypes against which other types of lines were compared. The multiples of 10 were prototypes against which the other numbers were also compared. These reference points are those that the non-reference points are seen 'in relation to'.

Empirical work has been carried out on reference points or prototypes in a variety of domains, including visual objects, colors, numbers, faces, and descriptions of personalities. These investigations have shown that cognitive reference points are given priority in processing, are more stable in memory, and have a special role in linguistic descriptions. The studies of Rosch and Mervis (1975), for example, demonstrated that the most prototype members of the categories "are those which bear the greatest family resemblance to other members of their own category and have the least overlap with other categories" (Rosch; Mervis 1975, p.598-599). His experiments "attempted to provide a structural principle for the formation of the prototypes" (Rosch; Mervis 1975, p. 600). According to the authors (Rosch; Mervis 1975, p.573), "six experiments explored the hypothesis that the members of categories which are considered most prototypical are those with most attributes in common with other members of the category and least attributes in common with other categories.". According to Krumhansl (1978, p.448), the differentiated status of these reference points is due to the fact that they are central or have a greater number of characteristics in common with the other members of the set.

Rosch (1975) also demonstrated the existence of **asymmetry** in judgments of similarities and distances between reference and non-reference points. She concluded in her empirical experiments that non-referential stimuli were judged to be more similar to referential stimuli than the other way around, i.e., the psychological distance between an element 'a' and an element 'b' was not the same as in the reverse order, i.e., between 'b' and 'a'. In the case of the number similarity experiments,

subjects said that "103 is virtually 100" and not the other way around. In the experiment between referential and non-referential places, the distances were asymmetrical, varying according to which of the two stimuli was placed at the fixed point. She applied a task in which subjects placed a stimulus in physical space to indicate their psychological distance from a second stimulus fixed in a given position. She considered that the distance was shorter when the fixed position contained a referential stimulus than when it contained a non-referential stimulus. Thus, Rosch concluded that non-referential stimuli were judged to be more similar to referential stimuli than the other way around. In the sentence where 'a' is 'b', the prototype was always in the second position and there was asymmetry in the relationship between the reference and non-reference points, that is, the distance between 'a' and 'b' was different from the distance between 'b' and 'a'. For Tversky (1977), the asymmetry is explained by the salience of the objects:

Similarity judgments can be regarded as extensions of similarity statements, that is, statements of the form "a is like b." Such a statement is directional; it has a subject, a, and a referent, b, and it is not equivalent in general to the converse similarity statement "b is like a." In fact, the choice of subject and referent depends, at least in part, on the relative salience of the objects. We tend to select the more salient stimulus, or the prototype, as a referent, and the less salient stimulus, or the variant, as a subject. We say "the portrait resembles the person" rather than "the person resembles the portrait." We say "the son resembles the father" rather than "the father resembles the son." We say "an ellipse is like a circle," not "a circle is like an ellipse," and we say "North Korea is like Red China" rather than "Red China is like North Korea." (Tversky 1977, p.328).⁴

For Tversky (1977, p.333), there is symmetry in similarity whenever the objects under consideration are equally salient, $f(A) = f(B)$, or the task is not directional, $\alpha = \beta$. Note examples of the two types of judgments given by Tversky (1977, p.333):

- 1) Assess the degree to which 'A' and 'B' are similar
- 2) Evaluate the degree to which 'A' is similar to 'B'.

In (1), the task is formulated in a non-directional manner, so the similarity between 'a' and 'b' is equal to the similarity between 'b' and 'a'. In (2), the task is directional, so the similarity between 'a' and 'b' may be different from the similarity between 'b' and 'a', i.e., asymmetric. If the similarity between 'a' and 'b' is interpreted as the degree to which 'a' is similar to 'b', then 'a' is the subject of the comparison and 'b' is the referent. In this task, the focus is naturally on the subject, so its characteristics are more weighted than those of the referent. Consequently, similarity is reduced more by the distinct characteristics of the subject than by the referent. As an example from Tversky and

⁴ According to Tversky (1977, p.328-329), the directionality and asymmetry in the relations of similarities are particularly perceptible in similes and metaphors. We say that "the Turks fight like tigers" and not "the tigers fight like Turks", since it is the tiger that is famous for its fighting spirit, it that is used as a referent and not as a subject. The poet writes "my love is as deep as the ocean" and not "the ocean is as deep as my love", since it is the ocean that symbolizes depth. Sometimes both directions are used, but they convey different meanings. "A man is like a tree" means that man has roots. "A tree is like man means that the tree has a life history." "Life is like a play" means that people have roles. 'A piece is like life' means that the piece can capture essential elements of life.

Gati (2004 [1978], p.81), a toy train is more similar to the real train because many features of the toy train are included in the real train. On the other hand, the real train is not as similar to the toy train because many of the features of the real train are not included in the toy train. Thus, according to Tversky's (1977, p.333) focus hypothesis, the asymmetry is determined by the salience of the stimulus or prototype, so that the less salient stimuli are more similar to the more salient stimuli and not vice versa, i.e., $S(A, B) > S(B, A)$ whenever $f(B) > f(A)$ (Tversky 1977, p.388). The similarity of (a, b) is greater than the similarity of (b, a) whenever the characteristics of 'b' are more salient than the characteristics of 'a' or whenever 'b' is more prominent than 'a', i.e., $S(A, B) = S(B, A)$ if $f(A - B) = f(B - A)$ or $\alpha = \beta$ (Tvesky; Gati 2004 [1978], p.81).

In Tversky and Gati (2004 [1978], p.82), the hypothesis of directional asymmetry, derived from the contrast model, was tested using semantic (countries) and perceptual (figures) stimuli. The two studies employed essentially the same design. Pairs of stimuli that differed in salience were used to test for the presence of asymmetry in the choice of similarity statements and in direct similarity assessments. According to Tversky and Gati (2004 [1978], p.85), studies using countries and figures revealed the presence of systematic and significant asymmetries in the judgments of similarities. The results support the theory based on the contrast model and the focus hypothesis, according to which the characteristics of the subject are more weighted than the characteristics of the referent. Subsequently, Sadalla, Burroughs and Staplin (1980, p.516 and 526) also found asymmetries in their experiments with spatial stimuli, that is, between referential and non-referential places: "since a reference point is considered as a place that defines the position of other adjacent places, it is concluded that other places should be easily seen 'in relation to' a reference point than vice versa" (Sadalla; Burroughs; Staplin 1980, p.517). That is, the adjacent places were judged to be closer to the reference places than the other way around. Asymmetric features were also found by Tversky and Hutchinson (1986, p.4), where they studied the relationships between nearest neighbors from one hundred datasets of similarities. It was assumed that 'i' was the nearest neighbor of 'j', but 'j' was not the nearest neighbor of 'i'. Similarly, a tonal context assigns to a note, chord, and to the central key itself, the status of reference point in relation to which the other notes, chords, and keys are viewed "in relation to". According to Krumhansl and Cuddy (2010, p.81):

Despite the common principle of reference points, tonal hierarchies appear to be unique to music. Nothing analogous appears, for example, in language or in other perceptual domains. This raises the possibility that tonal hierarchies are especially important in music because most listeners (those without absolute pitch, the ability to name tones in isolation) process music relatively. In other words, musical tones do not have inherent qualities that are invariant across contexts. Instead, pitches are heard in context, and related to one another in that context. The tonal hierarchy provides a stable framework for establishing these relationships.⁵

⁵ According to Krumhansl and Kessler (1982, p.363), "according to this view there are certain members of natural categories that function as cognitive reference points, or prototypes, for the category as a whole. These elements are described as the

Asymmetries were also found in an earlier study by Krumhansl (1979) where there were differences in the judgments of pairs of musical notes according to the order of presentation to the listeners and these differences were attributed to the hierarchy manifested by the tonal context. Two-note sequences that ended on a stable note were preferred by listeners over those that ended on an unstable note. These temporal effects were found when one of the test notes was a component of the tonic triad and the other was chromatic in relation to the established key and, consequently, less stable⁶. The asymmetry was lower when the notes occupied similar positions in the tonal hierarchy. Thus, it is possible to consider asymmetrical relationships in the distances between musical elements as well. A note, a chord, or a key 'a' may be closely related to a note, chord, or key 'b', but the reverse is not true, i.e., the distance between 'a' and 'b' is different from the distance between 'b' and 'a', depending on the reference or salient point which, in this case, is determined by the key. The central key determines the referential and non-referential points in comparisons of similarities and distances between any musical elements that occur within a tonal context.

According to Rosch (1975, p.546): "people in everyday life may well actually navigate through those distances as if they were asymmetrical. If use of reference points is a general cognitive strategy it should be applicable in many domains of human activity". In our case, to music. The studies by Krumhansl (1979), Krumhansl and Kessler (1982), Krumhansl *et al.* (1982) and Bharucha and Krumhansl (1983), for example, proposed "that stable notes and chords also function as cognitive reference points, and that the perception of melodic and harmonic events in relation to reference events is a crucial component of the perception of coherence in music" (Bharucha; Krumhansl 1983, p.93).

We suggest that not only do cognitive reference points function similarly in music, but also they may be especially important there. This is because music does not provide fixed reference tones except as determined by the music itself. Thus, unlike other domains in which cognitive reference points are defined independently of the category (red is perceptually red whether it is or is not thought of in terms of the category of colors), the function of a tone depends entirely on the musical context. Another way to express this is that for most listeners relational processing (relative pitch) predominates over absolute pitch (with pitches having fixed labels independent of context). At a general level, the importance of musical reference points is not merely that they exist, but also that they guide musical perception, memory, thought, and understanding (Krumhansl; Cuddy 2010, p.53).

most representative of the category, in relation to which all other category members are seen. Krumhansl (1979) noted the applicability of this description to the most structurally stable pitches in the tonal system in music."

⁶ The test-note technique was initially developed by Krumhansl and Shepard (1979) to study the hierarchical relationships of similarity and distance between musical notes in perceptual experiments through listeners' evaluations. In this study, they established a major tonal context from the C ascending and descending C scale, and then presented one test note at a time of the chromatic scale for listeners to rate on a seven-point scale how well each one fit into the tonal context (1 = very badly to 7 = very well). The classifications were then interpreted as a measure of the hierarchy, similarity and distance between the test notes and the induced tonalities, obtaining the following classification: first, the notes of the tonic chord, then the other diatonic notes and, finally, the chromatic notes outside the scale. Subsequently, Krumhansl and Kessler (1982) expanded this study by applying the test note technique in various tonal contexts using scales, chords and cadences in major and minor keys. One of the main goals of the authors in this experiment was to obtain a measure of hierarchy, similarity, and distance between the notes of the chromatic scale in relation to the major and minor keys that could be used to classify the distances between the keys.

In the asymmetry view of the structural alignment method, in a statement "X is like Y", the Y domain is called the base and the X domain is called the target. Comparisons are made of the target against the base, so having the most systematic and coherent item as a base maximizes the amount of information that can be mapped onto the target. The most informative element is always the base.

In transformation theory, there is asymmetry when representations differ in complexity. The most complex and richest object is the frame of reference. Suppose a subject has reasonable knowledge about China but very little about Korea. Transforming the representation of China into the representation of Korea would require a reasonably short program (which simply deletes large amounts of information about China that is not relevant to Korea), while the program that does the opposite would be more complex, since the slightest information about Korea is of little use to construct the complex representation of China. Thus, transforming the representation of China into the representation of Korea must be more complex than transforming the representation of Korea into the representation of China, i.e., $K(\text{China/Korea})$ must be greater than $K(\text{Korea/China})$.

APPLICATION OF THE CONTRAST, STRUCTURAL ALIGNMENT, AND TRANSFORMATION MODEL TO DIATONIC CHORDS DERIVED FROM THE FOUR TONAL SCALES

The three methods of similarities developed in psychology are applied to diatonic chords in major and minor keys taking into account the four tonal scales: Ionian, Aeolian, Harmonic Minor and Melodic Minor. In this study, the major key is derived exclusively from the Ionian mode and the minor key is derived from the three minor scale forms. According to Forte (1974 [1962], p.12), "these alterations of scale degrees 6 and 7 are so common that we do not consider them as genuine chromatic alterations. They have been assimilated as part of the diatonic minor scale.". For Piston (1987, p.43), "in the period of common harmonic practice, music in the minor mode is rarely limited to one type of minor mode". According to Harrison (1994, p.18),

Suffice it to say here that, while there are indeed three minor scales, we name pieces not according to these scales but according to the mode of the scales. More simply, we do not speak — as did a hapless former student of mine — of a "symphony in C harmonic minor" or of a "sonata in A melodic minor." The duality of major and minor duality is a higher-order phenomenon than is its manifestation in composition and elementary theory.

The same was said by Ian Guest (2006, vol.1, p.117), for him "it is not common to have music made only in harmonic minor or melodic minor, this classification only fits the scales" and Almir Chediak (1986, vol. 1, p.84) declared that tonality "is a system of sounds based on the major, harmonic minor, melodic minor and natural minor scales". According to Almada (2009, p.167), in the same way, "the minor key can be expressed in three different scales: natural, harmonic and melodic". Motte (1998, p.68) and Gauldin (2004, p.39) stated that the minor mode is a collection of nine notes

to be used in any composition in a minor key, and for Roig-Francolí (2011, p.400), and Kostka and Payne (2009, p.59-60), all the notes of the three minor scales are diatonic in the minor key. David Temperley (2018, p.18-23) called the nine-note set derived from the three minor scales *supermode*. In "Nineteenth-century Harmonic Theory", Bernstein (2002, p.788-789) mentions that Simon Sechter (1788-1867) merges the three versions of the minor scale into one in his "Die Grundsätze der Musikalischen Komposition", from 1853. Later on, Bernstein (2002, p.792) mentions that Mayrberger also considered the three forms of the minor scale in only one. In the same article, Bernstein (2002, p.803) states that "Sechter [1853] and Schoenberg [1978] considered the minor mode in terms of its three forms: harmonic, melodic and natural minor.". Based on these arguments, this study evaluates similarities, distances and groupings between diatonic chords, taking into account the four tonal scales as representatives of major and minor keys.

All the diatonic tetrads of the major and minor keys were compared with their respective tonic tetrads (C7M and Am7). ⁷ Fig.4 shows the vectors of the contrast, structural alignment and transformation model resulting from the comparison of all diatonic tetrads with the C7M tonic. The black notes connected by black arrows indicate the notes in common, the red notes connected by red arrows indicate the different notes that are over the same interval degree (referring only to the degrees and not to the major, minor, major, and diminished quality), and the red notes within a square without arrows correspond to the different diatonic notes that do not find a match in the other chord.

In **the contrast model (C)**, C7M's relationship to itself has the largest vector ($4 - 0 - 0 = 4$) because all the notes are matched. In the comparison between **C7M and Dm7**, there is 1 note in common, 3 different notes of C7M in relation to Dm7 and 3 different notes of Dm7 in relation to C7M, resulting in the equation $1 - 3 - 3 = -5$. In the comparison between **C7M and Em7**, there are 3 notes in common, 1 different note of C7M in relation to Em7 and 1 different note of Em7 in relation to C7M, resulting in the equation $3 - 1 - 1 = 1$. In the comparison between **C7M and F7M**, there are 2 notes in common, 2 different notes of C7M in relation to F7M and 2 different notes of F7M in relation to C7M, resulting in the equation $2 - 2 - 2 = -2$. In the comparison between **C7M and G7**, there are 2 notes in common, 2 different notes of C7M in relation to G7 and 2 different notes of G7 in relation to C7M, resulting in the equation $2 - 2 - 2 = -2$. In the comparison between **C7M and Am7**, there are 3 notes in common, 1 different note of C7M in relation to Am7 and 1 different note of Am7 in relation to C7M, resulting in the equation $3 - 1 - 1 = 1$. In the comparison between **C7M**

⁷ The notes, chords and keys in this article are encrypted using the letters of the alphabet. Notes are referred to as A, B, C, D, E F and G. Major chords and keys: A, B, C etc.; minor chords and keys: Am, Bm, Cm, etc. (7M) means that the chord has a major seventh, (7) means that the chord has a minor seventh, (#5) means that the chord is augmented, (ø) means that the chord is half-diminished and (°) means that the chord is diminished.

and Bø, there is 1 note in common, 3 different notes of C7M in relation to Bø and 3 different notes of Bø in relation to C7M, resulting in the equation $1 - 3 - 3 = -5$.

There are two considerations to be made regarding the method of **structural alignment**. One concerns the order of the four numbers within the vectors: matches in place (MIPS), matches out of place (MOPS), alignable differences, and non-alignable differences. The structural alignment, in fact, does not mention how the comparison vectors are constructed directly, so this choice was based on their indirect reports. The ordering MIPS, MOPS, alignable differences, and non-alignable differences within the four-number vector comes from a hierarchy where, obviously, commonalities come first because they are most important to similarities (Tversky 1977; Krumhansl 1978; Sjöberg 1972) and alignable differences are more important than non-alignable differences because they are more closely related to commonalities (Gentner; Markman 1994, 1997; Markman; Gentner 1993a, 1996, 2000).⁸ Therefore, the ordering of the four numbers within the structural alignment vectors in this study is determined by the acronym **IOAN**, which represents, respectively, the sequence: MIPS, MOPS, Alignable Differences and Non-Alignable Differences. The other consideration concerns a constraint or axiom of the structural alignment method called one-to-one mapping (Gentner 1983, 1989). According to one-to-one mapping, each feature, attribute, relationship, or object in one domain or representation can only be matched to a maximum of one feature, attribute, relationship, or object of the other domain or representation. For example, if the top circle of the left setting of fig.2 is matched with the top square of the right setting because both are at the top of the image, the same top left circle cannot be matched with the bottom right circle because an element in one image can only be mapped to a single element of the other image. Many-to-one mapping occurs when two or more elements of a scene are matched to a single element of the other scene. Many-to-one mappings are inconsistent because, in many domains, a coherent interpretation of the relationship between two scenes cannot be formulated if one part of one scene has two competing correspondences in the other scene (Marr; Poggio 1979). In the case of comparisons between musical elements, the restriction of one-to-one mapping means that a note of one chord can only be matched with a single note of the other chord, a note of one scale can only be matched with a single note of the other scale, a note of one key can only be matched with a single note of the other key, and so on in the comparison between any musical elements.

⁸ There are several articles that suggest that alignable differences are more important for similarities than non-alignable differences. For example, for Gentner and Markman (1997, p.50), "just as commonalities gain in importance when they are part of a matching system, so too do differences. That is, alignable differences are more salient than non-alignable differences. Intuitively, this focus on alignable differences makes sense, for it leads to a focus on those differences that are relevant to the common causal or goal structure that spans the situations." (see also Kahneman; Tversky 1984; Lindemann; Markman 1996; Markman; Medin 1995; Slovic; Macphillamy 1974).

In the **structural alignment method** (A), the relation of C7M to itself has the largest vector (4000) because all the notes are matched. In the comparison between **C7M and Dm7**, there is no match in place (MIP), there is 1 match out of place (MOP), 2 alignable differences, and 2 non-alignable differences, resulting in vector **0122**⁹. In the comparison between **C7M and Em7**, there is no match in place (MIP), there are 3 matches out of place (MOP), no alignable differences, and 2 non-alignable differences, resulting in vector **0302**. In the comparison between **C7M and F7M**, there is no match in place (MIP), there are 2 matches out of place (MOP), no alignable differences, and 4 non-alignable differences, resulting in vector **0204**. In the comparison between **C7M and G7**, there is no match in place (MIP), there are 2 matches out of place (MOP), no alignable differences, and 4 non-alignable differences, resulting in vector **0204**. In the comparison between **C7M and Am7**, there is no match in place (MIP), there are 3 matches out of place (MOP), no alignable differences, and 2 non-alignable differences, resulting in vector **0302**. In the comparison between **C7M and Bø**, there is no match in place (MIP), there is 1 match out of place (MOP), 2 alignable differences, and 2 non-alignable differences, resulting in vector **0122**.

Similarly, the transformation method does not mention how its comparison vectors are constructed directly, so the order of the four-number vectors was also constructed by the authors of this study. In the **transformation method**, the parameter of commonalities comes first because it is the most important in the evaluation of similarities. Secondly, the transformations themselves appear because they are different notes, but they correspond because they are on the same interval degree. In third place is the subtraction parameter that is weighted before addition because, according to Hahn, Richardson and Chater (2001, p.398), when it comes to representations, deletions "tend to be less expensive than insertions, because deletions require only a sufficient specification to identify the component to be deleted, while insertions require a complete specification of the component to be added". Therefore, the ordering of the four numbers within the vectors in the transformation method in this article is determined by the acronym **CTSA**, which represents, respectively, the sequence: **Commonalities, Transformations, Subtractions, and Additions**.

In the **transformation method** (T), the relation of C7M to itself has the largest vector (4000) because all the notes are corresponding (fig.4). In the comparison between **C7M and Dm7**, there is 1 note in common, 2 transformations, 1 subtraction, and 1 addition, resulting in the vector **1211**. In the comparison between **C7M and Em7**, there are 3 notes in common, no transformation, 1

⁹ In-place and out-of-place correspondences here are considered in terms of interval degree, i.e., the placement of the note within the scale. This means that the note C, which is the fundamental note of the C chord, and the minor seventh of the Dm chord, is an out-of-place match because it is in another interval position (see comparison between C7M and Dm7 in fig.4).

subtraction, and 1 addition, resulting in vector **3011**. In the comparison between **C7M and F7M**, there are 2 notes in common, no transformation, 2 subtractions, and 2 additions, resulting in the vector **2022**. In the comparison between **C7M and G7**, there are 2 notes in common, no transformations, 2 subtractions, and 2 additions, resulting in the vector **2022**. In the comparison between **C7M and Am7**, there are 3 notes in common, no transformation, 1 subtraction, and 1 addition, resulting in the vector **3011**. In the comparison between **C7M and Bø**, there is 1 note in common, 2 transformations, 1 subtraction, and 1 addition, resulting in the vector **1211**.

Figure 4: Comparison between all diatonic tetrads with the C7M tetrad.

<p>C: 4 - 0 - 0 = 4 A: 4000 T: 4000 C7M/C7M</p>	<p>C: 1 - 3 - 3 = -5 A: 0122 T: 1211 C7M/Dm7</p>
<p>C: 3 - 1 - 1 = 1 A: 0302 T: 3011 C7M/Em7</p>	<p>C: 2 - 2 - 2 = -2 A: 0204 T: 2022 C7M/F7M</p>
<p>C: 2 - 2 - 2 = -2 A: 0204 T: 2022 C7M/G7</p>	<p>C: 3 - 1 - 1 = 1 A: 0302 T: 3011 C7M/Am7</p>

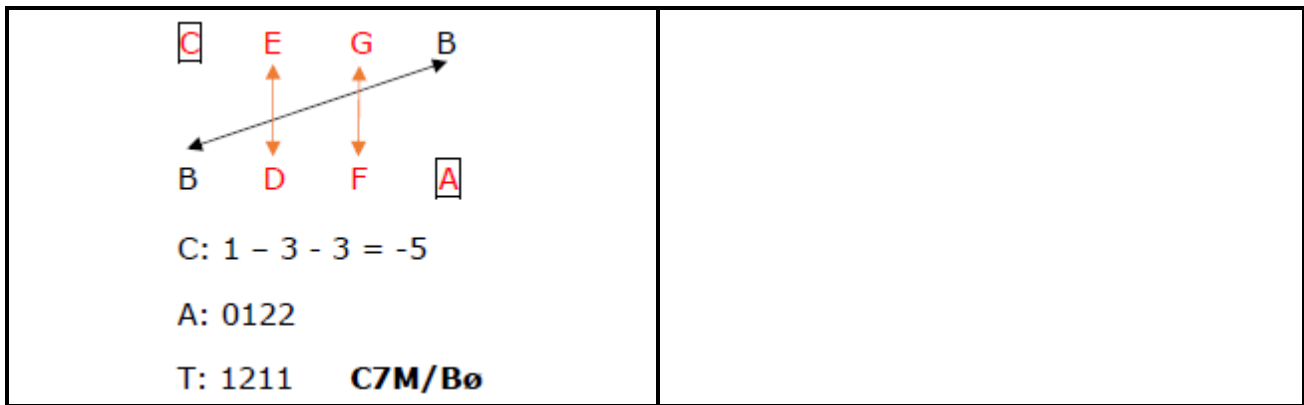


Table 1 shows that all methods obtain the same classification order in the evaluations of similarities, distances and groupings of diatonic chords in relation to the C7M tonic. In the contrast, structural alignment, and transformation model, the larger the vector of the commonalities, the more similar and closer are the chords involved in the comparison. Note the descending order of the contrast model vectors: 4, 1, -2, and -5. The number of commonalities decreases, and so do the similarities. In the structural alignment method, the commonalities also decrease, as can be seen by the first two numbers of each vector: 40, 03, 02 and 01, which represent the commonalities in place and out of place, respectively. The other two numbers indicate differences that will be important in other similarity classifications. In the transformation method, the commonalities also decrease, as can be seen by the first number of each vector: 4, 3, 2 and 1, which represent the commonalities. The other three numbers represent the differences that will also be important in other similarity classifications. Therefore, Am7 and Em7 (level 2) are the chords most similar and closest to C7M with the highest vectors (C: 1 / A: 0302 / T: 3011, respectively). Next are the F7M and G7 chords that are equally distant from C7M at level 3 with intermediate vectors (C: -2 / A: 0204 / T: 2022). Dm7 and Bø (level 4) are the farthest chords and therefore most different from C7M with the smallest vectors (C: -5 / A: 0122 / T: 1211).

Table 1: Comparison between the three similarity models in relation to the C7M chord.

Level	Contrast	Vector	Alignment	Vector	Transformation	Vector
1	C7M	4	C7M	4000	C7M	4000
2	Am7 Em7	1	Am7 Em7	0302	Am7 Em7	3011
3	F7M G7	-2	F7M G7	0204	F7M G7	2022
4	Dm7 Bø7	-5	Dm7 Bø7	0122	Dm7 Bø7	1211

Fig.5 shows the vectors resulting from the contrast, structural alignment and transformation model in the comparison of all tetrads derived from the three minor scales with the stress Am7.

In the contrast model (C), the relation of Am7 to itself has the largest vector $4 - 0 - 0 = 4$ because all the notes are corresponding (fig.5). In the comparison between **Am7 and Bø**, there is 1 note in common, 3 different notes of Am7 in relation to Bø and 3 different notes of Bø in relation to



Am7, resulting in the equation $1 - 3 - 3 = -5$. In the comparison between **Am7 and Bm7**, there is 1 note in common, 3 different notes of Am7 in relation to Bm7 and 3 different notes of Bm7 in relation to Am7, resulting in the equation $1 - 3 - 3 = -5$. In the comparison between **Am7 and C7M**, there are 3 notes in common, 1 different note of Am7 in relation to C7M and 1 different note of C7M in relation to Am7, resulting in the equation $3 - 1 - 1 = 1$. In the comparison between **Am7 and C^{7M}_{#5}**, there are 2 notes in common, 2 different notes of Am7 in relation to C^{7M}_{#5} and 2 different notes of C^{7M}_{#5} in relation to Am7, resulting in the equation $2 - 2 - 2 = -2$. In the comparison between **Am7 and Dm7**, there are 2 notes in common, 2 different notes of Am7 in relation to Dm7 and 2 different notes of Dm7 in relation to Am7, resulting in the equation $2 - 2 - 2 = -2$. In the comparison between **Am7 and D7**, there are 2 notes in common, 2 different notes of Am7 in relation to D7 and 2 different notes of D7 in relation to Am7, resulting in the equation $2 - 2 - 2 = -2$. In the comparison between **Am7 and Em7**, there are 2 notes in common, 2 different notes of Am7 in relation to Em7 and 2 different notes of Em7 in relation to Am7, resulting in the equation $2 - 2 - 2 = -2$. In the comparison between **Am7 and E7**, there is 1 note in common, 3 different notes of Am7 in relation to E7 and 3 different notes of E7 in relation to Am7, resulting in the equation $1 - 3 - 3 = -5$. In the comparison between **Am7 and F7M**, there are 3 notes in common, 1 different note of Am7 in relation to F7M and 1 different note of F7M in relation to Am7, resulting in the equation $3 - 1 - 1 = 1$. In the comparison between **Am7 and F#ø**, there are 3 notes in common, 1 different note of Am7 in relation to F#ø and 1 different note of F#ø in relation to Am7, resulting in the equation $3 - 1 - 1 = 1$. In the comparison between **Am7 and G7**, there is 1 note in common, 3 different notes of Am7 in relation to G7 and 3 different notes of G7 in relation to Am7, resulting in the equation $1 - 3 - 3 = -5$. In the comparison between **Am7 and G#ø**, there is no note in common, there are 4 different notes of Am7 in relation to G#ø and 4 different notes of G#ø in relation to Am7, resulting in the equation $0 - 4 - 4 = -8$. In the comparison between **Am7 and G#°**, there is no note in common, there are 4 different notes of Am7 in relation to G#° and 4 different notes of G#° in relation to Am7, resulting in the equation $0 - 4 - 4 = -8$.

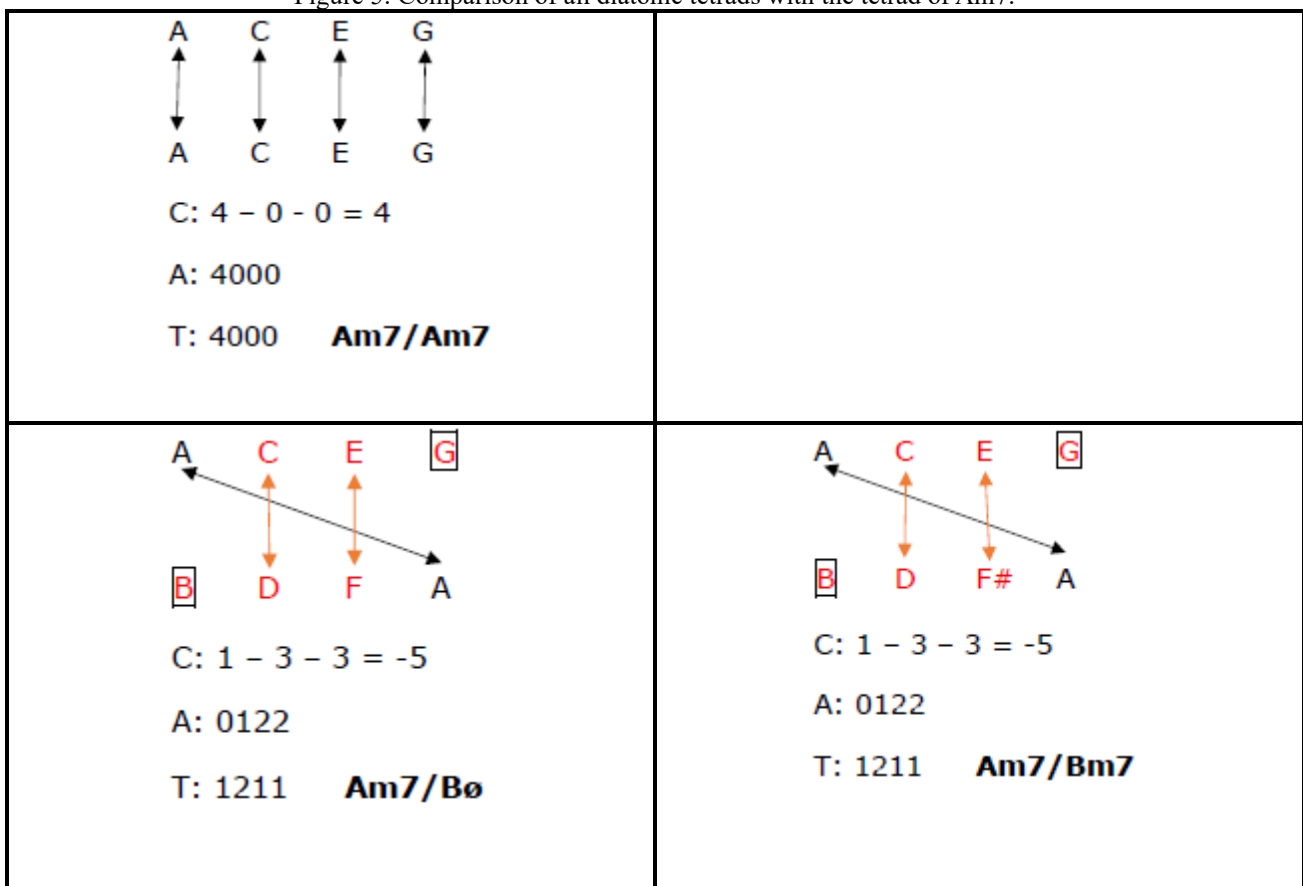
In the **structural alignment method (A)**, the relation of **Am7** to itself has the largest vector (4000) because all the notes are matched. In the comparison between **Am7 and Bø**, there is no match in place (MIP), there is 1 match out of place (MOP), 2 alignable differences, and 2 non-alignable differences, resulting in vector **0122**. In the comparison between **Am7 and Bm7**, there is no match in place (MIP), there is 1 match out of place (MOP), 2 alignable differences, and 2 non-

alignable differences, resulting in vector **0122**. In the comparison between **Am7 and C7M**, there is no match in place (MIP), there are 3 matches out of place (MOP), no alignable differences, and 2 non-alignable differences, resulting in vector **0302**. In the comparison between **Am7 and C_{#5}^{7M}**, there is no match in place (MIP), there are 2 matches out of place (MOP), 1 alignable difference, and 2 non-alignable differences, resulting in vector **0212**. In the comparison between **Am7 and Dm7**, there is no match in place (MIP), there are 2 matches out of place (MOP), no alignable differences, and 4 non-alignable differences, resulting in vector **0204**. In the comparison between **Am7 and D7**, there is no match in place (MIP), there are 2 matches out of place (MOP), no alignable differences, and 4 non-alignable differences, resulting in vector **0204**. In the comparison between **Am7 and Em7**, there is no match in place (MIP), there are 2 matches out of place (MOP), no alignable differences, and 4 non-alignable differences, resulting in vector **0204**. In the comparison between **Am7 and E7** there is no match in place (MIP), there is 1 match out of place (MOP), 2 alignable differences and 2 non-alignable differences, resulting in vector **0122**. In the comparison between **Am7 and F7M**, there is no match in place (MIP), there are 3 matches out of place (MOP), no alignable differences, and 2 non-alignable differences, resulting in vector **0302**. In the comparison between **Am7 and F#o**, there is no match in place (MIP), there are 3 matches out of place (MOP), no alignable differences, and 2 non-alignable differences, resulting in vector **0302**. In the comparison between **Am7 and G7**, there is no match in place (MIP), there is 1 match out of place (MOP), 2 alignable differences, and 2 non-alignable differences, resulting in vector **0122**. In the comparison between **Am7 and G#o**, there is no match in place (MIP), no match out of place (MOP), there are 4 alignable differences and no non-alignable differences, resulting in vector **0040**. In the comparison between **Am7 and G#^o**, there is no match in place (MIP), no match out of place (MOP), there are 4 alignable differences and no non-alignable differences, resulting in vector **0040**.

In the **transformation** method (T), the relation of **Am7** to itself has the largest vector (4000) because all the notes are matched. In the comparison between **Am7 and B_o**, there is 1 note in common, two transformations, 1 subtraction, and 1 addition, resulting in the vector **1211**. In the comparison between **Am7 and Bm7**, there is 1 note in common, two transformations, 1 subtraction, and 1 addition, resulting in the vector **1211**. In the comparison between **Am7 and C7M**, there are 3 notes in common, no transformation, 1 subtraction, and 1 addition, resulting in the vector **3011**. In the comparison between **Am7 and C_{#5}^{7M}**, there are 2 notes in common, 1 transformation, 1 subtraction, and 1 addition, resulting in the vector **2111**. In the comparison between **Am7 and Dm7**,

there are 2 notes in common, no transformations, 2 subtractions, and 2 additions, resulting in the vector **2022**. In the comparison between **Am7 and D7**, there are 2 notes in common, no transformations, 2 subtractions, and 2 additions, resulting in the vector **2022**. In the comparison between **Am7 and Em7**, there are 2 notes in common, no transformations, 2 subtractions, and 2 additions, resulting in the vector **2022**. In the comparison between **Am7 and E7**, there is 1 note in common, 2 transformations, 1 subtraction, and 1 addition, resulting in the vector **1211**. In the comparison between **Am7 and F7M**, there are 3 notes in common, no transformation, 1 subtraction, and 1 addition, resulting in the vector **3011**. In the comparison between **Am7 and F#o**, there are 3 notes in common, no transformation, 1 subtraction, and 1 addition, resulting in the vector **3011**. In the comparison between **Am7 and G7**, there is 1 note in common, 2 transformations, 1 subtraction, and 1 addition, resulting in the vector **1211**. In the comparison between **Am7 and G#o**, there is no note in common, there are 4 transformations, no subtraction, and no addition, resulting in the vector **0400**. In the comparison between **Am7 and G#o**, there is no note in common, there are 4 transformations, no subtraction, and no additions, resulting in vector **0400**.

Figure 5: Comparison of all diatonic tetrads with the tetrad of Am7.



<p>C: $3 - 1 - 1 = 1$ A: 0302 T: 3011 Am7/C7M</p>	<p>C: $2 - 2 - 2 = -2$ A: 0212 T: 2111 Am7/C^{7M}_{#5}</p>
<p>C: $2 - 2 - 2 = -2$ A: 0204 T: 2022 Am7/Dm7</p>	<p>C: $2 - 2 - 2 = -2$ A: 0204 T: 2022 Am7/D7</p>
<p>C: $2 - 2 - 2 = -2$ A: 0204 T: 2022 Am7/Em7</p>	<p>C: $1 - 3 - 3 = -5$ A: 0122 T: 1211 Am7/E7</p>
<p>C: $3 - 1 - 1 = 1$ A: 0302 T: 3011 Am7/F7M</p>	<p>C: $3 - 1 - 1 = 1$ A: 0302 T: 3011 Am7/F#^o</p>

<p>C: 1 - 3 - 3 = -5</p> <p>A: 0122</p> <p>T: 1211 Am7/G7</p>	<p>C: 0 - 4 - 4 = -8</p> <p>A: 0040</p> <p>T: 0400 Am7/G#°</p>
<p>C: 0 - 4 - 4 = -8</p> <p>A: 0040</p> <p>T: 0400 Am7/G#°</p>	

It can be seen in Table 2 that although it is possible to organize the similarities, distances and groupings of all the diatonic tetrads of the Am tonality in the same order in the three methods, there is a difference in one of the intermediate levels. The chords that appear at level 3 of the contrast model are divided into two groups in structural alignment and transformation. The methods of structural alignment and transformation have the same classificatory result at all levels. It should be noted that the contrast model was taken as an example of classificatory results because its method of assessing similarities is quite clear: $S(A, B) = \theta f(A \cap B) - \alpha f(A - B) - \beta f(B - A)$, while the four-number vectors of the other two methods were created by the authors of this study.

For the classification of similarities, the number of commonalities is first evaluated and, if necessary, in case of a tie, the number of differences is evaluated. This occurs at levels 3 and 4 of the structural alignment and transformation methods. It is observed that the chords of level 3 of the contrast model are divided into two groups in the methods of structural alignment and transformation. The four chords that appear highlighted in levels 3 and 4 of the alignment and transformation have the same number of commonalities (02 and 2, respectively), so what differentiates them and classifies them as third and fourth place are the differences. $C_{\#5}^{7M}$ has 3 differences (3#) from the Am7 chord, and D7, Dm7 and Em7 have 4 differences (4#) from Am7.

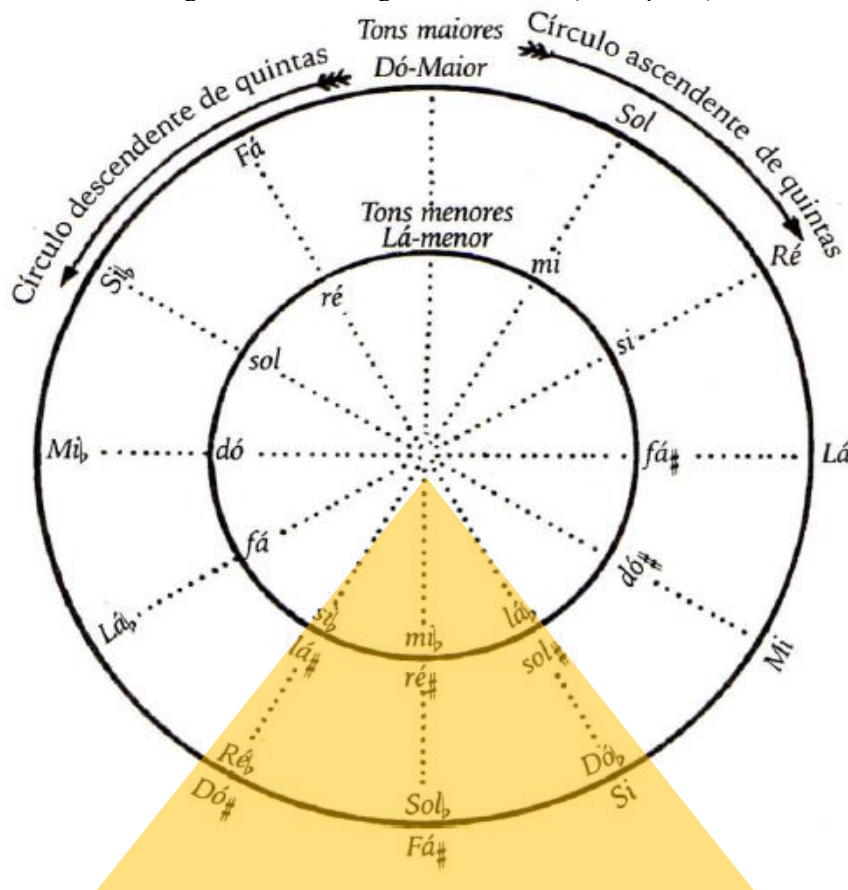
Table 2: comparison between the three similarity models in relation to the Am7 chord.

Level	Contrast	Vector	Level	Alignment	Vector	Level	Transformation	Vector
1	Am7	4	1	Am7	4000	1	Am7	4000
2	C7M F7M F#ø7	1	2	C7M F7M F#ø7	0302	2	C7M F7M F#ø7	3011
3	C ^{7M} _{#5} D7 Dm7 Em7	-2	3	C ^{7M} _{#5}	0212 (3#)	3	C ^{7M} _{#5}	2111 (3#)
			4	D7 Dm7 Em7	0204 (4#)	4	D7 Dm7 Em7	2022 (4#)
4	E7 G7 Bm7 Bø7	-5	5	E7 G7 Bm7 Bø7	0122	5	E7 G7 Bm7 Bø7	1211
5	G#°7 G#ø7	-8	6	G#°7 G#ø7	0040	6	G#°7 G#ø7	0400

APPLICATION OF THE CONTRAST, STRUCTURAL ALIGNMENT, AND TRANSFORMATION MODEL TO THE MAJOR AND MINOR KEYS DERIVED FROM THE FOUR TONAL SCALES

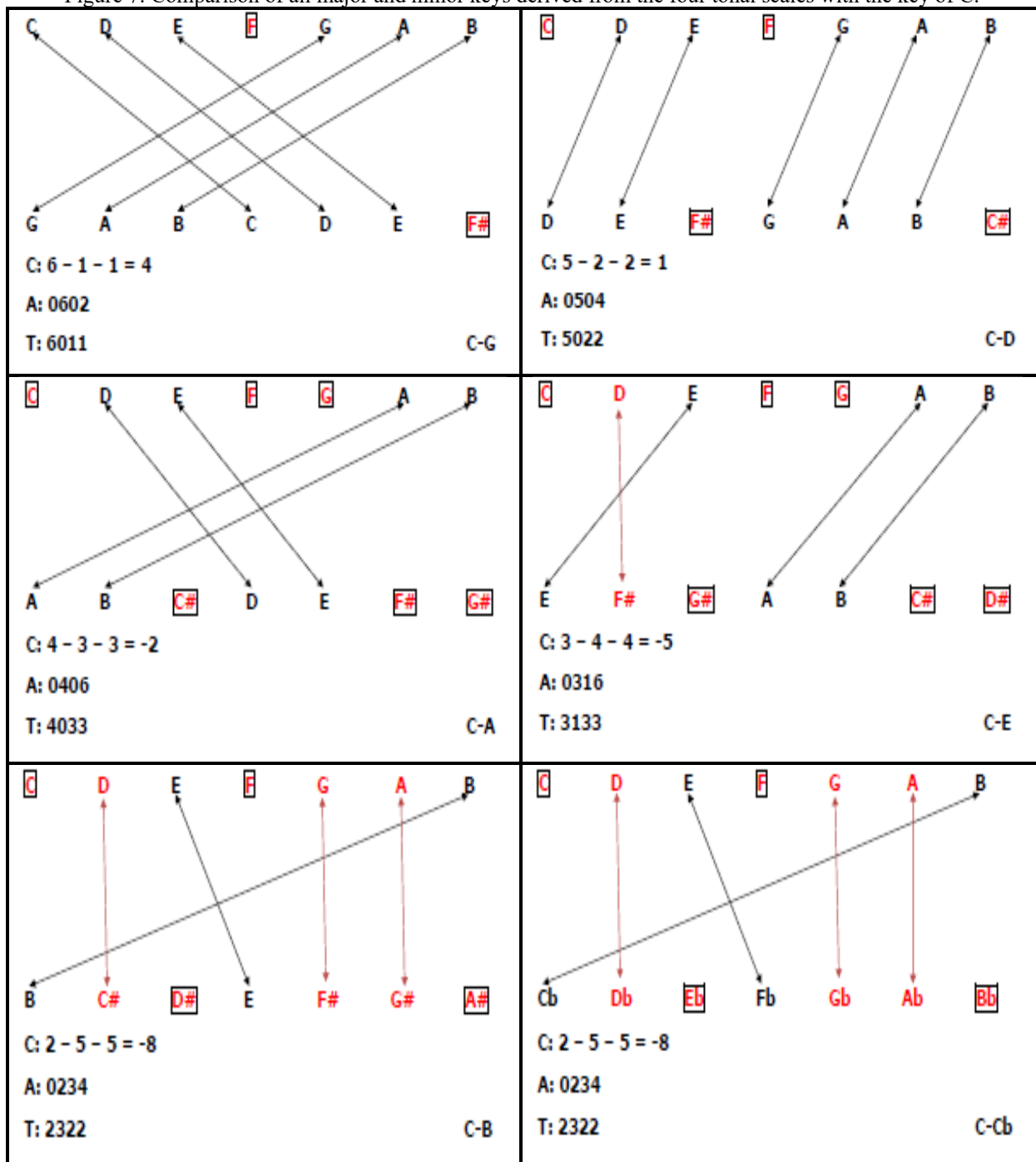
The distances and groupings of the Keys were obtained through the same methods of evaluation of similarities developed in cognitive psychology. The Keys involved in the comparison processes are those that appear in the circle of fifths, as explained by Schoenberg (2001, p.230). It can be seen that the only Keys that appear in an enharmonic way are those highlighted in a yellow triangle in fig.6.

Figure 6: Schoenberg's circle of fifths (2001, p.230).

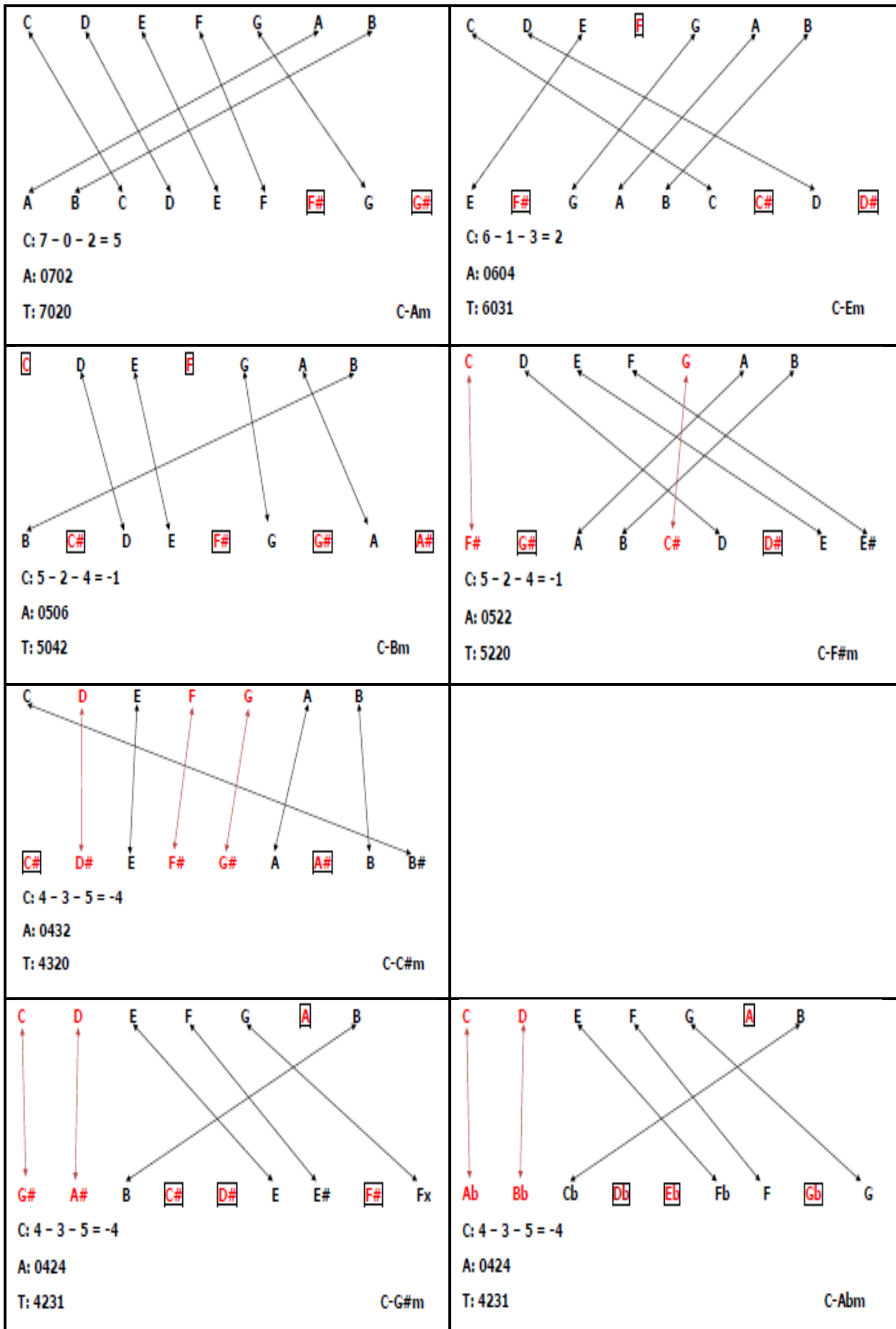


In figs.7 and 8 below, it is possible to see the similarity vectors of the three methods between all major and minor keys in relation to the C and Am keys, taking into account the four tonal scales. The black notes connected by black arrows indicate the notes in common between the keys, the red notes connected by red arrows indicate the different notes that are over the same interval degree (referring only to the degrees and not to the major, minor, augmented and diminished quality) and the red notes within a square without arrows correspond to the different notes that do not find a match in the other key.

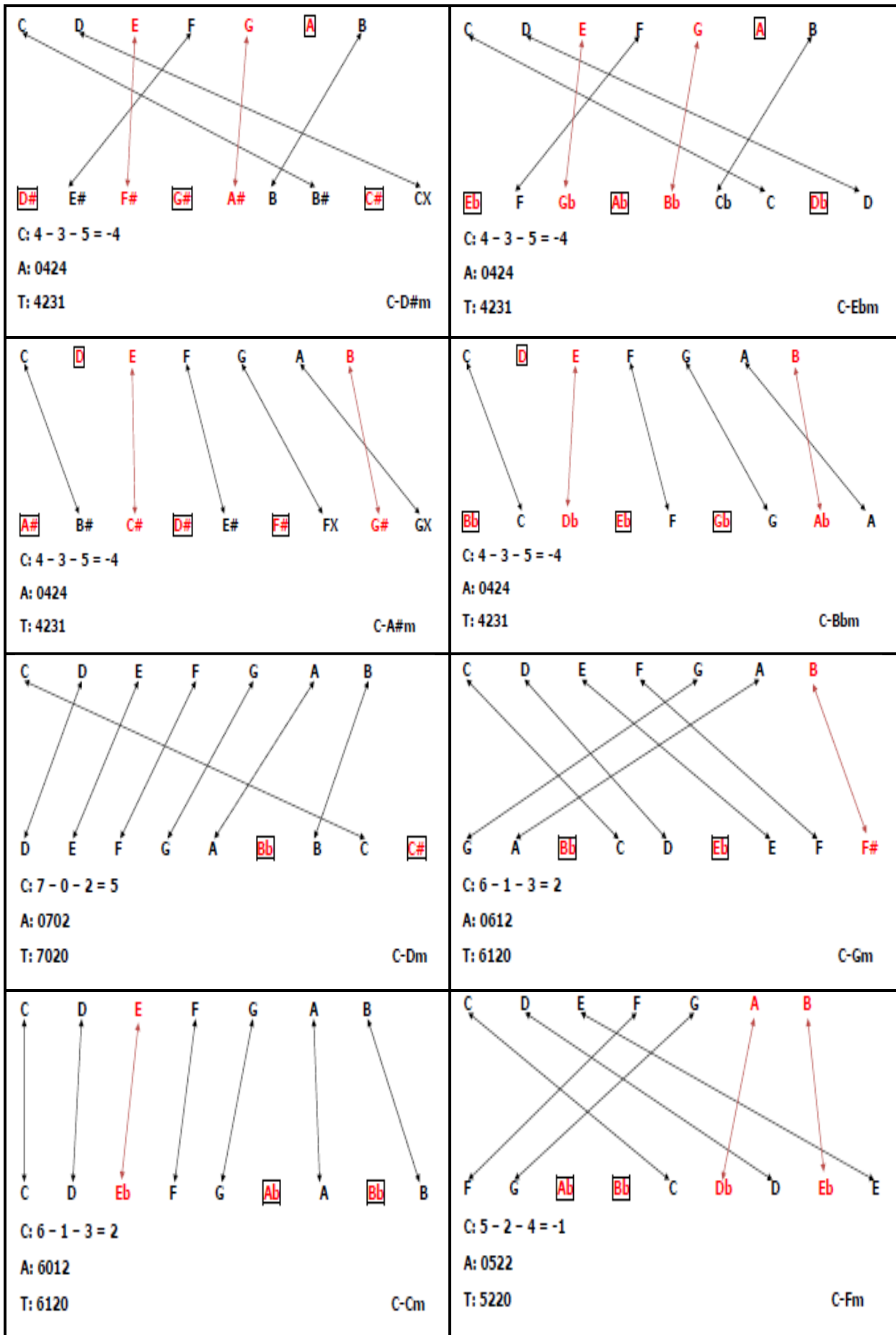
Figure 7: Comparison of all major and minor keys derived from the four tonal scales with the key of C.



<p>C: $2 - 5 - 5 = -8$ A: 0250 T: 2500</p> <p style="text-align: right;">C-F#</p>	<p>C: $2 - 5 - 5 = -8$ A: 0250 T: 2500</p> <p style="text-align: right;">C-Gb</p>
<p>C: $2 - 5 - 5 = -8$ A: 0234 T: 2322</p> <p style="text-align: right;">C-C#</p>	<p>C: $2 - 5 - 5 = -8$ A: 0234 T: 2322</p> <p style="text-align: right;">C-Db</p>
<p>C: $6 - 1 - 1 = 4$ A: 0602 T: 6011</p> <p style="text-align: right;">C-F</p>	<p>C: $5 - 2 - 2 = 1$ A: 0504 T: 5022</p> <p style="text-align: right;">C-Bb</p>
<p>C: $4 - 3 - 3 = -2$ A: 0406 T: 4033</p> <p style="text-align: right;">C-Eb</p>	<p>C: $3 - 4 - 4 = -5$ A: 0316 T: 3133</p> <p style="text-align: right;">C-Ab</p>

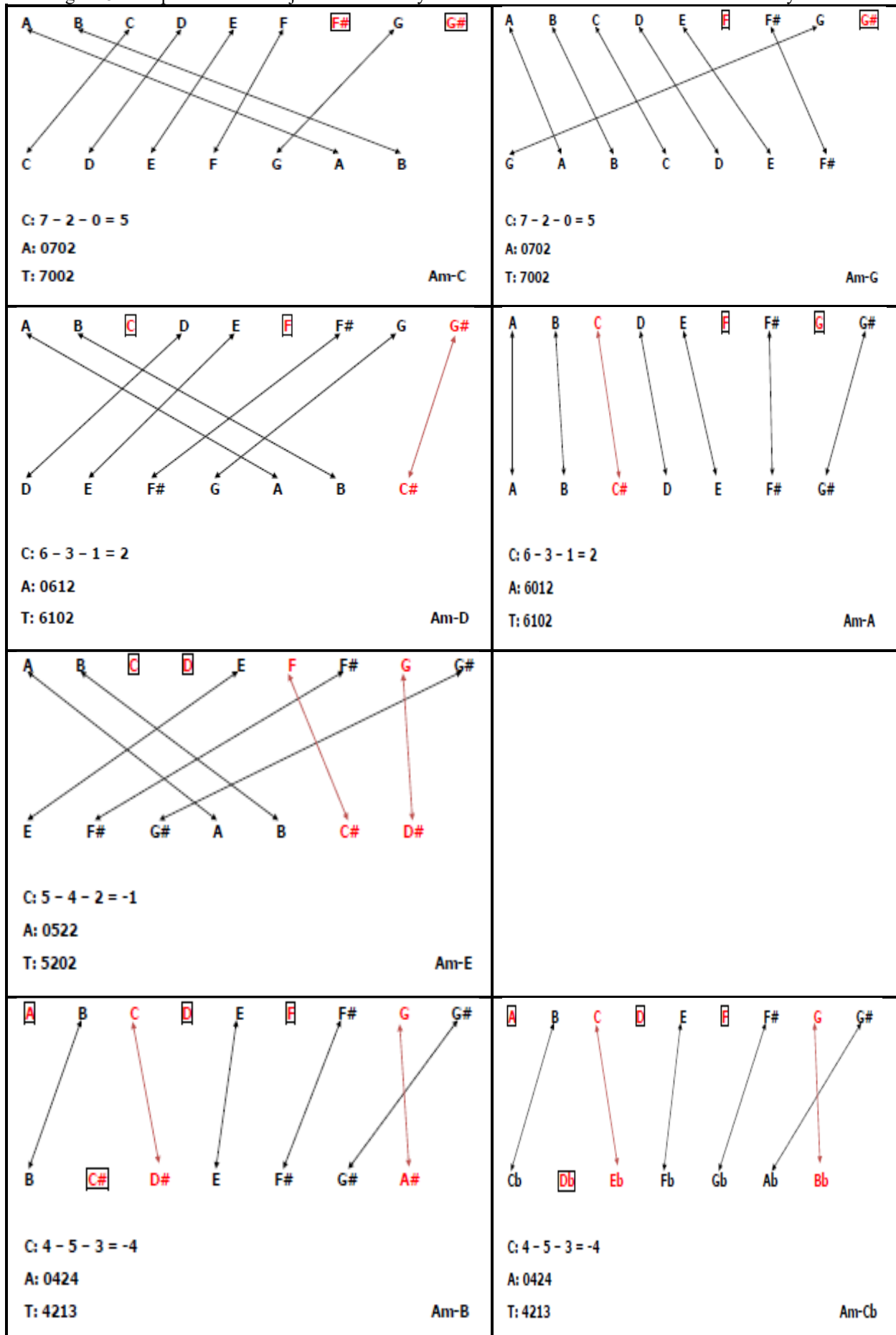


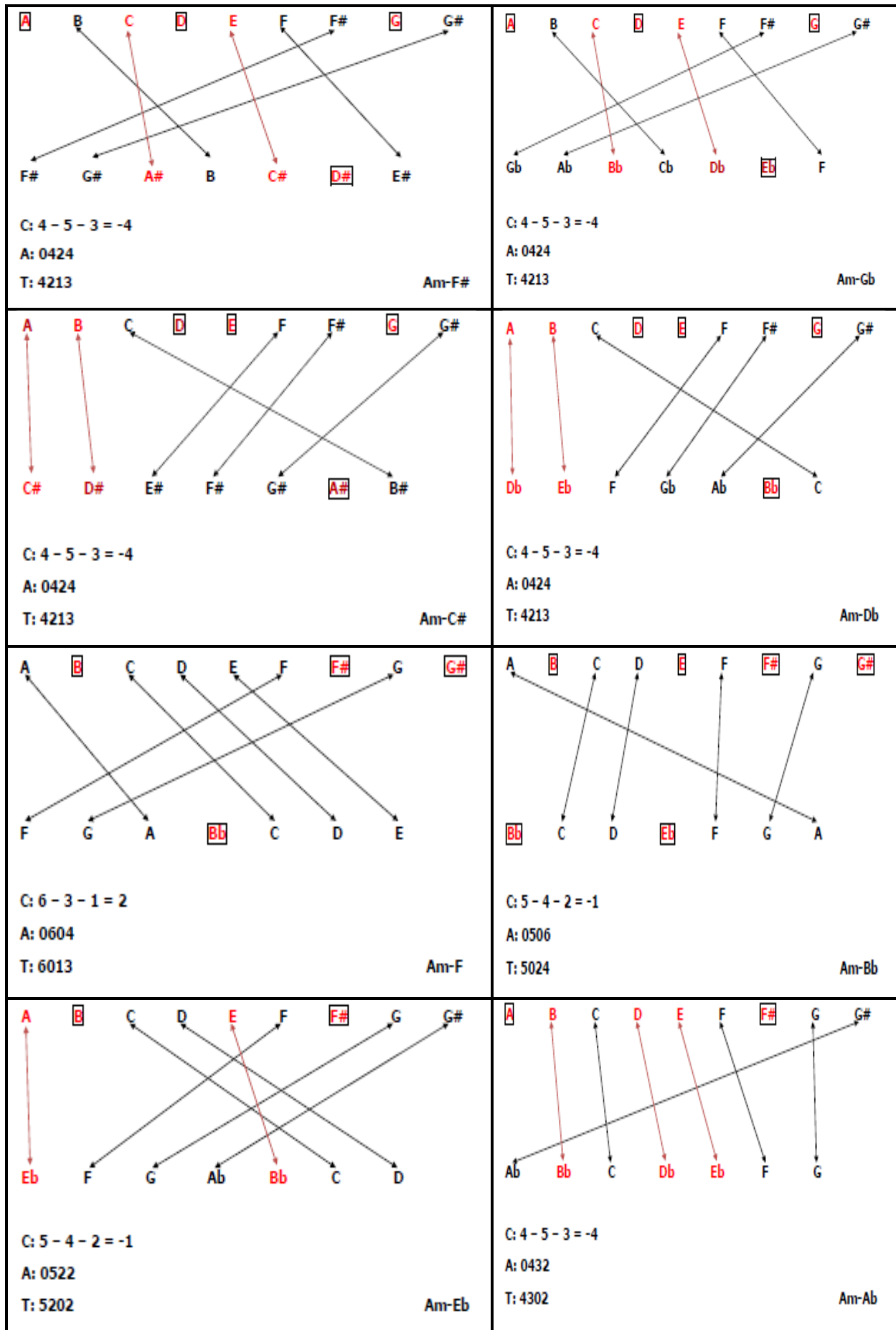
Interconnections of Knowledge: Multidisciplinary Approaches



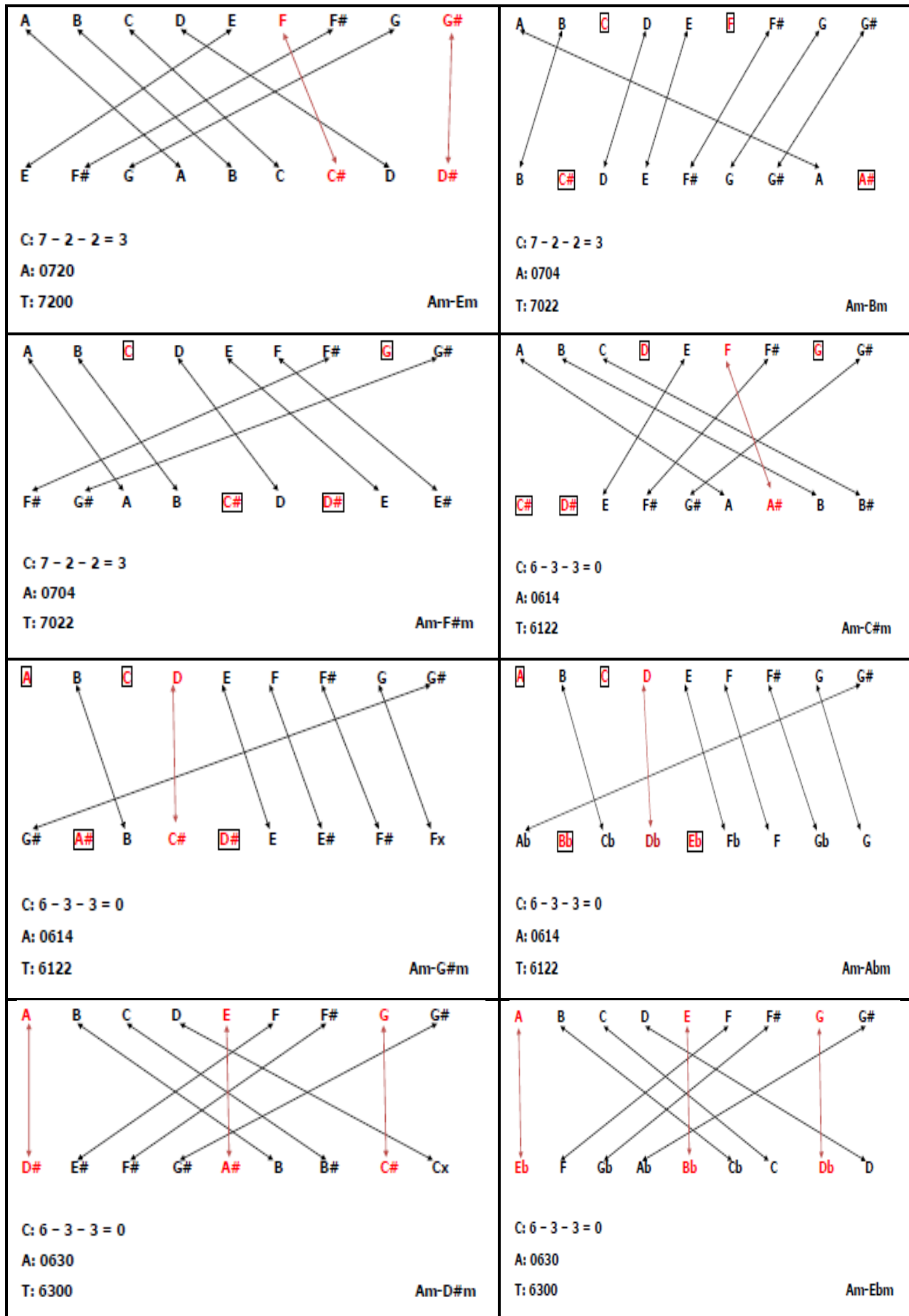
Interconnections of Knowledge: Multidisciplinary Approaches

Figure 8: Comparison of all major and minor keys derived from the four tonal scales with the key of Am.





Interconnections of Knowledge: Multidisciplinary Approaches



Interconnections of Knowledge: Multidisciplinary Approaches

<p>C: 6 - 3 - 3 = 0 A: 0614 T: 6122</p> <p style="text-align: right;">Am-A#m</p>	<p>C: 6 - 3 - 3 = 0 A: 0614 T: 6122</p> <p style="text-align: right;">Am-Bbm</p>
<p>C: 7 - 2 - 2 = 3 A: 0720 T: 7200</p> <p style="text-align: right;">Am-Dm</p>	<p>C: 7 - 2 - 2 = 3 A: 0704 T: 7022</p> <p style="text-align: right;">Am-Gm</p>
<p>C: 7 - 2 - 2 = 3 A: 0704 T: 7022</p> <p style="text-align: right;">Am-Cm</p>	<p>C: 6 - 3 - 3 = 0 A: 0614 T: 6122</p> <p style="text-align: right;">Am-Fm</p>

Table 3 shows the classification of similarities, distances and groupings between all major and minor keys in relation to the key of C, taking into account the four tonal scales. The way of classification is the same as that used for chords. First, the commonalities are evaluated, if there is a tie, the differences are observed. For example, in the contrast model, the Keys of Cm, Gm, and Em appear tied for third place with vector $(6 - 1 - 3 = 2)$, but in structural alignment and transformation, they appear divided into two groups, third place (Cm and Gm) and fourth place (Em), respectively. It is observed that the three Keys appear with 6 commonalities in structural alignment and transformation (the first two numbers of the vectors of the structural alignment method represent the commonalities in place and out of place, respectively; and the first number of the vectors of the transformation method represents the commonalities), but Cm and Gm have 3 differences (3#) with

respect to C and Em has 4 differences (4#). The differences, in these cases, are the classificatory requirements. What is striking in this case are the commonalities in place of structural alignment, something that does not happen in the contrast model or in the transformation. The key of Cm has its 6 commonalities as correspondences in place (MIPS) and the key of Gm has its 6 commonalities as correspondences out of place (MOPS). In this regard, the key of Cm can take the first position in the ranking list, as no other key has commonalities in its place. In this sense, structural alignment explains why C and Cm are considered the same key in the classical and romantic period, i.e., the change from C to Cm or vice versa was not considered modulation, but only a change of mode. Piston (1987, p.231-232) considered that the parallel major and minor keys (or homonyms) are practically identical and that the classical composition of the eighteenth and nineteenth centuries tended "regarded the two modes as simply two different aspects of one tonality" (also discussed in Krumhansl and Kessler 1982, p.339). For Piston (1987, p.62), "the change of mode from major to minor, or vice versa, does not affect the key [...] And it's one of the most important means of variation." According to Krumhansl and Kessler (1982, p.338-339):

Additionally, there is a close tie between a major key and the minor key built on the same tonic, which is called the parallel minor. This is true even though their key signatures differ in terms of three sharps or flats. For example, C major (with no sharps or flats) has C minor (with three flats) as its parallel minor. Despite the differences in key signatures, these keys share most of the structurally stable tones—the tonic, fourth, and fifth scale degrees—as well as the seventh, leading tone in the harmonic and ascending melodic forms. Possibly even more important is the fact that they also share the essential dominant, V, chord, which prepares the tonic of either of the parallel keys.

For Schoenberg (2004, p.74; 1999 [1969], p.52),¹⁰ "in classical music, major and minor are often interchanged without much explanation; A passage in minor is followed by another in major, and vice versa, without any harmonic element of connection." According to Schoenberg (2001, p.303-304, p.318; 1978, p.207-208, p.219), what allows the interchange between homonymous tonalities is the dominant one in common, that is, after a dominant one can come either a major or a minor tonic: "a dominant one can introduce a major or minor triad, and it can be the dominant one of a major or minor region. The possibility of permutation between major and minor is anchored in the strength of the dominant one" (Schoenberg 2004, p.73, 1999 [1969], p.51). An idea that was also part of Piston's thought (1987, p.63) when he said that the dominant one proceeds to the major or minor tonic with equal ease (also in Piston 1987, p.233). For Dubovsky *et al.* (2018, p.330), the interaction between the major and minor modes resulted in the enrichment of both modes. In the

¹⁰ The first reference is from the Portuguese edition, *Structural Functions of Harmony* of 2004. The second reference is from the 1999 edition *of Structural Functions of Harmony* [1969]. The same will apply to the references of other quotations from Schoenberg throughout the text: Portuguese edition and English edition, or vice versa. It is noteworthy that the 1954, 1969, and 1999 editions of *Structural Functions of Harmony* are identical with respect to the page numbers given as reference.

early nineteenth century, composers such as Schubert began to saturate their major pieces with elements of the minor to such an extent that the twenty-four major and minor keys seem to have merged into just twelve major-minor calls. According to Smith (1986, p.112, footnote 23),

One corollary of this pivotal status is that we can distinguish only twelve, and not twenty-four, keys-since there are only twelve possible leading tones, and hence only twelve possible V chords. Thus major and minor modes must be regarded functionally as different colorings of one key, rather than as different keys-as indeed they are treated by most nineteenth-century composers most of the time.

Without a doubt, the major-minor duality is abundant in the period of common practice of the 18th and early 19th centuries. As described by Schenker (1954, p.86-87):

Properly speaking, I think any composition moves in a major-minor system. A composition in C, for example, should be understood as in C major-minor ($C \frac{\text{maior}}{\text{menor}}$); for a pure C major, without any C minor ingredient, or, vice versa, a pure C minor, without any C major component, hardly occurs in reality.

This thought was also expressed by Ottman (1992 [1961], p.200) when he said that "a passage of music is sometimes said to be in mixed mode when it includes harmonic structures from both the major and minor modes", and also by Dubovsky et al. (2018, p.330), writing that "all the complexities that characterized the interaction of the greater with the minor formed the major-minor system, with the modes themselves receiving the denomination of major-minor or minor-major, depending on whether they are driven by the major or minor stress." Smith (1981, p.158) also regarded "the modes, especially major and the minor, as different colorings of the same key, rather than as separate tonalities; there are therefore only 12 distinguishable keys." For Ratner (1962, p.249), also, "it is possible to switch modes while retaining the same tonal center. The implications of the interchange of mode for eighteenth- and nineteenth-century music are tremendous. Both harmonic structure and harmonic color are involved.". According to Gauldin (2004, p.502),

The major and minor modes were clearly delineated in the tonal compositions of the later Baroque period (1670-1750). A movement or an entire piece of music exhibited tonal closure by starting and concluding in the same key and same mode, although interior modulations were possible. Later composers began to experiment with blurring the modes by introducing passages in the parallel major or minor key. This technique, known as modal exchange, was frequently employed by Beethoven and Schubert during the opening decades of the nineteenth century.

Even for Rameau (1971 [1722], p.162-163), about two hundred years before these authors, parallel tonalities meant only a change of mode over the same fundamental one and not a change of tonality:

Notice that we do not separate the term mode from the term key when a change between major and minor is found on the same tonic note, for we may change the mode from major to

minor or from minor to major without changing the tonic or principal note of the mode. For example, when we pass from a gay theme to a sad one, or from a sad to a gay, as occurs in most Chaconnes or Passacaglias [...] we can say that the key does not change, even though the mode changes. If the note Do is the tonic of the major mode, then it is also the tonic in the minor (Rameau 1971 [1722], p.162-163).¹¹

Another differentiation between the classification of the contrast model and the other two, structural alignment and transformation, can be seen in the key of C#m in relation to the prototype or referential key of C. In the contrast model, the key C#m appears in seventh place along with other key as can be seen in Table 4, however, in structural alignment and transformation, it can be placed between the seventh and eighth position as indicated by the arrow, because its vectors 0432 and 4320 in structural alignment and transformation, respectively, which have 4 commonalities and 5 differences, displaces the key of C#m that appears in the ninth position. The Key of C#m was placed in the ninth position because, as previously stated, the contrast model provides the classificatory example for the other two methods.

Table 3: results of the three similarity assessment methods in relation to the tonality of C.

Level	Contrast C	Vector	1	Alignment C IOAN	Vector	Level	Transformation C CTSA	Vector
1	Am Dm	$7 - 0 - 2 = 5$	2	Am Dm	0702 (2#) 0702 (2#)	2	Am Dm	7020 (2#) 7020 (2#)
2	G F	$6 - 1 - 1 = 4$	3	G F	0602 (2#) 0602 (2#)	3	G F	6011 (2#) 6011 (2#)
3	Cm Gm Em	$6 - 1 - 3 = 2$	4	Cm Gm	6012 (3#) 0612 (3#)	4	Cm Gm	6120 (3#) 6120 (3#)
			5	Em	0604 (4#)	5	Em	6031 (4#)
			6	D Bb	0504 (4#) 0504 (4#)	6	D Bb	5022 (4#) 5022 (4#)
5	F#m Fm Bm	$5 - 2 - 4 = -1$	6	F#m Fm	0522 (4#) 0522 (4#)	6	F#m Fm	5220 (4#) 5220 (4#)
			7	Bm	0506 (6#)	7	Bm	5042 (6#)
6	A Eb	$4 - 3 - 3 = -2$	8	A Eb	0406 (6#) 0406 (6#)	8	A Eb	4033 (6#) 4033 (6#)
			9	C#m	0432 (5#)	9	C#m	4320 (5#)
7	C#m G#m (Abm) D#m (Ebm) A#m (Bbm)	$4 - 3 - 5 = -4$	10	G#m (Abm) D#m (Ebm) A#m (Bbm)	0424 (6#) 0424 (6#) 0424 (6#)	10	G#m (Abm) D#m (Ebm) A#m (Bbm)	4231 (6#) 4231 (6#) 4231 (6#)
			11	E Ab	0316 (7#) 0316 (7#)	11	E Ab	3133 (7#) 3133 (7#)
			12	F# (Gb)	0250 (5#)	12	F# (Gb)	2500 (5#)
9	F# (Gb) B (Cb) C# (Db)	$2 - 5 - 5 = -8$	13	B (Cb) C# (Db)	0234 (7#) 0234 (7#)	13	B (Cb) C# (Db)	2322 (7#) 2322 (7#)

Table 4 shows the classification of similarities, distances and groupings between all major and minor keys in relation to the key of Am taking into account the four tonal scales. The same comments as earlier on the parallel or homonymous keys of C and Cm occur here in relation to the

¹¹ It is noted here that Rameau calls the fundamental note the "tonic note." This study, however, differentiates between these two terms. "Fundamental" refers to the first note of a scale or the fundamental bass of a chord, while "tonic" refers to the first-degree chord of a key.

keys of Am and A. The key of A has its 6 commonalities as correspondences in place (MIPS) and the key of D has its 6 commonalities as correspondences out of place (MOPS). In this regard, the key of A can take the first position in the ranking list, as no other key has commonalities in its place.

As with the key of C#m in relation to the key of C in the contrast model, the key of D#m (Ebm) appears in fourth place along with other keys as can be seen in table 4, however, in the structural alignment and transformation, it can be placed between the fourth and fifth position as indicated by the arrow, because its vectors 0630 in structural alignment and 6300 in transformation, which have 6 commonalities and 3 differences (3#), displaces the key D#m (Ebm) from the sixth position.

Table 4: results of the three similarity assessment methods in relation to the tonality of Am.

Level	Contrast Am	Vector	Level	Alignment Am IOAN	Vector	Level	Transformation Am CTSA	Vector
1	C G	7 - 2 - 0 = 5	1	C G	0702 (2#) 0702 (2#)	1	C G	7002 (2#) 7002 (2#)
2	Em Dm Bm F#m Cm Gm	7 - 2 - 2 = 3	2	Em Dm	0720 (2#) 0720 (2#)	2	Em Dm	7200 (2#) 7200 (2#)
			3	Bm F#m Cm Gm	0704 (4#) 0704 (4#) 0704 (4#) 0704 (4#)	3	Bm F#m Cm Gm	7022 (4#) 7022 (4#) 7022 (4#) 7022 (4#)
3	D A F	6 - 3 - 1 = 2	4	D A	0612 (3#) 6012 (3#)	4	D A	6102 (3#) 6102 (3#)
			5	F	0604 (4#)	5	F	6013 (4#)
4	D#m (Ebm) C#m G#m (Abm) A#m (Bbm) Fm	6 - 3 - 3 = 0	6	D#m (Ebm)	0630 (3#)	6	D#m (Ebm)	6300 (3#)
			7	C#m G#m (Abm) A#m (Bbm) Fm	0614 (5#) 0614 (5#) 0614 (5#) 0614 (5#)	7	C#m G#m (Abm) A#m (Bbm) Fm	6122 (5#) 6122 (5#) 6122 (5#) 6122 (5#)
5	E Eb Bb	5 - 4 - 2 = -1	8	E Eb	0522 (4#) 0522 (4#)	8	E Eb	5202 (4#) 5202 (4#)
			9	Bb	0506 (6#)	9	Bb	5024 (6#)
6	Ab B (Cb) F# (Gb) C# (Db)	4 - 5 - 3 = -4	10	Ab	0432 (5#)	10	Ab	4302 (5#)
			11	B (Cb) F# (Gb) C# (Db)	0424 (6#) 0424 (6#) 0424 (6#)	11	B (Cb) F# (Gb) C# (Db)	4213 (6#) 4213 (6#) 4213 (6#)

APPLICATION OF THE CONTRAST, STRUCTURAL ALIGNMENT, AND TRANSFORMATION MODEL TO THE 48 SERIES OF ALBAN BERG'S VIOLIN CONCERTO

The 48 series of Alban Berg's Violin Concerto (1935) were also classified through the three methods of assessing similarities developed in cognitive psychology. Menezes (2002, p.214) demonstrates that the original series of this concerto is based on triads, containing the four types of basic chords: major, minor, augmented and diminished chords (fig.9). The final part contains a fragment of the whole-tone scale.

Figure 9 (Menezes 2002, p. 215, ex.114): series of Alban Berg's Violin Concerto.

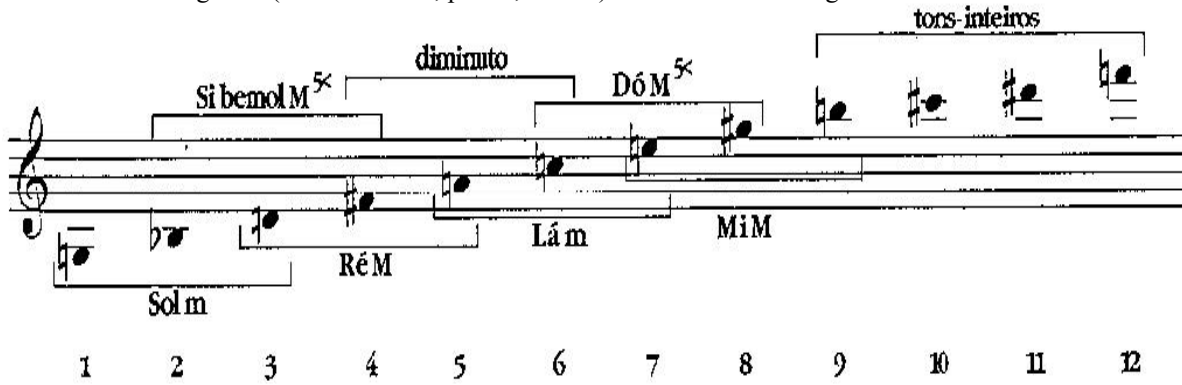


Table 5 shows the 48 series of Alban Berg's Violin Concerto, i.e. the 12 transpositions of the original series, the 12 transpositions of the inversion, the retrograde and the retrograde of the inversion. The transpositions of the 4 main series are numbered from 0 to 11.

Table 5: 48 series of Alban Berg's Violin Concerto.

	I0	I3	I7	I11	I2	I5	I9	I1	I4	I6	I8	I10	
O0	G	Bb	D	F#	A	C	E	G#	B	C#	D#	F	R0
O9	E	G	B	D#	F#	A	C#	F	G#	Bb	C	D	R9
O5	C	Eb	G	B	D	F	A	Db	E	F#	Ab	Bb	R5
O1	Ab	B	Eb	G	Bb	Db	F	A	C	D	E	F#	R1
O10	F	G#	C	E	G	Bb	D	F#	A	B	C#	D#	R10
O7	D	F	A	C#	E	G	B	D#	F#	G#	Bb	C	R7
O3	Bb	Db	F	A	C	Eb	G	B	D	E	F#	Ab	R3
O11	F#	A	Db	F	Ab	B	Eb	G	Bb	C	D	E	R11
O8	Eb	F#	Bb	D	F	G#	C	E	G	A	B	C#	R8
O6	C#	E	Ab	C	Eb	F#	Bb	D	F	G	A	B	R6
O4	B	D	F#	Bb	Db	E	Ab	C	Eb	F	G	A	R4
O2	A	C	E	Ab	B	D	F#	Bb	Db	Eb	F	G	R2
	RI0	RI3	RI7	RI11	RI2	RI5	RI9	RI1	RI4	RI6	RI8	RI10	

Fig.10 shows the comparisons with the highest similarity assessment in relation to the original series (O0). The black notes connected by black arrows indicate the common notes in different positions, the red notes connected by red arrows indicate the common notes in the same position. As can be seen in Table 6, all series were classified into only four groups, so only one example of each group will be described in the following paragraphs.

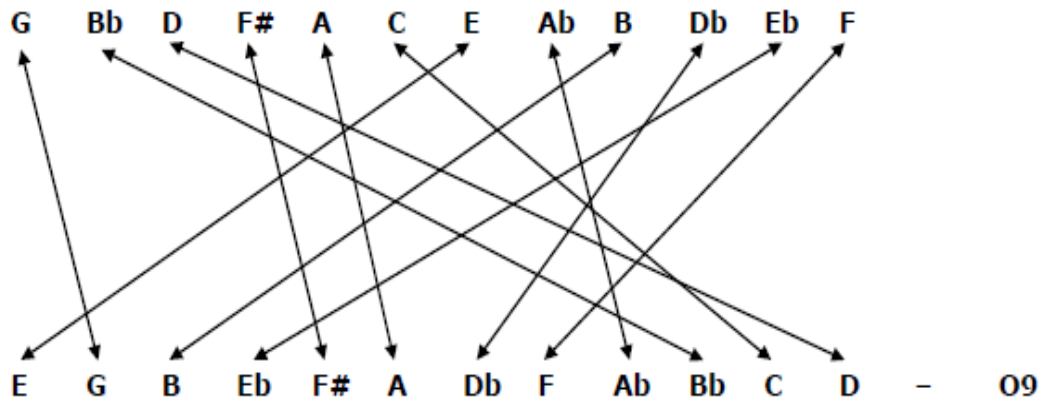
According to the **contrast model (C)**, in the comparison between **O0 and O9**, there are 12 notes in common, no notes other than O0 in relation to O9 and no notes other than O9 in relation to O0, resulting in the equation $12 - 0 - 0 = 12$. In the comparison between **O0 and RI3**, there are 12 notes in common, no notes other than O0 in relation to RI3, and no notes other than RI3 in relation to O0, resulting in the equation $12 - 0 - 0 = 12$. In the comparison between **O0 and I0**, there are 12

notes in common, no notes other than O0 with respect to I0, and no notes other than I0 with respect to O0, resulting in the equation $12 - 0 - 0 = 12$. In the comparison between **O0 and R2**, there are 12 notes in common, no notes other than O0 with respect to R2, and no notes other than R2 with respect to O0, resulting in the equation $12 - 0 - 0 = 12$. Figure 11 shows that the contrast model obtains the same result in all comparisons. This is true for all transpositions of the original series, all regressions, reversals, and retrogrades of the inversion.

In the **structural alignment method (A)**, in the comparison between **O0 and O9** there is no match in place (MIP), there are 12 matches out of place (MOP), no alignable difference and no non-alignable difference, resulting in vector **0/12/00**. In the comparison between **O0 and R13** there are 4 matches in place (MIP), 8 matches out of place (MOP), no alignable differences, and no non-alignable differences, resulting in the **4/8/00 vector**. In the comparison between **O0 and I0** there are 2 matches in place (MIP), 10 matches out of place (MOP), no alignable differences, and no non-alignable differences, resulting in the **2/10/00 vector**. In the comparison between **O0 and R2** there is 1 match in place (MIP), 11 matches out of place (MOP), no alignable difference, and no non-alignable difference, resulting in the vector **1/11/00**.

In the **transformation method (T)**, in the comparison between **O0 and O9** there are 12 commonalities, no transformation, no subtraction, and no addition, resulting in the vector **12/000**. In the comparison between **O0 and R13** there are 12 commonalities, no transformation, no subtraction, and no addition, resulting in the vector **12/000**. In the comparison between **O0 and I0** there are 12 commonalities, no transformation, no subtraction, and no addition, resulting in the vector **12/000**. In the comparison between **O0 and R2** there are 12 commonalities, no transformation, no subtraction, and no addition, resulting in the vector **12/000**. Figure 11 shows that the transformation method also obtains the same result in all similarity comparisons (12/000), as does the contrast model.

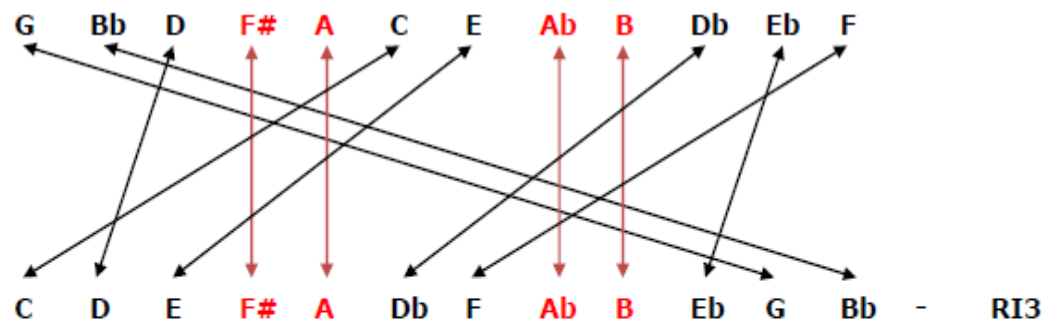
Figure 10: Similarities between the series shown in Table 6.



C: 12 - 0 - 0 = 12

A: 0/12/00

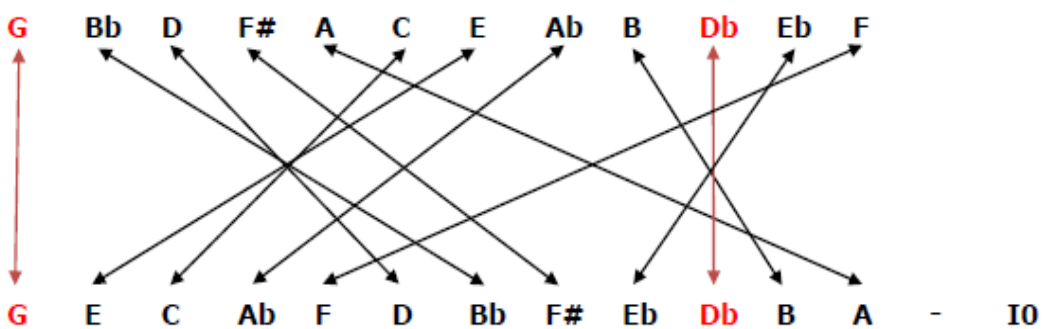
T: 12/000



C: 12 - 0 - 0 = 12

A: 4/8/00

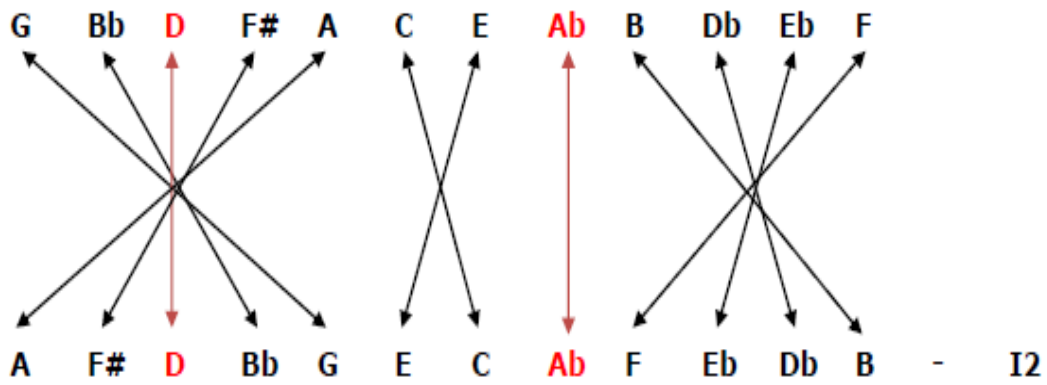
T: 12/000



C: 12 - 0 - 0 = 12

A: 2/10/00

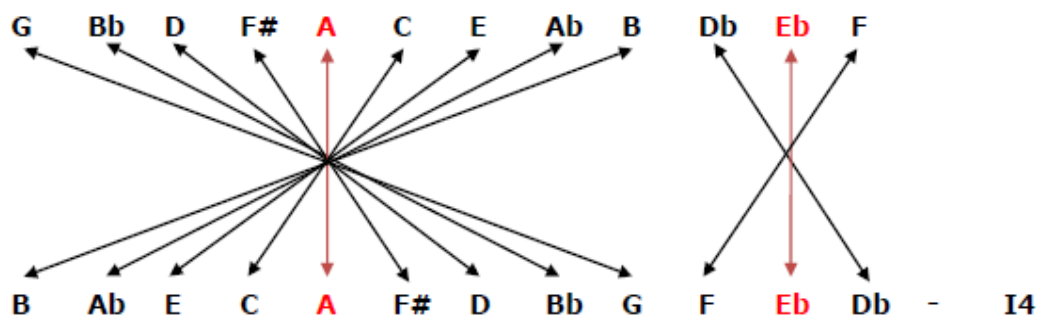
T: 12/000



C: 12 - 0 - 0 = 12

A: 2/10/00

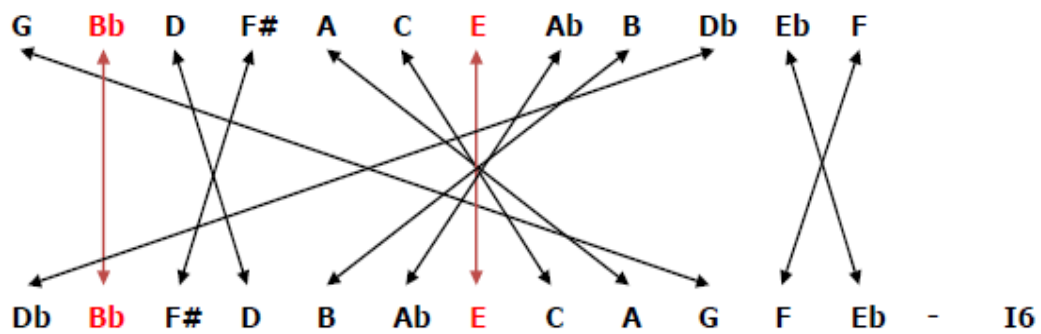
T: 12/000



C: 12 - 0 - 0 = 12

A: 2/10/00

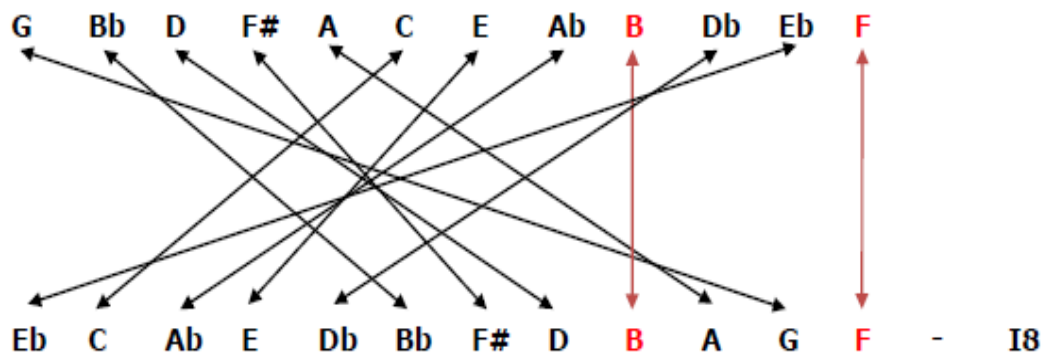
T: 12/000



C: 12 - 0 - 0 = 12

A: 2/10/00

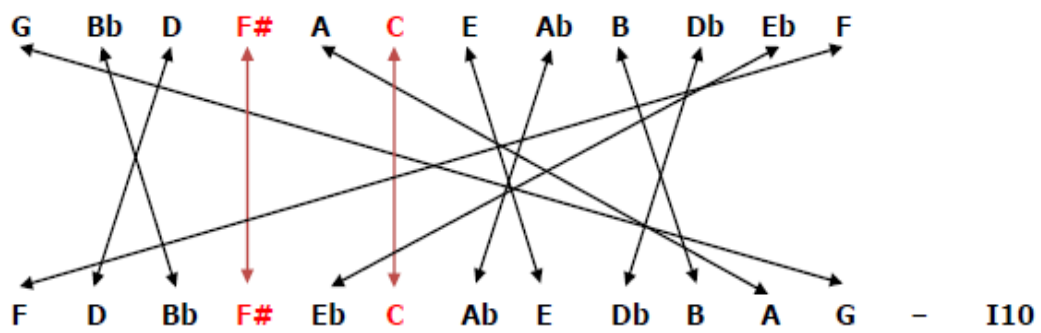
T: 12/000



C: 12 - 0 - 0 = 12

A: 2/10/00

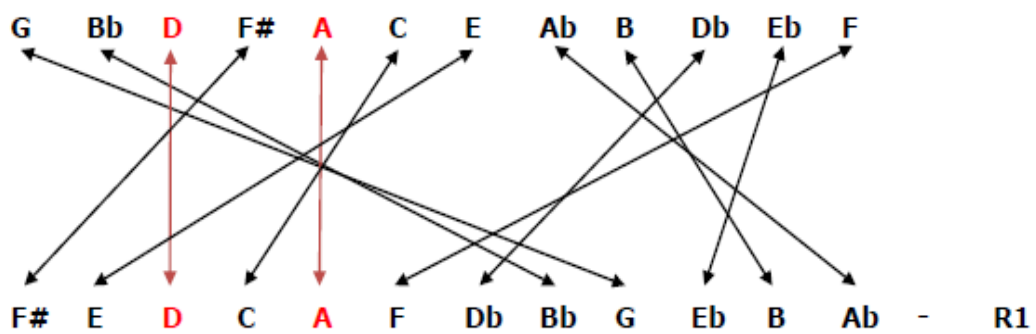
T: 12/000



C: 12 - 0 - 0 = 12

A: 2/10/00

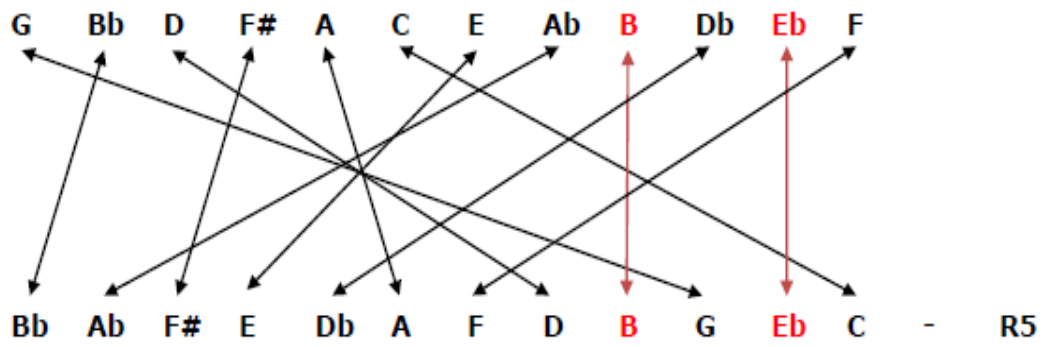
T: 12/000



C: 12 - 0 - 0 = 12

A: 2/10/00

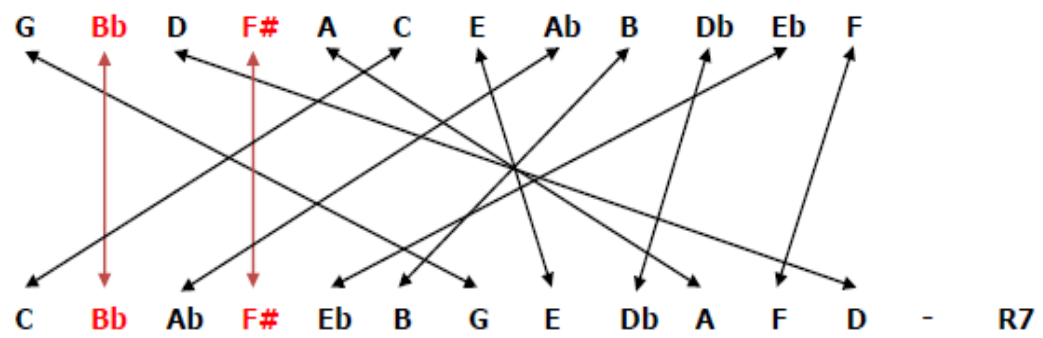
T: 12/000



C: 12 - 0 - 0 = 12

A: 2/10/00

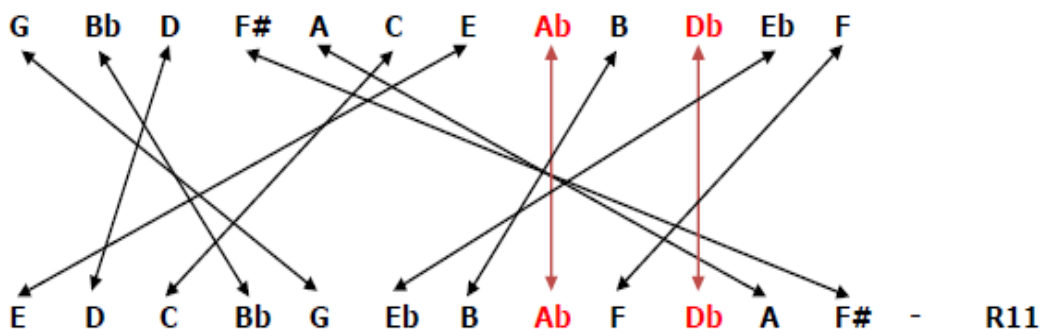
T: 12/000



C: 12 - 0 - 0 = 12

A: 2/10/00

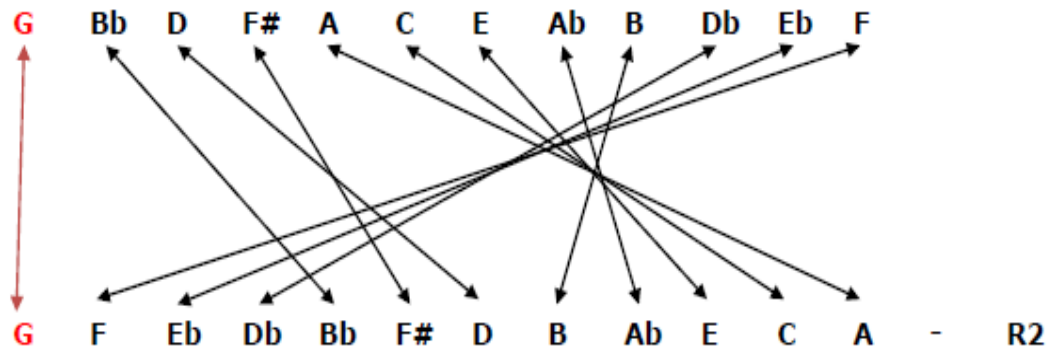
T: 12/000



C: 12 - 0 - 0 = 12

A: 2/10/00

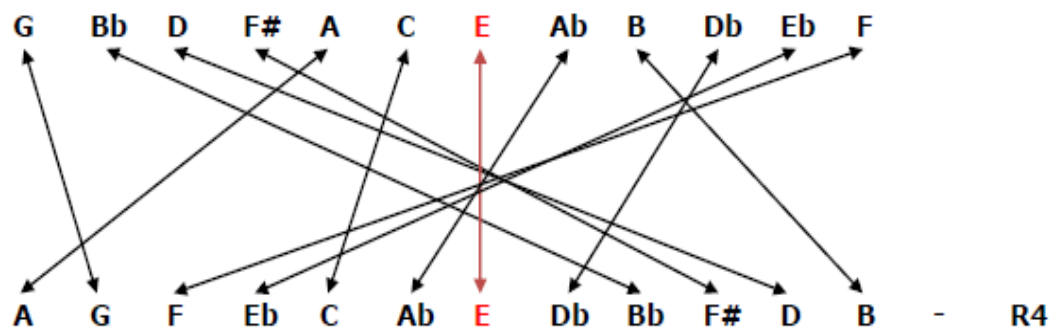
T: 12/000



C: 12 - 0 - 0 = 12

A: 1/11/00

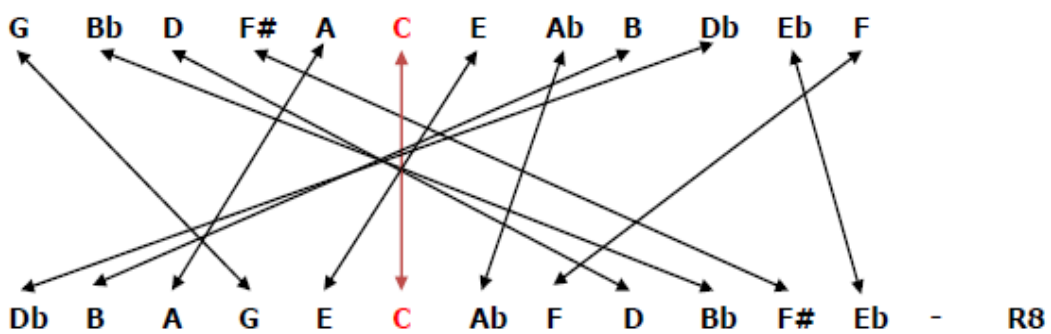
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C: 12 - 0 - 0 = 12

A: 1/11/00

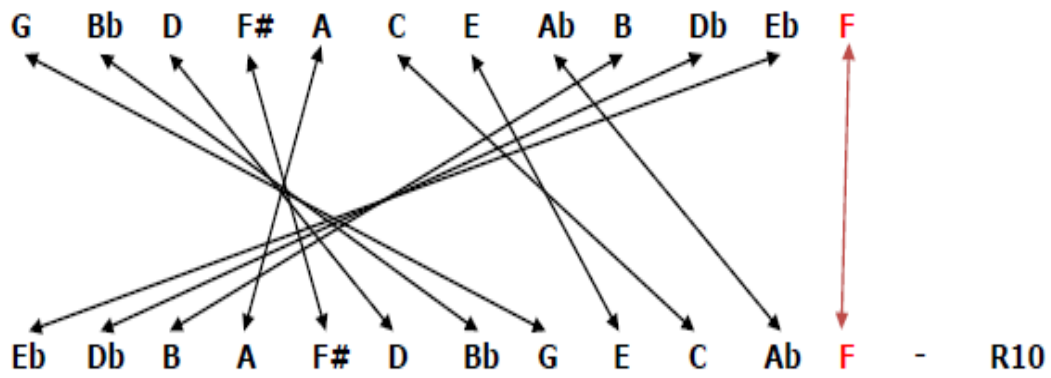
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C: 12 - 0 - 0 = 12

A: 1/11/00

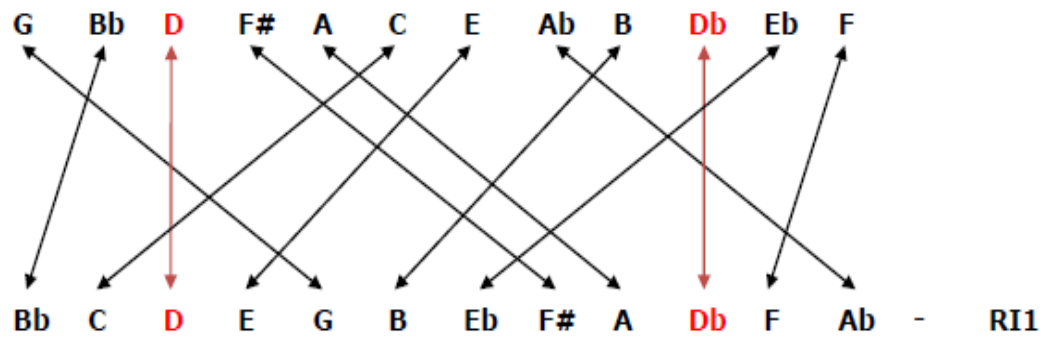
T: 12/000



C: 12 - 0 - 0 = 12

A: 1/11/00

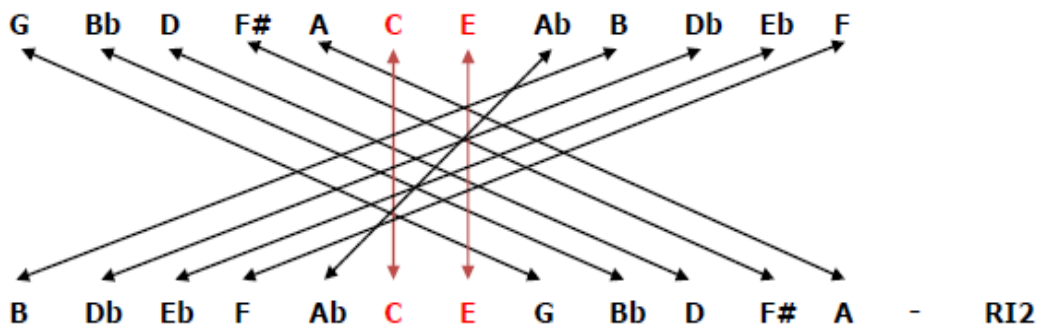
T: 12/000



C: 12 - 0 - 0 = 12

A: 2/10/00

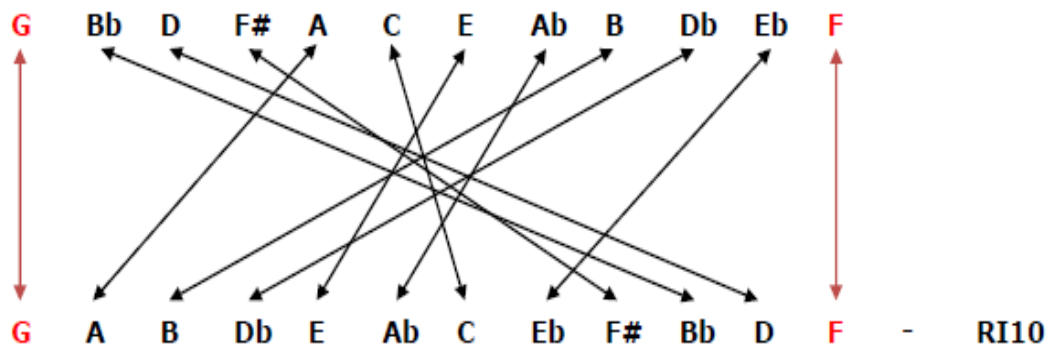
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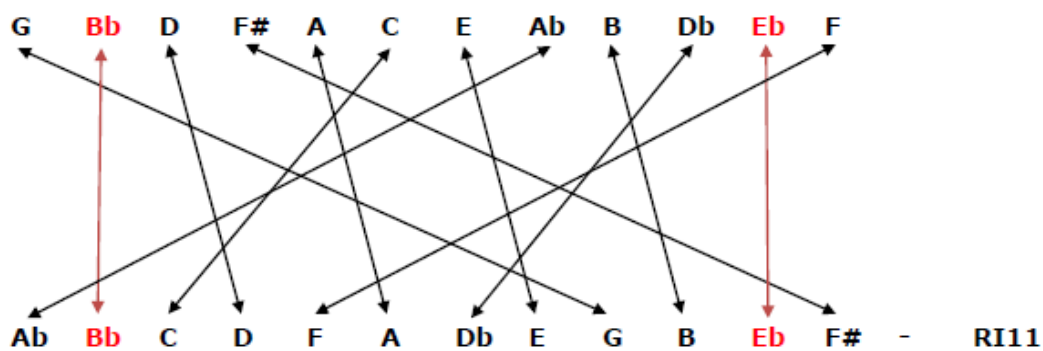
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It is observed that the only method that obtains differentiated results and, therefore, is useful in the classification of similarities, distances and groupings of the twelve-tone series is structural alignment (Table 6). The contrast model and the transformation do not obtain differentiated and significant results that allow a classification of similarities, distances and groupings of the series because they contain exactly the same vectors in their respective methods. The coincidences of placements of some notes in the series make sense only for structural alignment, as the parameters matches in place and out of place (MIPS and MOPS) make all the difference.

Based on the way used in the methods of classification of similarities in which the commonalities are the first parameters to be considered and then, if there is a tie, the parameters of the differences are considered, it is observed in table 6 that RI3 is the most similar series and closest to the original (O0) with the vector 4/8/00. In second place are the series with vector 2/10/00. In third place are the series with vector 1/11/00. The most dissimilar series and, therefore, the furthest from the original (O0) are those with the vector 0/12/00. This includes all transpositions of the original series and the remaining series that did not obtain differentiated and significant values of similarities.

Table 6: classification of similarities, distances and groupings of all 48 series of Alban Berg's Violin Concerto in comparison with the original series.

1	2	3	4
4/8/00	2/10/00	1/11/00	0/12/00
RI3	I0		All original series
	I2		All other series
	I4		
	I6		
	I8		
	I10		
	R1	R2	
	R5	R4	
	R7	R8	
	R11	R10	
	RI1		
	RI2		
	RI10		
	RI11		

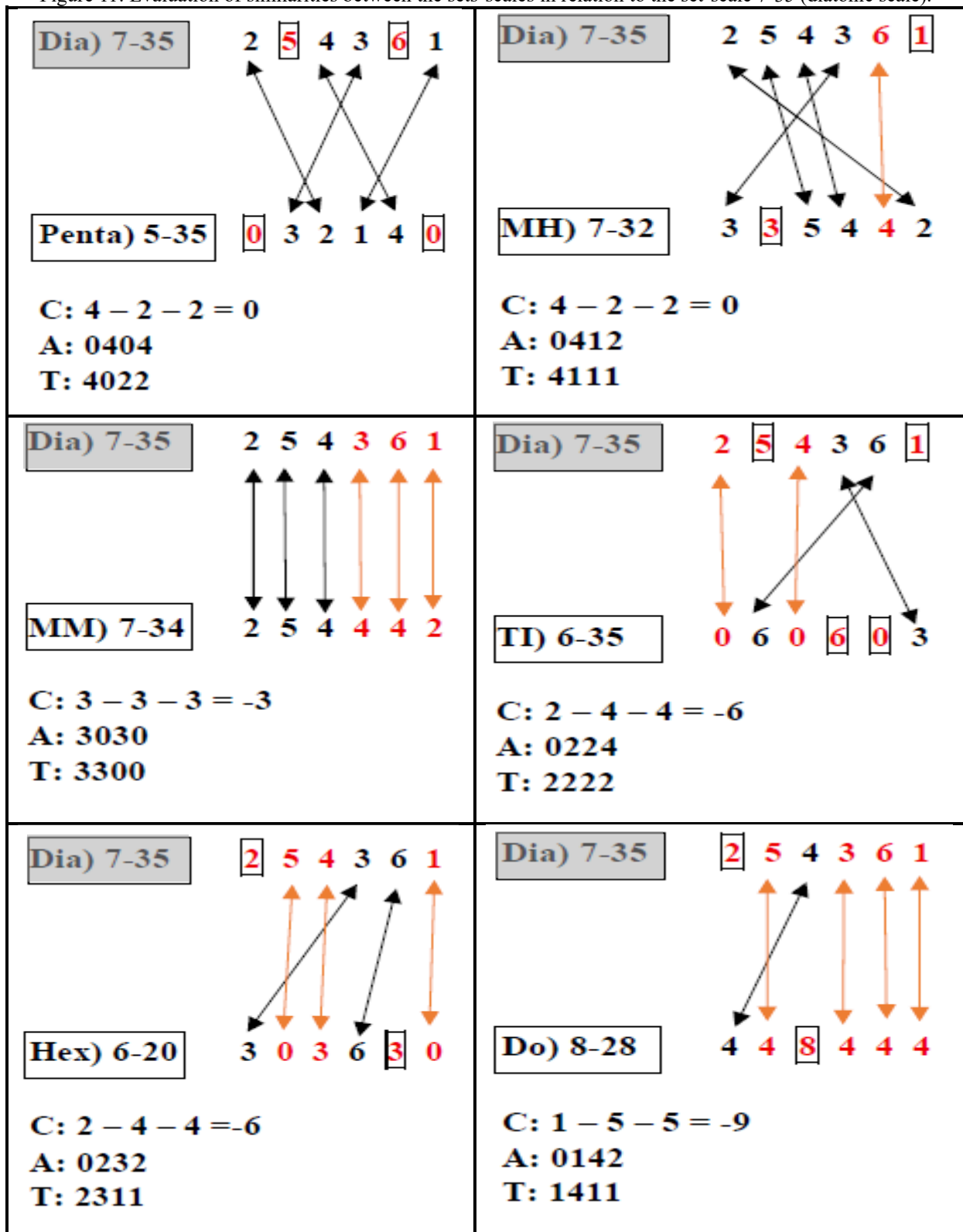
APPLYING THE CONTRAST, STRUCTURAL ALIGNMENT, AND TRANSFORMATION MODEL TO SOME REPRESENTATIVE SETS OF SCALES

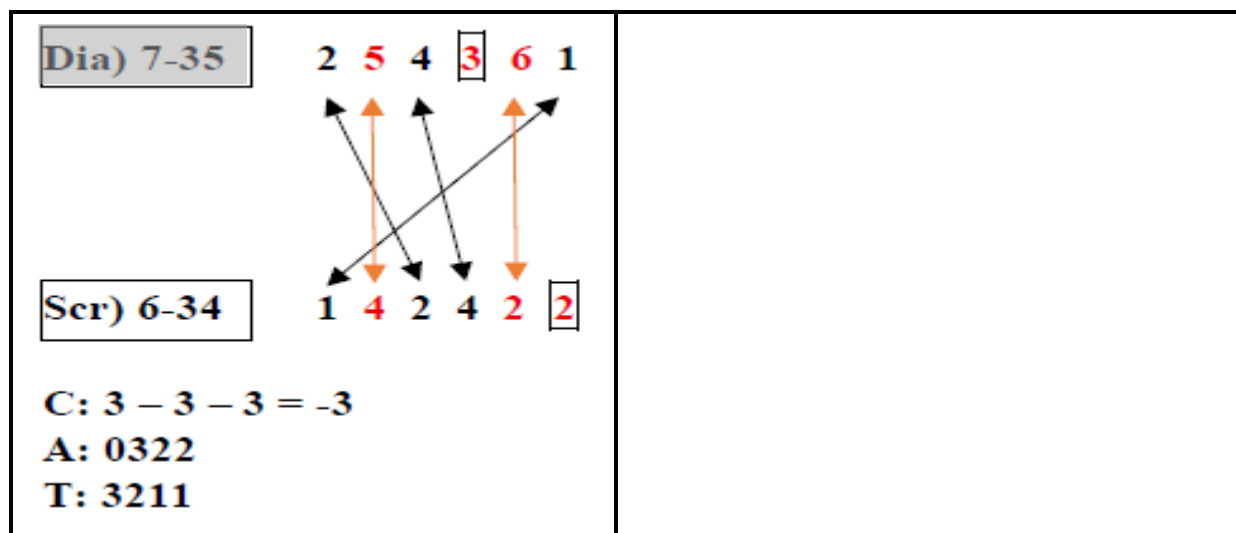
The sets chosen for comparison are those that refer to the diatonic (7-35), pentatonic (5-35), harmonic minor (7-32), melodic minor (7-34), whole tones (6-35), hexaphonic (6-20), diminished dominant (8-28) and Scriabin (6-34) scales. The prototype or referential set-scale is the diatonic set (7-35) from which all other set-scales are compared (tab.7). As in Forte (1973, p.46-60), similarities were classified according to the interval vectors of the *set-classes* rather than based on sets or notes. The black notes connected by black arrows indicate the interval vectors in common, whether they are in the same position or not. The red notes connected by red arrows indicate different vectors, but they are under the same positioning relationship within the vectors. The red notes within a square indicate different vectors that do not find a match in the other set. The vectors of the contrast model (C), structural alignment (A) and transformation are shown in fig.11.

Table 7: scale sets under consideration.

Set-classes (sets)	Grades	Vectors
Diatonic 7-35 (013568A)	C C# D# F F# G# A#	254361
Pentatonic 5-35 (02479)	C D E G A	032140
Harmonic minor 7-32 (0134689)	C C# D# E F# G# A	335442
Melodic minor 7-34 (013468A)	C C# D# E F# G# A#	254442
Whole tones 6-35 (02468A)	C D E F# G# A#	060603
Hexaphonic 6-20 (014589)	C C# E F G# A	303630
Domdim 8-28 (0134679A)	C C# D# E F# G A A#	448444
Scriabin 6-34 (013579)	C C# D# F G A	142422

Figure 11: Evaluation of similarities between the sets-scales in relation to the set-scale 7-35 (diatonic scale).





Based on the comparisons of the interval vectors, it can be seen in Table 8 that the **contrast model** separates the sets representing scales into four groups. The sets of scales most similar to the 7-35 (diatonic) set scales are 7-32 (harmonic minor) and 5-35 (pentatonic) with vector (4 - 2 - 2 = 0). In second place are the scale-sets 7-34 (melodic minor) and 6-34 (Scriabin) with vector (3 - 3 - 3 = -3). In third place are the sets of scales 6-20 (hexaphonic) and 6-35 (whole tones) with vector (2 - 4 - 4 = -6) and in fourth and last place is set scale 8-28 (dominant, diminished) with vector (1 - 5 - 5 = -9).

In the **structural alignment** method, you can align your results with the same ordering as the contrast model. To do this, it is sufficient to consider first the number of commonalities and then the number of differences, as has been done since the beginning of this study in all methods and comparisons. Thus, the scales 7-32 and 5-35 appear in first and second place, respectively, because there are 4 commonalities, but what differentiates them is the number of differences. The 7-32 set-scale has 3 differences (3#) and the 5-35 set-scale has 4 differences (4#). The same is true of the 7-34 and 6-34 scale sets, which appear in third and fourth place, respectively. Both have 3 commonalities, but it is the number of differences that classifies them. The 7-34 set-scale has 3 differences (3#) and the 6-34 set-scale has 4 differences (4#). The 6-20 and 6-35 scale sets appear in fifth and sixth place, respectively, because they both have 2 commonalities, but the 6-20 scale set has 5 differences (5#) and the 6-35 scale set has 6 differences (6#). The last place belongs to the 8-28 set-scale with 1 commonality and 6 differences (6#).

In the **transformation** method it is possible to equate the same ordering of the contrast model with some displacements, as happened with the structural alignment method. The scale-sets 7-32 and 5-35 that appear tied in first place in the contrast model appear divided into two levels in the transformation method, levels 1 and 2, respectively. The scales 7-34 and 6-34 that appear tied for second place in the contrast model appear divided into two levels in the transformation method, levels 3 and 4, respectively. The scales 6-20 and 6-35 that appear tied for third place in the contrast

model appear divided into two levels in the transformation method, levels 5 and 6, respectively. The 8-28 scale set that appears fourth and last in the contrast model also appears last in the transformation method, however, in seventh place.

In the **transformation** method, the classification of similarities of the scale-sets is also done first from the number of commonalities and then from the number of differences. For example, the scale sets 7-32 and 5-35, which appear in first and second place, respectively, have 4 interval vectors in common, but are differentiated by the number of differences. The 7-32 set-scale has 3 differences (3#) and the 5-35 set-scale has 4 differences (4#). This ranks them first and second, respectively. The scale sets 7-34 (melodic minor) and 6-34 (Scriabin) have 3 interval vectors in common, but they differ by the number of differences, the scale set 7-34 has 3 differences (3#) and the scale set 6-34 has 4 differences (4#). This ranks them third and fourth, respectively. The 6-20 (hexaphonic) and 6-35 (whole tones) scale sets have 2 interval vectors in common, but they differ by the number of differences, the 6-20 scale set has 5 differences (5#) and the 6-35 scale set has 6 differences (6#). This ranks them fifth and sixth, respectively. The scale set 9-28 (domdim) appears in seventh and last place because it has only 1 interval vector in common and 6 differences (6#).

Table 8: similarities between interval vectors of scale sets.

Level	Sets	Contrast 7-35 (day)	Level	Alignment 7-35 (day)	Level	Transformation 7-35 (day)
1	7-32 (MH)	$4 - 2 - 2 = 0$	1	0412 (3#)	1	4111 (3#)
	5-35 (Penta)		2	0404 (4#)	2	4022 (4#)
2	7-34 (MM)	$3 - 3 - 3 = -3$	3	3030 (3#)	3	3300 (3#)
	6-34 (Scr)		4	0322 (4#)	4	3211 (4#)
3	6-20 (Hex)	$2 - 4 - 4 = -6$	5	0232 (5#)	5	2311 (5#)
	6-35 (TI)		6	0224 (6#)	6	2222 (6#)
4	8-28 (domdim)	$1 - 5 - 5 = -9$	7	0142 (6#)	7	1411 (6#)

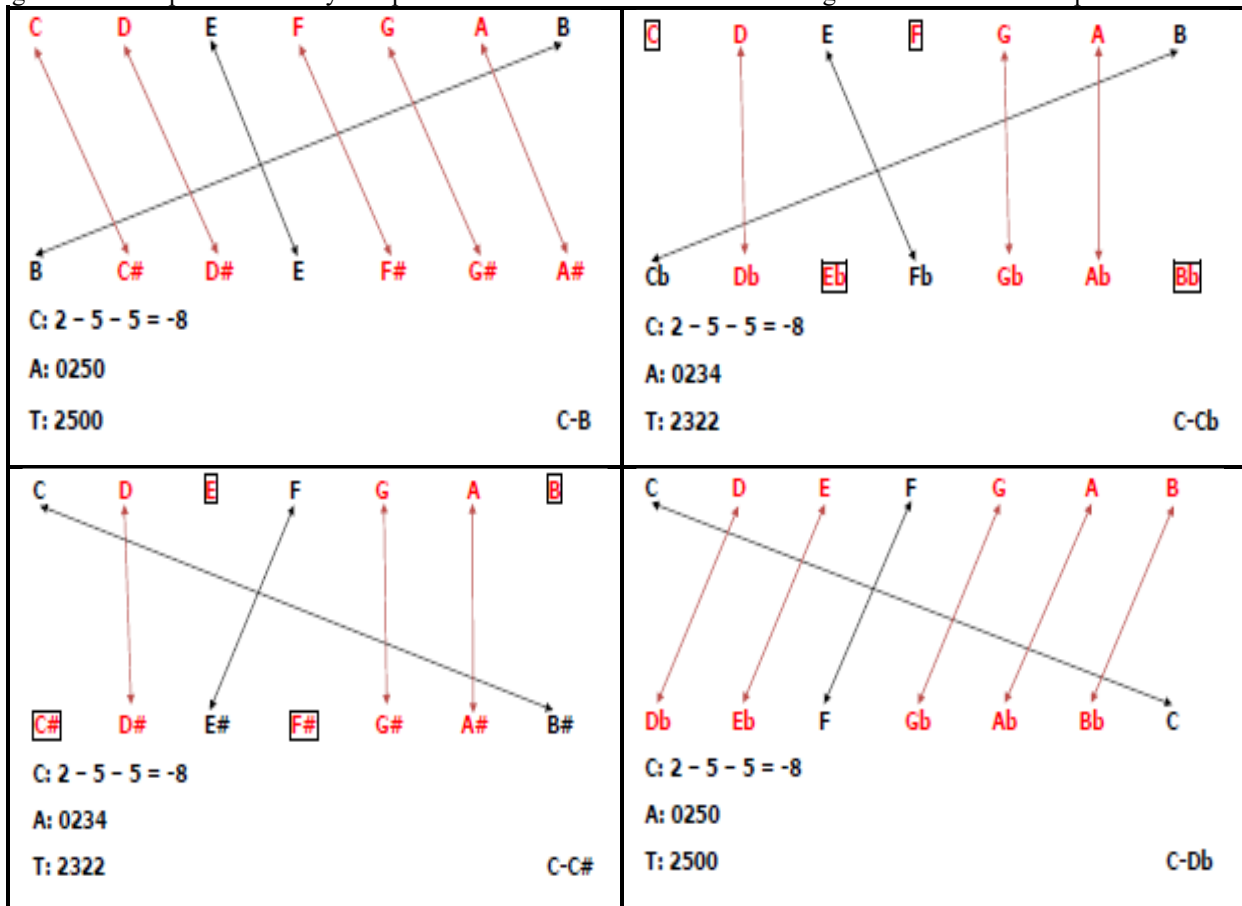
CONCLUSION

The three methods of assessing similarities developed in cognitive psychology proved to be very useful in classifying the distances and groupings of the various musical elements. The relationships of similarities and proximities between the diatonic chords derived from the four tonal scales and the tonic chord C7M only needed the evaluation of the commonalities to define their classificatory order. However, the similarities and proximity relationships between the diatonic chords derived from the four tonal scales and the tonic chord Am7 had to evaluate first the number of commonalities and then the number of differences in order to define their classificatory order. The same occurred in the evaluation of similarities, distances and groupings of major and minor tonalities in relation to the prototype or referential tones of C and Am. By defining the contrast model as an example to be followed by the other methods, we confronted some disparities in the cases of the key of C#m in relation to the key of C and D#m (Ebm) in relation to the key of Am. In all other cases, it



was possible to adjust the similarities, distances and groupings of all keys with the contrast model. As for the series of Alban Berg's Violin Concerto, it is noted that it was possible to divide them into four different groups. The only useful psychological method in the classification of similarities, distances and groupings of the twelve-tone series was structural alignment because there are no differentiated and significant results in the methods of the contrast and transformation model. The in-place and out-of-place matches (MIPS and MOPS) parameters made all the difference in the ranking. The sets representing scales also submitted the results of structural alignment and transformation to the results obtained in the contrast model, however, without any type of confrontation or disparity between them, except for the division of the groups into two, as happened with the previous categories: chords and tonalities. It is worth remembering that the vectors of four numbers and their ordering were elaborated by the authors of this article, and it is possible, obviously, to create other vectors and other ordering of them, including new methods of connection between musical elements. For example, instead of connecting the alignable differences of the structural alignment method based on the same interval degree, they could be connected based on the conduction of parsimonious voices by semitone, however, this was tried as an option for this study, but the results were not suitable for the equal temperament, i.e., the chords and enharmonic keys obtained differentiated classificatory results. It can be seen in fig.12 that the enharmonic keys C-B/C-Cb and C-C#/C-Db obtain different results in the methods of structural alignment and transformation when the different notes are connected by the shortest semitone path. This is one of the reasons why the contrast model was taken as an example for the classification of the other methods, it does not obtain differentiated results when enharmonic elements are compared.

Figure 12: Example of similarity comparisons between enharmonic tones using the shortest semitone path connections.



It is now suggested that new research applies the methods of evaluation of similarities developed in cognitive psychology in the classification of distances and groupings of other musical elements, such as other chords, other scales, other twelve-tone series, other sets and even sound objects, provided that comparable characteristics can be attributed to them. Finally, the main objective of this research was to suggest the methods of evaluation of similarities developed in cognitive psychology in the theoretical and practical formations of music, which, in a way, is one of the main objectives of interdisciplinarity, that is, to seek interactions and solutions in different areas of knowledge.



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Skin wound healing using topical treatment with própolis

 <https://doi.org/10.56238/sevened2024.010-011>

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ABSTRACT

This chapter presents the concepts of skin and the mechanisms of wound healing of this organ, along with concepts of some pathways and cellular dynamics in the processes with topical propolis treatment in different in vivo models.

Keywords: Skin wound, Treatment, Própolis.

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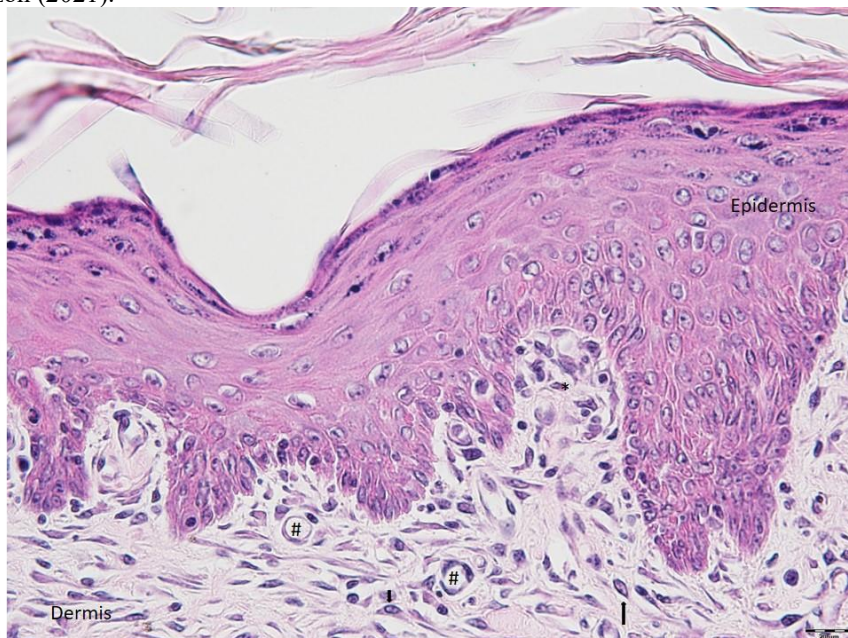
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INTRODUCTION

The skin is a fundamental organ of the body and essential to its integrity. It is also the primary mechanical barrier, isolating the external environment, maintaining hydration and electrolyte homeostasis, regulating body temperature, and facilitating Vitamin D synthesis (Kolimi et al., 2022; Proksch et al., 2008).

The skin comprises three layers: the epidermis, dermis, and hypodermis (Fig. 1). The epidermal layer consists of stratified squamous epithelium with keratinization and continuous renewal. The primary cell type in the epidermis is the keratinocyte, which undergoes morphological changes transitioning from cuboidal to squamous shape modified into layers: basal (also known as germinative), spinous, granular, lucid, and corneal layers (Gilchrest, 1983; Khavkin & Ellis, 2011a; Raja, 2007). Keratinocytes is major cell that form the epidermal barrier and play a crucial role in re-epithelialization. They can cover wound surfaces to regenerate an epithelial barrier with the external environment, constituting the body's first physical defense barrier. The keratinocytes secrete multiple cytokines to stimulate re-epithelialization, angiogenesis, the production of connective tissue matrix, and innate immunity. After injury and microbial invasion, keratinocytes release various cytokines, chemokines, and antimicrobial peptides (AMPs) that activate immune cells and directly eliminate pathogens (Fang & Lan, 2023; Piipponen et al., 2020).

Figure 1 - Photomicrograph of rat skin showed with epidermis and dermis. The epidermis including cell layers and many keratinocytes, the dermis can observe the papillary dermis (*); fibroblasts (arrows); and blood vessels (#). Courtesy by Gushiken & Pellizzon (2021).



Melanocytes, Langerhans, and Meckel cells are other crucial parts of the epidermal layer. Melanocytes found between the basal and spinous layers of the epidermis that secretion melanin by tyrosine via tyrosine kinase and stored in melanosomes are essential for UV light protection.



(Gilchrest et al., 1979; Khavkin and Ellis, 2011b). Langerhans cells are antigen-presenting cells originating in the bone marrow and observed in the spinous layer of the epidermis. These cells have extensive cytoplasmic branching, increasing the surface area for contact with antigens. During aging, there may be a decline in the number and functionality of these cells (Pilkington et al., 2018). Merkel cells are mechanoreceptors located in the basal layer of the epidermis and have embryonic origins in the neural crest. In the epidermis, they interact with adjacent keratinocytes via desmosomes and contact afferent myelinated nerve fibers (Winkelmann, 1977).

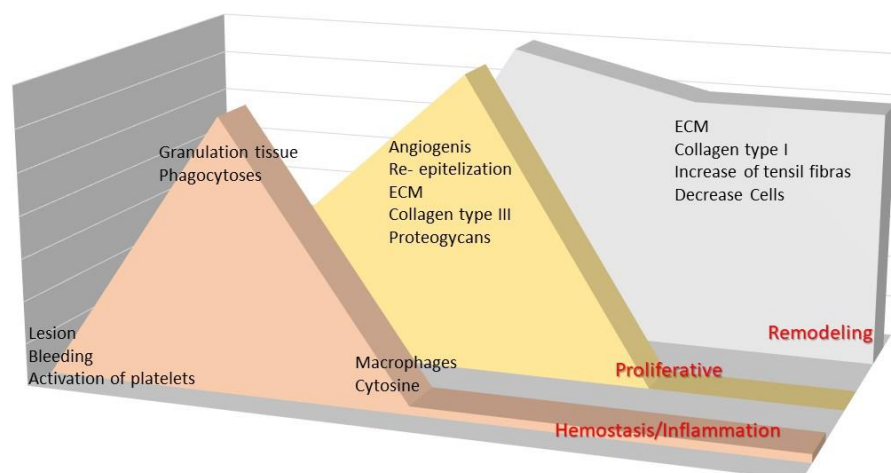
The second layer of the skin is the dermis, soft, irregular, moderately dense connective tissue, and there are two distinct regions: the papillary dermis (soft connective tissue) and the reticular dermis (deeper, moderately dense connective tissue). The papillary dermis, connective tissue cells, fibroblasts, collagen fibers, blood vessels, and many nerve endings can be observed (Losquadro, 2017). In the dermis, we can find the majority of sebaceous and sweat glands and the base of the hair follicles (Jacobsen et al., 1985; Kanitakis, 2002; Khavkin & Ellis, 2011b; Plewig & Kligman, 1978; Zouboulis, 2004).

The hypodermis is the deepest layer of the skin and where the most significant accumulation of unilocular adipose tissue, the essential function for the secretion of vitamin D (Fjeldborg et al., 2014; Khavkin & Ellis, 2011b; Lee & Tontonoz, 2014; Nguyen & Soulika, 2019; Stienstra et al., 2014; Wong et al., 2016).

SKIN WOUND HEALING

The tissue repair process begins with the epidermis, and the dermis is disrupted; this injury is highly concerning clinically because it involves rupturing the body's primary protective barrier. The skin lesions can be acute or chronic; the second one increases the complexity of wound healing, which increases the complexity of repair (Moliterni et al., 2021). Chronic lesions are significantly expensive in healthcare systems (Sen, 2021). The tissue repair process is highly complex and interdependent, with overlapping biological activities (Gantwerker & Hom, 2011) (Fig. 2).

Figure 2: Scheme showing the three main phases of tissue repair, modified from Gantwerker & Hom (Modified by Pellizzon based on Gantwerker and Hom, 2011).



Hemostasis/Inflammation Phase: The hemostasis/inflammation phase begins seconds after the skin structures are disrupted and activates the coagulation process to stop bleeding. Platelets play a crucial role in coagulation, and a series of multiple cytokines, hormones, and chemokines are released and activated by endothelial receptors and dermal cells. Within minutes, there is an influx of inflammatory cells, predominantly neutrophils, and macrophages, essential for the subsequent phases of healing. There is an increase in the release of cytokines and growth factors such as Interleukin 1 ($IL-1\beta$), Tumor Necrosis Factor- α ($TNF-\alpha$), Fibroblast Growth Factor (FGF), and Platelet-Derived Growth Factor (PDGF) (Gantwerker & Hom, 2011; Gushiken et al., 2021; Rodrigues et al., 2019; Wang et al., 2004). Due to the influx of neutrophils, macrophages, and lymphocytes to the injury site, the inflammatory phase begins, with intense activity of phagocytic cells to eliminate debris cells and bacteria. This phase involves an increase in pro-inflammatory cytokines such as $IL-1\beta$, $TNF-\alpha$, and Interleukins 6 and 8 ($IL-6$ and $IL-8$), crucial for combating infection (Larouche et al., 2018; Robson, 2003). There is also an increase in growth factors, such as Vascular Endothelial Growth Factor (VEGF) and Insulin-like Growth Factor 1 (IGF-1), promoting proliferation of dermal and epidermal cells (fibroblasts, endothelial cells, and keratinocytes) (Gushiken et al., 2021; Larouche et al., 2018; Reinke & Sorg, 2012; Rodrigues et al., 2019).

Proliferative Phase: In the proliferative phase, injured cells continue to secrete growth factors such as FGF/VEGF/EGF-epidermal/ $TGF-\beta$, promoting migration and proliferation of cells, especially in the dermal region, where fibroblasts, macrophages, endothelial cells, and extracellular matrix synthesis are present (Bennett et al., 2003). Fibroblasts synthesize the extracellular matrix,

especially collagen III, proteoglycans, and fibronectin, which are crucial for the cellular environment, promoting migration of other cell types (Rodrigues et al., 2019; Singer & Clark, 1999).

Remodeling Phase: The remodeling phase involves complete skin repair and naturally depends on the previous phases. There is a decrease in granulation tissue and replacement by synthesized extracellular matrix and apoptosis of cells that migrated to the area. The increase of TGF- β 1 promotes fibroblast differentiation into myofibroblasts that promote wound contraction and closure. Matrix Metalloproteinases (MMPs) degrade the previously synthesized matrix, promoting complete reorganization of collagen type I, elastin, and other matrix components. Thus, the biological events of tissue repair after any skin injury are completed, resulting in the reconstruction of all epidermal and dermal elements, leading to increased organ resistance and flexibility (Karppinen et al., 2019; Martins et al., 2013; Reinke & Sorg, 2012; Singer & Clark, 1999).

Topical Products for Skin Wound Healing: The population widely uses topical treatment due to its ease of administration, allowing for self-application and generalizing its possible self-medication (Gushiken et al., 2021). Due to the numerous biological events that occur during tissue repair, it can take years for complete skin recovery. There are only a few products for topical treatment for all phases, so we are looking for a new product that becomes interesting for research and economic importance due to its wide application in human and veterinary medicine.

Among the products used for topical healing treatment, we choose propolis, which has been described for use in the process of skin injury repair, with a worldwide distribution and description of its use for a range of healing properties of propolis. Since 13,000 BC, the Greeks, Romans, and Egyptians understood that propolis could be applied as a medicine in creams and was used in the embalming process of bodies. Propolis is a resinous substance similar to wax produced by bees and used in hives as a sealant for their holes. Due to its high-temperature resistance, this resin liquefies between 60-70°C, and in some types of propolis, we have a much higher melting point, reaching up to 100°C (Kuropatnicki et al., 2013). The chemical composition of propolis varies depending on the region of the plant species used by bees for pollen extraction, resulting in many propolis varieties for study, with different biological actions of this resin. The main components are wax, resin, and phenolic compounds such as phenolic acids, flavonoids, and terpenoids. Terpenoids and flavonoids are the main responsible for the pharmacological activities of propolis (Przybyłek & Karpiński, 2019). Searching for a new product and assessing potential in the healing process depends on understanding the process of second-intention wound healing. The phases are crucial for activating the entire cascade of the healing process and improving the patient's quality of life.

OBJECTIVE

This study aims to identify skin contraction studies using propolis in experimental models to understand the main models used and the state of the art of these studies.

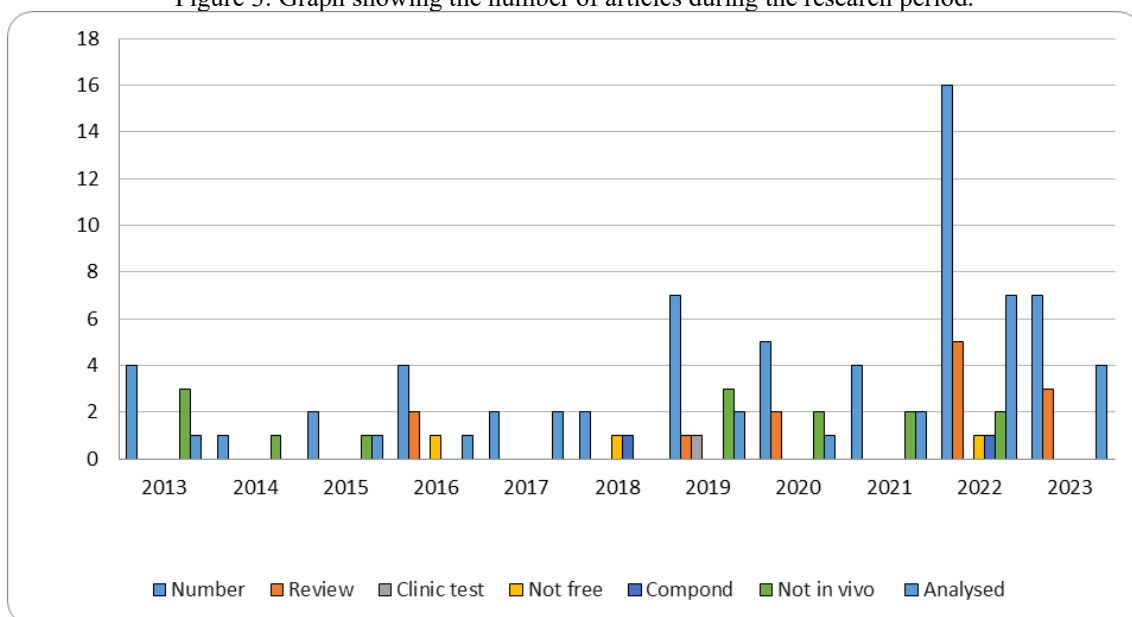
METHODOLOGY

To achieve this, we used the PUBMED search platform (www.pubmed.com) and analyzed articles found in the last 10 years (2013-2023) using the following search terms: "propolis" AND "wound healing" AND "skin" present in the title, abstract, and keywords. Inclusion criteria required articles to include the following topics: in vivo experimentation, topical use of propolis, and English language texts. Exclusion criteria involved articles that did not review articles, case reports, clinical trials, articles not available in unpaid search platforms, articles without in vivo tissue contraction, and articles exclusive to isolated propolis substances. This study was based on the data search methodology of Machado-Velho et al. (2023).

RESULTS

The results of the search on the PUBMED platform yielded 54 articles during the search period, of which the following articles were excluded based on the exclusion criteria: 13 reviews, 1 clinical study, 3 from paid libraries, and 6 without a description of tissue contraction. Within the inclusion criteria, 21 articles met the defined parameters (Fig. 3).

Figure 3: Graph showing the number of articles during the research period.



From the 21 articles that met the parameters of the review search, propolis originated from 9 countries, with the geographic distribution observed in Figure 4.

Figure 4: Biogeographical Location of propolis based on the review process from 2013-2023.



Propolis Formulation: Among the formulations, we observed that most articles used hydroalcoholic preparation in different concentrations, while some authors did not specify the concentration used. The base extraction is hydroalcoholic 70%, one of the most common methods of obtaining active products with more remarkable preservation of active principles. After the initial extraction, several articles promote the development of new formulations, such as nanoparticle associations and non-ionic cream dressings with controlled release of propolis (Table 1).

Table 1: Resume of the article and experimental models with formulations used propolis.

Article	Animal Model	Lesion Model	Country propolis	Topical Formulation
Kapare et al., 2023	Wistar Rat	Excision diameter: 1 cm. Incision Length: 3 cm	India	Polyvinyl Alcohol base in hidrogel
Conceição et al., 2022	Wistar Rat	Excision diameter: 2 cm.	Brazil	Hydroalcoholic extract Paste.
Takzaree et al., 2015	Wistar Rat	Excision	Iran	Hydroalcoholic extract
Salrian et al., 2022	Wistar Rat	Excision diameter: 1 cm.	Iran	Propolis 3% and Honey 1,5% in ointment 1,5% honey in ointment
Gupta et al., 2022	Wistar Rat	Excision diameter: 1 cm.	India	Hydroalcoholic extract 2%
Ibrahim et al., 2022	Balb/C mouse	<i>uninformed</i>	Saudi Arabia	Collagen hydrolysates (CHDs) plus honey-propolis wax
Corrêa et al., 2017	Swiss mouse	Excision diameter: 8 mm	Brazil	Propolis Red Brazilian PRB- 1:3 (W/V)
Abu-Seida, 2015	Dog	Excision: 3cm	USA	Ointment
Rosseto et al., 2017	SK1mouse with hair	Excision: 3,5 mm 6 lesion for animal	Brazil	Hydroalcoholic extract BPE 50:50 w/w. Solid lipid nanoparticles (SLN) and nanostructured lipid carriers (NLC)

Barud et al., 2013	Wistar Rat	Excision:6 mm) 3 by animal	Brazil	Bacterial (BC) membranes (W/W) 1,2/2,4/3,6%
Eskandarinia et al., 2019	Wistar Rat (Female)	Excision: 12mm	Iran	
Eskandarinia et al., 2020	Wistar rat (female)	Excision:11mm	Iran	Dressing
Abdellatif et al., 2021	Spragye –Dawley rat	Excision	Egypt	Nanoemulsion
Diab et al., 2022	Wistar rat	Excision	Egypt	Nanoparticles
Hashemi et al., 2023	Srague Dawley rat	Burn	Iran	Dressing with nanoparticles
Du et al., 2023	Balb-c mouse	Excision : 7 mm	China	Dressing with silk fibroin
Pahlevanneshan et al., 2021	Wstar rat	Excision : 11 mm	Iran	Dressing nanocomposite polyurethane
Elkhateeb et al., 2022	Rabbit (New Zealand)	Excision : 3x3 cm	Egypt	Propolis nanostructured lipid carriers
Segueni et al., 2022	Wistar Rat	Excision. 2 by animal	Argeria	Hydroalcoholic extract
Picolotto et al., 2019	Balb/c mouse	Excision 10mm	Brazil	Dressing
Çelik Yilmaz; Aygin, 2023	Balb/c mouse	Excision	Turkey	Hydroalcoholic extract

Application Forms of Propolis: The application forms varied significantly among the analyzed articles. They ranged from diluted propolis applied directly to the wound to developing dressings with nanoparticles and synergy with other elements. Hydroalcoholic formulations are commonly used by the population and in various propolis products. These formulations are prepared after the extraction of raw propolis into a final solution of 70%, similar to what was described by Aldana-Mejia et al. (Aldana-Mejia et al., 2021). Among the analyzed works like Conceição et al. (Conceição et al., 2022) and Takzarre et al. (Takzaree et al., 2015) used 1% propolis, Gupta et al. used 2% propolis (Gupta et al., 2022), Corrêa et al. (Corrêa et al., 2017) used a ratio of 1:3 (w/v), and Rosseto et al. (Rosseto et al., 2017) used red propolis in a 30:70 ethanol (w/w) solution. Conceição et al. (Conceição et al., 2022) and Eskandarinia et al. (Eskandarinia et al., 2019) used a water-based paste (cornstarch) associated with 1% red propolis, 0.5% and 1% propolis, respectively. Eskandarinia et al. also used an association with hyaluronic acid at two concentrations of propolis (Eskandarinia et al., 2019). As a comparative effect of biological actions, Takzarre et al. used a hydroalcoholic solution of 1% propolis and studied its synergy with honey at 3% propolis (Takzaree et al., 2015). Salrian et al. developed synergistic comparison groups with 3% propolis and 1.5% honey (Salrian et al., 2022). Kapare et al. (Kapare et al., 2023) used a PVA formulation in a hydrogel with 5% propolis, exhibiting suitable viscosity and physical stability for 180 days. Eskandarinia et al. (Eskandarinia et al., 2020) developed a dressing with a 1:10 propolis-ethanol ratio associated with polyurethanes alone or combined with gel, showing good viability of the dressing for both biological action and clinical

application in lesions. Propolis was manipulated to prepare dressings as described by Ibrahim et al. (Ibrahim et al., 2022), who used an association with hydrolyzed collagen or with bacterial membrane and cellulose as described by Barud and Picolotto (Barud et al., 2013; Picolotto et al., 2019), or even with an association with nanoparticles (polycaprolactone and quercetin) as described by Hashemi and colleagues (Hashemi et al., 2023) in a burn model. Du and colleagues used dressings with silk fibers associated with gelatin with 1% propolis (Du et al., 2023). There are descriptions of dressings with polyurethane and nano lignin (Pahlevanneshan et al., 2021) and potentially nanostructured lipid carriers (Elkhateeb et al., 2022).

Antibacterial Model: Several studies presented antibacterial studies of propolis, targeting both gram-positive and gram-negative bacteria. The most commonly used bacteria in the studies were *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Escherichia coli*, *Pseudomonas aeruginosa*, and *Acinetobacter baumannii*. Different forms of propolis administration have different effects on different bacterial strains. All analyzed articles that conducted antibacterial activity described inhibitory growth tests under the action of different propolis concentrations (Barud et al., 2013; Diab et al., 2022; Du et al., 2023; Elkhateeb et al., 2022; Eskandarinia et al., 2019; Eskandarinia et al., 2020, 2019; Pahlevanneshan et al., 2021; Segueni et al., 2022).

In vitro Model: Antioxidant activities were evaluated in in vitro models. Fibroblasts (murine L-929) and keratinocytes (HaCAT) were used in cell studies. In this review, authors tested the viability of propolis with proposed application associations over time (Abdellatif et al., 2021; Du et al., 2023; Eskandarinia et al., 2020, 2019; Hashemi et al., 2023; Pahlevanneshan et al., 2021; Rosseto et al., 2017).

In vivo Model: The excision model was defined for the review, with various circular, square, and multiple lesions on the dorsal region among the 21 articles used. As for *in vivo* experimental models, we observed one strain of SK1 mice (hairless), one Swiss mouse, four Balb/C mice, two Sprague Dawley rats, eleven *Rattus norvegicus* (Wistar) rats, one rabbit, and one dog. In mice, the excision size ranged from 3.5 to 10 mm in diameter. The lesions ranged from 6 mm to 2 cm in diameter in rats. In the article that used a rabbit and a dog, we observed lesions of 9 cm² and 3 cm in diameter, respectively (Abdellatif et al., 2021; Abu-Seida, 2015; Barud et al., 2013; Çelik et al., 2023; Conceição et al., 2022; Corrêa et al., 2017; Diab et al., 2022; Du et al., 2023; Elkhateeb et al., 2022; Ibrahim et al., 2022; Kapare et al., 2023; Pahlevanneshan et al., 2021; Picolotto et al., 2019; Rosseto et al., 2017; Salrrian et al., 2022; Segueni et al., 2022; Takzaree et al., 2015).

Experimental Time: There is a significant difference between the experimental analysis times, ranging from 0 to 20 days in mice, 0 to 30 days in rats, 7 to 21 days in rabbits, and 0 to 28 days in dogs (Abdellatif et al., 2021; Abu-Seida, 2015; Barud et al., 2013; Çelik Yilmaz and Aygin,

DISCUSSION

The skin exhibits broad physiological adaptability and resistance to physical and chemical aggressions. Throughout this review process, a significant disparity was noted among study protocols concerning the activity of propolis in tissue repair of this organ. Tissue repair is a multifaceted process reliant on various elements, with cellular response contingent upon molecular factors and the introduction of materials or new products to interact in this highly orchestrated process for organ repair (Vasalou et al., 2023). Thus, understanding the diverse pathways of propolis action became imperative for analyzing scar formation pathways to develop test protocols for new products based on clinical parameters and applications.

Propolis is a natural resinous mixture produced by honeybees from substances collected from various plant sources (Salatino et al., 2011) and distributed across the Americas, Europe, Asia, and Africa. Possessing diverse chemical characteristics, it induces distinct biological responses and has been described since 13,000 BC (Kuropatnicki et al., 2013). Propolis cannot be utilized before purification, so suitable solvents can be extracted to remove unwanted materials while preserving active components, such as polyphenolic fractions (Miguel & Antunes, 2011). Depending on the extraction method, the biological activities of propolis can be intensified, including antimicrobial, anti-inflammatory, antioxidant, and immunostimulatory properties attributed to its chemical composition, which includes flavonoids, aromatic acids, diterpenic acids, and phenolic compounds (Lofty, 2006; Trusheva et al., 2006). This product has sparked global research interest as an alternative to antibiotics (Miguel & Antunes, 2011) because of the immunoregulatory effect of propolis on the production of factors involved in inflammation, such as cytokines, prostaglandins, chemokines, and others (Hu et al., 2005; sales et al., n.d.). Indeed, studies have demonstrated that propolis can induce immunomodulatory effects in animals, influencing macrophage activation, antibody synthesis, and lymphoid organ weight (Çelik et al., 2023; Eyng et al., 2015; Fischer et al., 2010; ORSI et al., 2000).

Many articles confirm the different activities of propolis for antibacterial, antiviral, antifungal, and antiprotozoal purposes. Many factors influence this activity, involving dosage and propolis extraction methods, which can promote differences in antimicrobial activity (Miguel & Antunes, 2011). One hypothesis regarding the antimicrobial activity of propolis suggests that it acts directly on the bacterial membrane, altering ATP activity and reducing bacterial motility (Przybyłek & Karpinski, 2019). Artepel C, present in different propolis types, especially green propolis, emerges as an essential bacterial agent, with its mechanism of action still unclear (Beserra et al., 2021; Veiga et al., 2017).

Thirty-eight percent of the analyzed studies confirm the effect of different propolis types on reducing bacterial activity. This is significant because, in skin lesions, numerous opportunistic

contaminations can either chronic the lesion or complicate chronic diseases such as diabetic wounds, which, in addition to contamination, alter TNF-Alpha synthesis and keratinocyte activity (Fang & Lan, 2023). Keratinocytes undergo a regulated terminal differentiation process to form the stratum corneum, creating an essential physical barrier. This process promotes epidermal renewal, where keratinocytes organize themselves, increasing the synthesis of intermediate filaments and lipid granules, thus promoting a permeability barrier (Harris-Tryon & Grice, 2022).

In vitro models using cell cultures are frequently employed to advance understanding of underlying mechanisms of in vivo cellular behavior. Two-dimensional (2D) cell cultures have been utilized as in vitro models to study cellular responses to biophysical signals, including cell differentiation, migration, growth, and mechanics, all impacted by their biochemical and biomechanical microenvironment (Duval et al., 2017; Huh et al., 2011). In 29% of the articles in this review, authors used 2D cultures, highlighting cellular viability and stretch repair, using fibroblasts as target cells (HaCAT and L929). Propolis concentrations ranging from 0.1 to 1000 ug/ml were included for cellular viability, with maximum viability described as up to 1 ug/ml (Abdellatif et al., 2021). One article presented the activity of lesion retraction in vitro, indicating significant activities (Ibrahim et al., 2022). As a future experiment, laboratory experiments could be conducted with a user-defined three-dimensional (3D) model closely mimicking the cellular microenvironment. However, creating such a model faces challenges, including constructing the tissue-tissue interface, controlling spatial-temporal distributions of oxygen and carbon dioxide, nutrients and waste, and personalizing other microenvironmental factors that regulate in vivo activities (Huh et al., 2011).

In vivo studies in all analyzed articles were conducted using different formats and sizes. The definition of the model becomes fascinating because the process of healing skin lesions is highly complex. In the skin, the lesion can result from various severe or chronic processes, from trauma, pressure, burns, or even diseases such as diabetes, which promote either complete wound repair or loss of skin functionality (Hashemi et al., 2023; Singer & Clark, 1999).

Complete skin repair requires several events and a complex synchronization dependent on various cell types in sequential stages that need to be coordinated at different stages to restore injured tissue, involving interrelated and overlapping mechanisms of cell migration and proliferation, extracellular matrix (ECM) synthesis, growth factors, and cytokines that coordinate the process (Gushiken et al., 2021; Proksch et al., 2008; Rodrigues et al., 2019; Singer & Clark, 1999).

The tissue repair process depends on homeostasis and activation of the inflammatory phase, which can vary from 0-7 days, with the peak response between 3-5 days post-injury (Flynn et al., 2023; Isaac et al., 2010). Platelet activation involves cellular aggregation and activation of serum fibrinogen, paralleled by cytokine release (IL-1 β) and growth factors (TNF- α , FGF- β , and PDGF) synthesized by platelets and cells in the region, attracting leukocytes (neutrophils and monocytes) to

the injury site. Neutrophils are essential cells in this phase as they release various pro-inflammatory cytokines, such as IL1- β , TNF- α , IL-6, and IL-8, essential for the debridement of necrotic tissue and phagocytosis of pathogenic antigens. At the same time, there is a migration of inflammatory response cells to the region and release of other growth factors, such as VEGF and IGF-1, activating fibroblasts, keratinocytes, and endothelial cells (Beldon, 2010; Flynn et al., 2023; Gushiken et al., 2021; Isaac et al., 2010). Within the review process, we observed that all analyzed articles included the inflammatory phase within the analysis period; however, in most articles, there was no description of measuring all growth factors, which could increase the understanding of the pathways of action of different propolis in the wound healing and skin repair pathway, hindering the assertiveness of understanding the mechanism of action in tissue repair.

The proliferative phase begins approximately at the end of the inflammatory peak around the fifth-day post-injury, finishing between the 21st and 30th days. It is characterized by fibroplasia, angiogenesis, and reepithelialization. This phase involves intense migration and proliferation of cells and synthesis of granulation tissue with the synthesis of a provisional extracellular matrix, presence of type III collagen, and migration of different cell types such as macrophages, endothelial cells, and fibroblasts, via chemotactic and mitogenic factors due to the release of growth factors (FGF, VEGF, EGF, and TGF- β 1) by cells at the injury site (Flynn et al., 2023; Isaac et al., 2010).

The process of cell migration activation to the wounded area occurs centripetally, always initiating from the tissue at the lesion margins. In the case of fibroblasts, their migration is crucial for restructuring the local cellular environment, restoring the extracellular matrix and vascularization essential for complete tissue remodeling (Flynn et al., 2023). Fibroblasts synthesize compounds of the provisional extracellular matrix during the proliferative phase, such as collagen type III, proteoglycans, and fibronectin. PDGF and TGF- β induce fibroblast differentiation into myofibroblasts, expressing α -actin, α -myosin, and desmin, thus possessing contractile and movement capacities within the wounded area. Fibronectin deposition occurs during their migration on the fibrin scaffold. Angiogenesis initiates soon after the injury but is more active during the proliferative phase. Mediators like VEGF and angiopoietins stimulate endothelial cell proliferation, thus promoting vascular system restructuring at the site, crucial for supplying oxygen, and nutrients, and promoting cell migration, proliferation, and extracellular matrix synthesis. Reepithelialization occurs during the proliferative phase, closing the wound and restoring skin barrier function. Keratinocytes are stimulated by growth factors to differentiate and migrate through the extracellular matrix towards the lesion center, promoting reepithelialization (Flynn et al., 2023; Gushiken et al., 2021; Isaac et al., 2010).

The remodeling phase is the last stage of wound healing, starting concurrently with the proliferative phase and lasting up to 2 years. Mechanisms initiated in earlier stages are gradually

deactivated, aiming to normalize epidermal thickness, cellular content, extracellular matrix composition, and blood vessel count as close to pre-injury levels. Granulation tissue decreases, provisional extracellular matrix is replaced, gradual degradation of collagen type III occurs, replaced by collagen type I, and apoptosis of provisional cells that migrated to the wounded area (Flynn et al., 2023; Gushiken et al., 2021; Rodrigues et al., 2019).

Propolis demonstrates high potential in the skin tissue repair process, acting on TGF-beta transduction and reducing levels of MMP, pro-inflammatory cytokines, eicosanoids, and increasing collagen I deposition (Cristiane et al., 2013; da Rosa et al., 2022; Franchin et al., 2016). Due to these characteristics, propolis is highly interesting for developing wound healing products, especially for topical applications. Topical medications play different roles in wound healing stages. In the Brazilian market, products containing neomycin and bacitracin (Nebacetin) are used in the initial phase for their properties in preventing and containing infections, a factor that impairs healing. Panthenol or dexpanthenol-based products act in the proliferative phase, promoting fibroblast proliferation and granulation tissue synthesis and accelerating reepithelialization by promoting keratinocyte migration from the lesion border. Collagenase degrades the extracellular matrix, mainly collagen III synthesized in the previous phase, promoting the migration of endothelial cells and keratinocytes crucial for revascularization and epidermal reconstitution.

Dressings protect the wounded area from external agents and pathogens, reducing the risk of infections and aiding in the reduction of wound contraction time. Developing an effective dressing requires considering the physical characteristics and its biological functional activity suitable for each type of wound. Dressings can have specific purposes, such as antibacterial, debriding, occlusive, absorptive, or adhesive, with hydrocolloids, alginates, and collagen being interesting materials in various presentations like cream, film, gel, and foam.

This review highlights the diversity of study protocols in wound healing research, suggesting the standardization of some analyses for more consistent evaluation. A comprehensive understanding of wound healing processes, the influence of substances like propolis, and the role of different interventions, including topical medications and dressings, can lead to the development of more effective therapies for wound care.

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Listening with empathy, caring with dedication: Promoting humanized communication in the context of health

 <https://doi.org/10.56238/sevened2024.010-012>

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ABSTRACT

In the health sphere, communication assumes a vital importance, permeating not only the relationship between doctors and patients, but all interactions between health professionals and those they serve. The quality of this communication shapes the understanding of diagnoses, therapeutic decisions, and necessary care. This text delves into the complexity and scope of challenging messages, underlining the imperative of active listening; the training of the entire health team in the art of empathy and in building bonds with their patients; and the effects of communication on physical and mental health, highlighting the urgency of strategies to raise the communicative skills of all involved. The methodology used in this research was epistemological, interdisciplinary, and qualitative, based on the bibliographic search in scientific sources available on digital platforms. The proposed theme aims to promote a more compassionate and patient-centered practice, highlighting the importance of clear, ethical, sensitive, and effective communication in all aspects of health care.

Keywords: Health communication, Doctor-patient relationship, Active listening, Communication quality, Communicative skills, Patient-centered care, Health education, Interdisciplinarity, Mental health.

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INTRODUCTION

Since the dawn of civilization, a pattern of distancing from what is perceived as complex or challenging has been observed in human beings, often resulting in the marginalization of what is not fully understood, generating discomfort and anguish. While some express their concerns in shouts, others share them in whispers, while some opt for complete silence. There are also those who hear but don't understand, and those who pretend not to listen, in a variety of behavioral shades. This ancestral pattern not only evidences a difficulty in dealing with the emotional and behavioral complexity of one's fellow human beings, but also suggests a resistance to confronting the intricate subtleties of society and its problems. In this context, attentive and sensitive listening emerges as an indispensable tool in the health area, transcending mere auditory perception, encompassing the understanding of the individual's verbal and non-verbal manifestations. This involves not only capturing their words, but also interpreting their emotions, gestures and behaviors, which often reflect the challenges and adversities faced in life in society¹.

Communication represents the essential building block that sustains human interactions, enabling the understanding, connection, and transformation of individual experiences. As we advance, our communicative ability improves, incorporating nuances of language, reading, and interpreting the world and ourselves. This intricate communicative web unfolds in the interaction with the other, where each individual assigns personal meanings and interpretations to what is expressed or communicated. Thus, communication is inherently subjective, mirroring the uniqueness of each person and their perceptions^{2,3}.

In healthcare, communication plays an important role, especially in medicine, where the quality of interaction between healthcare professionals and patients can have a direct impact on the understanding of diagnoses, therapeutic choices, and necessary care. The effectiveness of communication goes beyond the simple transmission of information; It involves building an interpersonal relationship that transcends the content communicated, leaving a deep mark on those who receive the news⁴.

The importance of communication in medical practice, particularly when dealing with delicate situations such as the communication of difficult news, becomes evident in the need to provide sensitive information and, at the same time, offer emotional support and adequate support to patients and their families^{5,6}. The quality of this communication can have a profound impact on the way people deal with and absorb unfavorable prognosis, triggering a range of emotions, reflections, and significant consequences in their lives⁷.

Faced with the complex challenge of communicating bad news in the medical environment, a crucial question emerges: how can health professionals, including doctors, nurses, psychologists, dentists, speech therapists, occupational safety technicians, and managers of medical institutions,



improve their communication skills to convey sensitive information in an understandable and compassionate manner, respecting the uniqueness of each individual and minimizing the emotional impact?

The central hypothesis of this research is that the practice of qualified listening has the potential to transcend the traditional models of the biomedical approach to care. In addition, it is suggested that the enhancement of the communication skills of all health professionals can be achieved through specific training strategies and protocols. Such approaches not only have the potential to improve the delivery of sensitive information, but also to mitigate adverse emotional repercussions on both patients and medical staff, contributing to a more empathetic and patient-centered healthcare practice.

Therefore, this study aims to investigate the existing gaps in communication between health professionals and patients, as well as to explore strategies and methods to improve the communicative skills of all those involved in this context. In addition, it is intended to evaluate the impact of this communication on the physical and mental health of patients. Based on this analysis, the study aims to promote reflections on practices that aim to improve the communication of difficult news, seeking a more humanized, patient-centered approach to health based on more qualified listening.

Finally, it is also important to investigate the training of all health professionals, identifying opportunities for improvement in educational curricula to integrate training in communicative skills. This aims to adequately prepare all healthcare professionals to deal with challenging situations such as communicating bad news.

METHODOLOGY

The present study adopts an interdisciplinary and contextualized methodological approach to broadly investigate the dynamics of communication between physicians and patients in the context of difficult news. The methodology used was based on bibliographic research in scientific literature, encompassing the analysis of works available in virtual libraries and specialized databases, published mainly in this century.

The interdisciplinarity method was applied, aiming to integrate knowledge from different areas of knowledge, such as medicine, psychology and pedagogy, to understand holistically the complexity of the phenomenon of qualified listening in the health sphere. The selection of materials for data extraction was meticulous, in line with the objectives of the research. Initially, only materials with titles linked to the outlined purposes were considered. The analysis of the information followed the predefined scopes, providing fundamental subsidies to achieve the objectives of the research and validate the hypothesis.



The initial research process involved consulting several libraries, using descriptors such as "difficult news to patients" and "medical communication". However, there was a scarcity of relevant results on the MEDLINE/PubMed, PePSIC and SciELO platforms. Subsequently, new titles such as "qualified listening in medicine", "humanization", "medical training and empathy" and "communication of difficult news in the medical context" were searched on these platforms, as well as on Google Scholar, to enrich the content of the research. In addition, to complement the study, materials from the websites of academic institutions, hospitals and other internet sources that follow scientific research standards were used.

After the literature review, an exploratory study was carried out to deepen the understanding of the phenomenon, based on existing theoretical contributions, consulting new articles. This research approach, supported by several data sources, at different times and according to the needs of the researchers, fits into a scientific-epistemological perspective that, according to Morin⁸, enriches the panorama of the scientific community by integrating the voices of different authors. Such an approach allows for a broader and deeper understanding of the perspectives that influence the communication process, establishing connections between the fields of education, medicine, and psychology, contributing significantly to the advancement of knowledge in this area.

BAD NEWS IN HEALTH: IMPACT AND COMPLEXITIES IN COMMUNICATION

Effective communication between physicians and other health care professionals with their patients goes beyond the simple transmission of information about prognoses and procedures. In challenging situations, it also encompasses the delicate task of delivering bad news related to unfavorable diagnoses⁴. The communication of sensitive information encompasses any type of data that may arouse uncomfortable sensations related to disease diagnosis and prognosis⁹. This type of communication can have a significant impact on the patient's future expectations, an aspect that requires evaluation considering several elements, such as the clinical status, available coping resources, care context and emotional support, among other subjective, dynamic and complex aspects⁷.

Certainly, communicating adverse prognoses is one of the most difficult tasks for healthcare professionals, generating significant emotional repercussions on the patient and their support circle. The medical team is often concerned about the emotional impact of negative news on the person and how they will react¹⁰. In addition, these emotional consequences also impact the professionals themselves, who often face fears when dealing with the reactions of patients and their families, especially when managing these delicate situations¹¹.

It is important to highlight that physicians' difficulties in communicating bad news may originate in academic training, since few universities emphasize communication training in their



curricula. Therefore, investing in methods that enable students to develop and improve this skill is of paramount importance¹².

QUALIFIED LISTENING IN MEDICAL PRACTICE

In medical practice, communication plays a crucial role in establishing a therapeutic relationship not only between doctors and patients, but also between doctors and other collaborators. Within this context, skilled listening emerges as a skill that transcends the simple act of listening.

When it comes to the patient, qualified listening implies dedicating full attention to him/her, understanding not only the words expressed, but also the feelings, concerns and emotions underlying his/her narrative¹³. According to Maynard¹⁴ and her team of researchers, new approaches to care are emerging, highlighting the importance of the practice of qualified listening. This technique involves interactions based on dialogue, connection, and support, providing a deeper understanding of psychological distress based on each individual's uniqueness. Valuing the patient's experiences, it seeks to meet their needs, taking into account the various aspects that make up their daily lives. Qualified listening is not only a facilitating and transformative tool, but also strategic in the development of autonomy and the promotion of social inclusion. In addition, it promotes a more flexible and adaptable approach to work. Applied in both individual and group sessions, it has a significant focus on investing in people and their interpersonal relationships. The lack of this practice can increase the risks and vulnerability of those who suffer from mental health problems¹⁴.

It is common for listening to be seen only as the act of listening, leading many to consider it an instinctive behavior. However, it is a fundamental tool to offer care from the perspective of comprehensive care¹⁴.

Within this context, active listening is an essential component of skilled listening. It goes beyond the mere passive listening to the information shared by the patient, but also involves the physician's ability to ask pertinent questions, express empathy, validate the patient's feelings and, fundamentally, understand the situation and the nuances behind the words spoken¹⁵.

In medical practice, skilled listening transcends the simple ability to listen. It manifests as a multidimensional skill, requiring not only the ability to absorb the patient's words, but also to interpret and synthesize that information in a meaningful way. This practice implies cultivating a receptive and empathetic posture, which goes beyond the surface of words, allowing the physician to establish a genuine connection with the patient, based on trust and mutual security¹⁶.

It is essential that qualified listening goes beyond simply listening to words expressed verbally. It encompasses careful observation of nonverbal cues, such as body language, facial expressions, and other forms of nonverbal communication, which can offer valuable insights into the patient's emotional state and needs¹.



Lack of eye contact can hinder the formation of meaningful emotional connections. Research using magnetic resonance imaging indicates that the emotional connection established through eye contact is mediated by a cerebellum-brain network and is associated with the amplification of shared attention¹⁷. Thus, simple gestures, such as the doctor directing his gaze directly to the eyes of the patients, promote a deeper emotional bond. The empathy established between physician and patient not only contributes to improved diagnostic accuracy, but also positively influences treatment adherence, increasing satisfaction and loyalty to services. Dedication to understanding the patient's feelings about the disease builds powerful emotional bonds¹⁸.

PROFESSIONAL TRAINING AND THE ROLE OF EMPATHY AND BONDING IN COMMUNICATING WITH PATIENTS

Recently, it has been observed that the idealization of the medical profession is often linked to considerable prestige and the expectation of economic success, but confronted with a distant reality: a precarious, distorted and vulnerable labor market, in addition to health policies that neglect the essential conditions for adequate medical practice¹⁹.

In addition, it is vital to ponder that the decision to pursue a medical career is not just about a job, but also about an undeniable commitment to empathy and compassion. To be a doctor is not only to practice a profession, but to adopt a way of life based on sensitivity, genuine concern for the well-being of others, and the ability to understand and alleviate the suffering of others. That is why the discussion of this theme becomes so significant. The commitment to empathy and compassion, repeatedly, is the basis that sustains humanized practices in medicine, thus becoming an indisputable pillar in the practice of the profession^{20,1}.

From this perspective, the communication of difficult news encompasses delicate situations, such as the revelation of diagnoses of serious diseases, the exposure of risky surgical procedures, or the explanation of unfavorable prognosis. Preparing properly to convey this information is indispensable, starting with establishing an environment conducive to conversation. To this end, it is essential to create an empathetic bond by listening carefully to their concerns and responding clearly and compassionately to the questions raised. Choosing simple and accessible language is essential, avoiding complex medical jargon to allow the patient to gradually understand and absorb the information offered. In addition to transmitting the news itself, it is equally relevant to recognize and validate the patient's emotions, offering emotional support, understanding and sensitivity to their suffering^{21,1}.

The doctor-patient relationship has undergone constant changes over the centuries, profoundly impacting the notion of empathy. Costa and Azevedo²⁰ highlight the dehumanization of patients in hospital environments, illustrating that, in the wards, sick individuals lose their



individuality, being labeled as 'bed 10' or 'stroke patient'. Involved in frequent contexts of poor communication in clinical practice, medical students learn valuable lessons about the type of physician they wish to avoid becoming²⁰. A study conducted in Finland, published in 2005, showed that an early immersion in medical practice helped students to better understand the perspective of "being patient/being sick", recognizing the seriousness of the doctor-patient relationship and identifying models of professional behavior, the latter analysis being intrinsically related to empathy²².

The communication of difficult news in the context of healthcare, which is often challenging and feared, raises a consideration that deserves to be highlighted: the transformation of this dense information into more sensitive and humanized communications for patients. According to researcher and psychologist Carlos Rozeira¹, this proposal goes beyond mere vocabulary alteration; It instigates a paradigmatic shift in the perspective of health professionals, encouraging them to recognize that behind each diagnosis or prognosis there is a unique individual, full of history, emotions, and expectations. Thus, the humanization of care is sought, going beyond the strictly clinical aspects by valuing the uniqueness of each patient. The sensitive approach to 'hard news' aims to establish an empathetic connection between the professional and the patient, promoting a bond based on mutual understanding and trust. This transformation not only fosters more effective communication, but also creates an environment conducive to successful treatment and improved patient experience in the context of medical care. In this scenario, empathy emerges as a primary tool in reducing fears and building a closer and more therapeutic relationship between both parties¹.

The focus should not be on the nature of the difficult news itself, but rather on the lack of efforts to turn it into more sensitive and empathetic communication. This change represents a transformative potential for a more humanized, patient-centered medical practice and, consequently, more effective in care and treatment¹.

In both the medical and psychological approaches, empathy emerges as a fundamental skill for treatment adherence and the construction of a fruitful therapeutic relationship. This relationship is rich in aspects, encompassing genuine commitment to the therapeutic process, a deep understanding of the patient's problems and perspectives, and the authentic manifestation of empathy in therapeutic interventions aimed at them^{1, 21}.

The creation of a positive therapeutic bond between the professional and the patient amplifies collaboration and engagement in therapeutic goals, which facilitates the effective resolution of the concerns expressed by the patient^{23,24}.

After the initial communication, it is fundamentally important to offer additional support, presenting treatment alternatives where available, and referring the patient for psychological assistance if necessary. Maintaining continuous follow-up and being available to answer questions



later are essential actions to ensure that the patient feels supported throughout the process. The healthcare provider should remain accessible to provide additional support after the conversation, demonstrating openness to offering complementary information and emotional support. Through this sensitive and compassionate approach, we seek to provide not only information, but also emotional support¹.

According to a study²⁰ conducted on the teaching of empathy as an essential part of the skills in doctor-patient interaction in medical courses, semi-structured interviews were conducted with medical professors at the School of Medical Sciences of the State University of Campinas (FCM–Unicamp), revealing diverse perspectives. The results highlight that learning this aspect is influenced by a variety of factors, including family environment, education received, and medical training, as well as personal interactions throughout the academic journey. One of the approaches suggested by some interviewees emphasizes that the best way to teach empathy is through example, demonstrating this skill to students and providing spaces for discussion and reflection to promote its understanding and application. The role of example and attitudes is highlighted as a fundamental tool to transmit this knowledge, as expressed by one of the research participants: "It's impossible to teach this if you don't practice. This is not embedded in the role of being a teacher"²⁰.

However, it is important to recognize that this ability to transmit is not uniform across all faculty members, evidencing a gap in valuing empathy in the doctor-patient relationship. Therefore, there is a need for greater involvement of teachers in promoting discussions and creating scenarios for practice and training, despite the time constraints for interactions with students and the challenges faced in the educational environment, including the overload of teaching responsibilities²⁰.

While the medical course, there is a decline in the empathy of students, often associated with a progressive emotional rigidity. This phenomenon is correlated with the ideal of physician that students seek to achieve. Events such as the emphasis on personality at conferences and the challenging transition from apprentice to medical professional can shape a student's attitude. The lack of time during consultations, the behavioral models adopted during graduation and the challenges faced by the student in balancing the duality between learner and physician, dealing with situations of loss, are pointed out as factors that contribute to the decrease in the importance attributed to empathy in the doctor-patient relationship²⁰.

The cited research reveals significant gaps in the development of medical identity throughout academic training, with little assistance offered to students, except in specific initiatives. In the interviews, a conception of empathy more linked to feelings than to cognition is highlighted, while the doctor-patient relationship is perceived sometimes as a means to achieve results, sometimes as a human encounter enriched by non-verbal elements. The transmission of empathy to new physicians is seen more as an example to be observed than as something formally taught, and its practice



throughout the medical course is fragmented, depending on the performance of the professors. Curricular reforms that value the training of skills centered on the consolidation of practices and a healthy doctor-patient relationship, based on empathy, are recommended in order to fill these gaps in medical education²⁰.

We recognize that enhancing communicative skills is crucial in clinical practice, going beyond technical and scientific knowledge. These skills are key to establishing empathetic relationships and providing quality care. Proper training, especially during clinical internships, plays a vital role in the training of future professionals, focusing on building a solid bond between doctor and patient. This link enables a broader understanding of the concerns, values, and challenges faced by patients, allowing for a holistic approach to their care^{1,20,29}.

Contemporary demands in medical education require continuous revisions to meet emerging needs in clinical practice. Aspects such as a focus on social-emotional skills, which include empathy, effective communication, and teamwork, stand out as significant challenges. The ability to interact with patients in a humanized way, valuing their individuality and establishing relationships of trust, is as crucial as technical knowledge for medical practice^{1, 20, 29}.

COMMUNICATION AND THE IMPACT ON PHYSICAL AND MENTAL HEALTH

To date, the research highlights elements that point to the significant impact of effective communication in health promotion, especially in delicate moments, in which the dissemination of challenging information can trigger additional complications, especially of a psychological nature. Inadequate or insensitive communication can aggravate emotional distress, increase stress, anxiety, and a sense of hopelessness, making the adjustment process more difficult. Often, a physical health problem poorly understood by the patient can manifest itself in mental symptoms and/or other physical problems, phenomena known as somatization and psychomatization¹.

Somatization manifests when physical symptoms are present without an identifiable organic cause. These symptoms have an emotional origin; For example, in panic disorder, the person may experience physical symptoms similar to those of a heart attack, although no organic problems are detected on medical tests¹.

In psychosomatic illnesses, changes can be observed in clinical examinations, in which the body manifests physical symptoms and the results of the tests confirm these symptoms. Although they are diseases with organic foundations, they are triggered by emotional disturbances, such as anger, anxiety, anguish, fear, or a desire for revenge. These feelings have the potential to lead to real and physical illnesses, such as depression, abdominal pain, diarrhea or tremors¹.

Inside each of us dwells an incomparable wonder: the brain. It is in it that the stage of life unfolds. Although we believe that we maintain control and that we are, most of the time, rational



beings who dominate our brain in all decisions, reality often proves to be the opposite. We are at the mercy of internal brain circuits that drive us to act through habits, stereotypes, and decisions that often occur without our full knowledge²⁵.

In recent years, works and studies dedicated to neuroscience, especially those that focus on the study of the human brain, have highlighted the historical neglect in the understanding and attention given to this vital organ. Interestingly, there is a care more dedicated to other bodily organs than to the epicenter of our cognitive and sensory activities. The brain, weighing approximately 1.5 kg, represents 2 to 3% of the body mass and can be visualized as a complex machine full of neural circuits, equivalent to neuron chips, similar to the integrated circuits found in the electronic devices we use daily, such as computers and smartphones. The brain is an intricate network of wires and connections that never rests, even during sleep²⁶.

Like any fully functioning machine, the brain requires energy. Its consumption is remarkable, using about 20% of the oxygen and 15 to 20% of the glucose available in the body. In moments of intense mental activity, such as in-depth studies or complex debates, the brain can consume up to 50% of the body's oxygen. In high-pressure, stressful, or challenging decision-making situations, the brain operates at an even faster pace. However, keeping it constantly in operation is comparable to keeping an engine at continuous maximum speed, which can inevitably lead to overloads or failures in its operation²⁶.

This biological supercomputer, composed of 80 to 100 billion nerve cells and a network of connections, is constantly forming until the age of 25, presenting a unique energy demand. The brain is more than a physical organ; It is an adaptable and dynamic machine, capable of forging new connections, although it usually follows established standards to preserve energy. Their neural structures have a direct influence on our perceptions and responses, shaping our thoughts and behaviors²⁵.

Each brain has its own uniqueness, with specific ways to solve questions, and its complexity allows for the constant formation of new connections. However, the overload caused by bad news, when communicated without proper attention, can be harmful. Excessive worry represents one of the challenges faced by human beings, especially due to the negative impact it can have on the brain and mental health, resulting in high levels of stress and anxiety, directly affecting the functioning of the entire body^{1,7,25}.

Chronic stress can trigger the excessive production of hormones, such as cortisol, the excess of which can have harmful effects. This includes impacts on memory, decision-making ability, and concentration. In addition, excess cortisol can suppress the immune system, cause sleep difficulties, weight gain, digestive problems, increased blood pressure, cognitive impairment, cardiovascular risks, mental health impacts, and decreased bone density. This range of problems, from



immunological and digestive issues to affects on body weight, mental health, and bone health, highlights the importance of hormonal balance for the overall health of the body^{1,7}.

Additionally, excessive worry tends to keep the brain in a constant state of alertness, impairing its adequate rest. Rest and recovery are essential for brain health, as they allow the brain to consolidate memories, process information, and regenerate. When the mind is overwhelmed with constant worry, this ability to recover can be compromised, negatively affecting cognitive and emotional health¹.

Negative events tend to leave a more lasting mark on our mind than positive ones. Daniel Kahnemann, winner of the Nobel Prize in Economics, revealed that people often try harder to avoid losses than to achieve gains. In long-term relationships, it takes approximately five positive interactions to make up for a single negative one. Harmony is achieved when positive experiences outweigh negative ones by a ratio of three to one or more. Negative events tend to have a more profound impact than positive ones, as a bad deed can tarnish a hero's reputation more than a good deed can improve a villain's reputation²⁸.

According to Rick Hanson²⁷, the extraordinary power of bad events in the human mind is related to the brain's intense response to unpleasant stimuli compared to pleasant stimuli of the same intensity. The main neural circuitry of this disproportionate reaction is made up of the amygdala, the hypothalamus, and the hippocampus. Although the amygdala reacts to positive experiences and sensations, it is more activated by negative events and sensations in most people²⁷.

Imagine a scene in which a doctor, with harsh words, arouses anger in a patient. This feeling activates the amygdala, which immediately sends warning signals to the hypothalamus and the control centers of the sympathetic nervous system, located at the base of the brain. The hypothalamus responds by requesting a rush of adrenaline, cortisol, norepinephrine, and other stress hormones. The body reacts: the heart races, thoughts become agitated, and a feeling of discomfort sets in. Meanwhile, the hippocampus records the experience, recording who said what and how the patient felt, to consolidate it in cortical memory networks, preparing for future learning. The amygdala, in turn, prioritizes the storage of this stressful experience, even influencing the formation of new neural connections, perpetuating fear. Over time, these negative experiences can make the amygdala even more sensitive to aversive stimuli. This vicious cycle is fueled by cortisol, a hormone released by the amygdala and requested by the hypothalamus, which strengthens and intensifies its activity. This results in faster and more intense responses to negative events. Even after the apparent danger has passed, cortisol continues to circulate in the body for several minutes, keeping the person in a state of alertness. For example, someone who narrowly escapes a car accident may remain nervous and shaky even twenty minutes after incident ²⁷.



During this time, cortisol acts excessively in the brain, resulting in overstimulation that weakens and eventually leads to the elimination of cells in the hippocampus, reducing their capacity over time. This poses a significant problem, as the hippocampus plays a crucial role in contextualizing events, helping to calm the amygdala and modulate the hypothalamus to stop the release of stress hormones. As a result, it becomes more challenging for the brain to contextualize a single negative event among a series of positive experiences, which makes it difficult to control an overactive amygdala and hypothalamus²⁷.

This process results in a greater sense of stress, worry, irritation, or hurt experienced today, which increases vulnerability to feeling those same emotions the next day. This creates a cycle of persistent negativity and establishes a vicious feedback loop²⁷.

The role of the physician in the theme of healing goes beyond the simple remission of physical symptoms. According to Covas²⁹, the idea of healing is a holistic process that seeks the full restoration of the individual in his or her totality, rooted in humanistic medicine. This entails not only treating illness, but also alleviating suffering, fostering well-being, and counteracting the impacts of persistent illnesses. This conception encompasses several therapeutic philosophies, from allopathy to homeopathy and oriental medicine, converging to center the human being as the epicenter of medical care. The role of the physician, then, goes beyond the direct treatment of the disease, involving actions to optimize not only the individual aspects, but also the social and environmental aspects that affect the patient's health.

In this context, building sensitive and transparent dialogue skills becomes essential in the approach to healing, allowing not only understanding of medical conditions, but also providing emotional support and clear information about prognoses and treatments. Knowing how to communicate difficult issues in a compassionate and understanding way is essential to promote trust and partnership between physician and patient, contributing significantly to the joint search for healing and well-being²⁹.

Numerous studies underscore the importance of the bond between physician and patient in determining the positive outcome of treatment, both for the patient and for the healthcare professional. In this sense, the concept of patient-centered care has stood out, prioritizing the doctor-patient relationship and promoting genuine collaboration between both parties. This model represents a significant change in relation to the previous paradigm, in which the physician exercised power and adopted a paternalistic role in medical care. Patient-centered care encourages the patient's active participation in the consultation, sharing with the physician the responsibilities in the healing process²⁹.



STRATEGIES AND METHODS FOR IMPROVING COMMUNICATIVE SKILLS

Communication plays a key role in the context of healthcare, where patients, clients, and family members have the right to be informed about their clinical conditions. It is the responsibility of health professionals to convey this information in a clear and understandable manner⁴.

Establishing effective communication in this environment implies ensuring a quality dialogue, ensuring that what is expressed is understood by the receiver². Managing this communication is a constant challenge for health teams³⁰. This dynamic goes beyond simple data sharing; It entails creating an interpersonal bond through the content shared and how it impacts the recipient of the message. Especially when communicating unfavorable news, as highlighted in this study, it is not just about transmitting the information; It is essential to consider the appropriate elements and care when dealing with content that frequently triggers anxiety, pain, and reflections on various aspects of life, health and disease processes, as well as death and dying^{5,6,12}.

We understand that communication between healthcare professionals and patients plays a key role in ensuring a clear understanding and establishing effective treatment plans, especially in complex situations. Therefore, it is essential to provide information in a gradual and understandable manner. This entails assessing the patient's initial level of understanding, breaking down the information into easily assimilated chunks, and checking understanding after each step. In addition, it is important to consult with the patient about their preferences regarding additional information, allowing them to direct their own learning process¹².

In these challenging circumstances, it is essential to make the information understandable and memorable. This involves organizing information logically, breaking it down into clear, sequential chunks, and employing strategies such as enumeration and repetition to facilitate assimilation. Additionally, it is crucial to use simple and accessible language. After transmitting the information, it is essential to verify that the patient has understood the proposed plan, encouraging him to recapitulate in his own words what was explained, thus ensuring the clarity of understanding²⁹.

At the end of the consultation, it is important to reinforce the future planning agreed with the patient, clarifying the next steps and their chronology, especially in delicate situations. Establishing a contingency plan for eventualities, fostering a sense of collaboration between doctor and patient, and verifying that there is agreement and comfort with the plan are crucial final elements. Additionally, asking if there is a need for adjustments or if questions persist is significant to ensure that the patient feels involved in the process and that all of their concerns have been addressed. This effective and compassionate communication is essential to build and maintain a healthy and collaborative relationship between physician and patient in challenging moments²⁹.

It is important to note that in the scientific community, specific protocols have been developed for the communication of bad news in the medical context, providing oriented structures



to deal with this delicate task. One example is the SPIKES protocol, introduced by Bachman in 1992, with the goal of simplifying the transmission of bad news, especially to cancer patients. This protocol, consisting of six steps, covers everything from choosing the appropriate place for the conversation to the conclusion, where a summary of what was discussed occurs. Another example is the CLASS protocol, which consists of five steps and emphasizes the physical environment, active listening, recognition of emotions, formulation of strategies, and a final review of the dialogue¹².

Another relevant protocol, the P-A-C-I-E-N-T-E, adapted by Pereira (2010) from SPIKES, is divided into seven stages. It emphasizes **Preparation; the Assessment of the patient's knowledge and willingness to know; the Invitation to truth, that is, honesty in communication; Inform, sharing information in sufficient quantity, speed and quality for the patient to make his decision; the management of the patient's emotions and the strategic planning for the next care; Do not abandon the patient, that is, ensure that the patient will receive medical follow-up until the end; Outline a Strategy, i.e., plan the next care to be offered and its treatment options**³¹.

All of these methods have in common the goal of organizing communication and offering support to the patient throughout the process. They underscore the need for healthcare professionals to be assertive in communicating challenging news and to create an environment of trust. It is essential to cultivate authenticity, positive consideration, and empathy when dealing with the communication of difficult news in the health area^{12,32}.

In the difficult task of communicating bad news to patients, the physician assumes a central position of great responsibility. As it is often the first point of contact with the patient, it is up to the patient, with rare exceptions, to transmit information that can have a significant impact on the individual's life. However, it is essential to highlight that, in the communication process, both the physician and the patient's family have the support of other professionals¹.

Many physicians recognize the complexity of communication, as establishing a genuine connection with patients and families is critical. In the transmission of bad news, there is a significant emotional charge that affects both health professionals and receivers of information. Therefore, the crucial skill lies not only in informing, but in knowing how, when, and to what extent to share this delicate news, especially when it comes to serious diagnoses³⁴.

Communicating bad news is a stressful task for doctors, leading many to avoid or perform this communication inappropriately. Sometimes, professionals see this situation as a failure, which can lead to the use of euphemisms to soften the message, even if this compromises transparency. This difficulty is aggravated by the fact that physicians also deal with their own emotions and personal concerns during the process³⁴.



Although educational guidelines for medical school degrees emphasize the importance of communication, few universities include the teaching of this skill in their curricula. The communication of bad news is still little addressed in the Brazilian context, despite being a widely studied topic at the international level. Thus, there is a growing global concern with the training of health professionals, highlighting the importance not only of technical knowledge, but also of communication skills in the interaction with patients and families³⁴.

Within the health team, several professionals play key roles in this process, helping to ensure that the news is transmitted in the most sensitive and welcoming way possible. Psychologists, for example, play an important role in offering emotional support to the patient and their family, helping them deal with the emotions and psychological impacts of the news. We have already seen that in the clinical/hospital context, the communication of bad news is the responsibility of the physician, and serious diagnoses or the finding of death are examples of this scenario. However, it is important to recognize the significant role of the psychologist in collaborating with the multidisciplinary team before, during, and after this communication. Before the crucial moment, the psychologist can offer support to the team and initiate the bond with the patient, assessing their understanding and helping to adjust expectations. When preparing to communicate bad news, it is essential to know the patient, their perceptions, and coping resources by sharing relevant information with the team. During communication, the psychologist accompanies the process, offering emotional support and facilitating the understanding of information. Careful posture and accessible language are essential, as well as constant monitoring of the patient's perception and acceptance of their emotions. After communication, the psychologist continues to offer emotional support and assist the patient in assimilating the information. Additionally, it can provide support to staff in the face of challenging situations. In all these stages, the presence and performance of the psychologist are essential to promote an environment of care and understanding in the face of difficult moments¹.

Social workers also play an important role in providing guidance and practical support in dealing with social, financial, and organizational issues that may arise as a result of the bad news. They help connect patients to external resources and find solutions to challenges they may face¹.

In addition, nurses play an essential role in supporting the patient before, during, and after the news is communicated. They are often on the front lines of patient care and are responsible for providing physical and emotional comfort, as well as ensuring that the patient receives the necessary care¹.

Even professionals such as occupational safety technicians have a role to play in this context, ensuring that the environment is safe and that all appropriate measures are taken to protect the patient and the team during this delicate moment¹. Their presence in the hospital context is often perceived only as a legal requirement, without due recognition of their contribution to the safety and comfort of



all involved. This stereotype can result in underestimating their role in fostering a culture of safety and effective communication. However, it is crucial to understand that these professionals have valuable knowledge about accident prevention and occupational health, which is essential to safeguard both employees and patients in a complex hospital environment³⁵.

In addition, involving occupational safety technicians in promoting humanized communication not only helps prevent accidents, but also contributes to cultivating a more collaborative and empathetic work environment. Although their work is not directly linked to the direct care of patients, they play an important role in situations involving other team members. It is essential that they know how to communicate failures, warn of potential dangers, and offer guidance in a humanized way, even in urgent circumstances. By facilitating the clear communication of safety protocols and promoting an organizational culture that values safety and well-being, these professionals play a crucial role in promoting more efficient interpersonal communication and reducing stigma and prejudice in the hospital environment³⁶.

So, while it is the physician who often has the responsibility of communicating the bad news, the support and collaboration of the entire healthcare team is essential to ensure that the patient receives the necessary support in all aspects of their journey.

FINAL THOUGHTS

Certainly, the effectiveness of communication plays a key role in the context of healthcare, minimizing conflicts and misunderstandings between medical staff, patients, and their families. The impact of ineffective communication has direct repercussions on the patient and their family, resulting in unsatisfactory care. The quality of this communication is a built process, especially when the physician faces the challenge of sharing difficult news. It is essential that this medical figure believes in the patient's potential, offering information in a clear and truthful way, without omissions about prognoses and possible paths. At the same time, it is imperative to inspire respect, acknowledging the uniqueness of the patient and assuring him that every effort is made to preserve his life. In addition, it is vital to allow the expression of empathy, sharing and sympathizing with the pain of the other.

It is noteworthy that the communication challenges faced by health professionals are, in part, due to gaps in academic training. It is essential to emphasize the development of these communication skills during training, also promoting a more humanized approach to care. Currently, medical efficiency is not only measured by technical competence, but also by the way these professionals establish empathetic connections with their patients and families¹².

To conclude, it is interesting to remember that the physical environment and technological resources are, without a doubt, relevant elements in health environments. However, its importance



does not surpass the human essence, which shapes thought and actions, enabling the construction of a more humanized reality. This reality, less hostile and aggressive, offers a refuge for those who pass through health institutions on a daily basis³³.

The deficiency of empathy in personal interactions can compromise the effectiveness and satisfaction of users in health services, also perpetuating interpersonal conflicts among professionals. The lack of adequate investments for technical improvement, training in teamwork skills, and the development of resilience accentuate discomfort and demotivate health professionals. This culminates in the loss of connection between the professional and their mission, resulting in an automated and non-humanized care delivery. But, we need to fight, humanized health care generates strong bonds, promoting trust and well-being between professionals and users.



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Law and legal argumentation

 <https://doi.org/10.56238/sevened2024.010-013>

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ABSTRACT

The main objective of this article is to approach the studies of argumentation and rhetoric, based from the classical world, to the contemporary argumentation of Robert Alexy's Discourse Theory in the field of Discourse Analysis. It discusses what is Argumentation in the General Sense and Classical Rhetoric, then the postulates of Argumentation in Legal Discourse are presented. To articulate the philosophical postulates of Socrates, Plato and Aristotle about the use of rhetoric and the contributions of the Analysis of the use of legal argumentation in the discourse with Robert Alexy, who will deal with legal argumentation in the discourse of judicial decisions from the philosophical point of view. The study arose from the factual analysis of argumentation by legal practitioners in the presentation of problems and in the decisions rendered by judges. This research presents the construction of the legal discourse that is based on legal argumentation so that it does not summarize the common argumentation used in the non-legal discourse. The bibliographic review method is used, consulting articles from indexed journals for its development. The research based on Alexy, and the legal discourses in decisions when based on legal argumentation are related to the field of Philosophy.

Keywords: Rhetoric, Persuasion, Argumentation.

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INTRODUCTION

The objective of this article is the analysis of Robert Alexy's Theory of Legal Argumentation⁵ to the detriment of the use of argument in the general sense and the use of rhetoric, with a view to the critical reconstruction for the foundation of legal discourse. For this, it is necessary to carry out a thorough study on the art of argumentation, that is, knowing how to persuade through a well-formulated discourse.

The study of argumentation goes beyond several areas of knowledge, namely, Philosophy, Sociology, Linguistics and Law. To this end, the domain of argumentation is essential, especially when it comes to legal argumentation, considering that society expects from law operators answers of complex content and based on social problems, so that legal questions have emerged since the 5th decade of the twentieth century about the failure of positive law, bringing to the fore the importance of discussions about argumentation. In this context, new theories and theorists have emerged in the legal argumentative conception, which is divided into three distinct categories: formal, material and pragmatic. According to Habermas⁶, *argumentation* is a "type of discourse in which participants thematize controversial validity claims and seek to resolve or criticize them with arguments" and that *arguments* would be as "means with which it is possible to obtain intersubjective recognition of a validity claim raised by the proponent in a hypothetical way"⁷, so that "reasons that are systematically linked to the claim of validity of a problematic externalization", ⁸and with this the "force" is measured, contextualizing it, by the acuity of the reasons, which is revealed, for example, by the effectiveness in convincing the participants of a discourse, motivating them to assent to the respective *claim of validity*.

ORGANIZATION OF LANGUAGE IN DISCOURSE

Argumentative techniques should be the object of research in the school field, so that argumentation does not consist only in the production of text, but also in the way of knowing how to express oneself. Thus, argumentation should be seen as a necessary activity; However, it depends on several factors that must be considered in order to have a good argument:

The true substance of language is not constituted by an abstract system of linguistic forms, nor by isolated monologic enunciation, nor by the psychophysiological act of its production, but by the social phenomenon of verbal interaction, carried out by the enunciation or enunciations. Interaction thus constitutes the fundamental reality of language⁹.

⁵ALEXY, Robert. Theory of Legal Argumentation: The Theory of Rational Discourse as a Theory of Legal Grounds. 3. ed. Rio de Janeiro: Forense, 2011, p. 20.

⁶HABERMAS, Jürgen. Theory of Communicative Action: Rationality of action and social rationalization. Martins Fontes, 2012, p. 44, 48, 60, 61.

⁷REBOUL, O. Introduction to Rhetoric. Translated by Ivone Castilho Benedetti. São Paulo: Martins Fontes, 2004.

⁸MY DICTIONARY. Rhetoric. Available at: <https://www.meusdicionarios.com.br/retorica/>. Accessed: 30 out. 2023.

⁹BAKHTIN, Mikhail. Marxism and the Philosophy of Language: Fundamental Problems of the Sociological Method in the Science of Language. São Paulo: Hucitec, 1986.

According to Abreu¹⁰, arguing is the art of convincing and persuading. To convince is to "manage information", to speak to the reason of the other, demonstrating, proving; it is to build something in the field of ideas; it's making the other think like us. To persuade is to know how to manage the relationship, to speak to the emotion of the other; it is to build on the terrain of emotions; it is "sensitizing the other to act".¹¹

There are particular characteristics of argumentation as a result of which the problems inherent to his study are revealed, Perelman¹² points out the initial distinction between demonstration and argumentation, which results in fundamental sociological consequences for the thought he will develop throughout his work:

Argumentation is essentially communication, dialogue, discussion. While demonstration is independent of any subject, even the speaker, since a calculation can be performed by a machine, argumentation in turn requires that contact be established between the speaker who wants to convince and the audience willing to listen¹³.

It is true that it would be impossible to argue without referring to rhetoric, since the art of arguing permeates the way of managing discourse, in order to obtain the final goal, which would be the effective result in relation to social practices.

As Reboul stated¹⁴, Rhetoric conceives of argumentation as the act of assigning the floor to an audience, submitting to it theses that are not necessarily true, but credible and reasonable. Therefore, an argument is a set of statements connected by the existence of one or more premise that purports to offer reasons to show the other that the conclusion is true.

WHAT IS RHETORIC AND HOW DID IT COME ABOUT?

Rhetoric is a word that means **to convey ideas with conviction, the art of speaking well, communicating clearly**. It is a word that originates from the Latin *rhetorica*, which came from the Greek *rhêtorikê*¹⁵.

As Reboul put it¹⁶:

The birth of rhetoric is traditionally attributed to the Sicilian Corax and dates back to the fifth century B.C., a historical period characterized by the transition from tyrannical rule to democratic rule. During this period, numerous legal conflicts were fought by citizens who, stripped of their property by tyranny, resorted to justice in an attempt to recover them. However, the figure of the legal professional as it is known today was not known, so that

¹⁰ABREU, A. S. *The Art of Arguing: Managing Reason and Emotion*. São Paulo: Ateliê Editorial, 2003.

¹¹ABREU, 2003, p. 25.

¹²PERELMAN, C. *Argumentation*. Einaudi Encyclopedia. v. 11. Lisbon: Imprensa Nacional-Casa da Moeda, 1987, p. 234-265.

¹³*Ibid.*, p. 235.

¹⁴REBOUL, 2004.

¹⁵Available at: <https://www.meusdicionarios.com.br/retorica/>. Accessed: 16 out. 2023.

¹⁶*op. cit.*

citizens who sought the solution of their conflicts in the judiciary had to provide for themselves the support of their theses.

It was through the treatises of Corax and Tisias, the poetic and philosophical incursions of Gorgias and Protagoras,¹⁷ that the first propositional manifestations of rhetoric were made.

According to Cicero's testimony:

When, says Aristotle, tyranny was destroyed in Sicily, and questions between private individuals, after a long interval, were again submitted to the courts, for the first time, in that people of penetrating mind and naturally inclined to discussion, the Sicilians Corax and Tisias, were seen to give a method and rules. Before, no one followed a set course, nor submitted to a theory, and yet most expressed themselves with care and order.¹⁸

According to Pernot¹⁹, the use of oratory is used in high regard at the beginning of the century. IV, being ostensibly placed in the judiciary and political circles²⁰.

Corax of Syracuse and Tisias were his disciple as the first to introduce rhetoric to Athens, according to Reboul²¹.

Aware of this growing practical need for discursive elaboration, Corax and his disciple Tisias, around 465 B.C., launched the first methodical treatise on the art of the word – a manual that presented, in a didactic way, lessons on how to properly support a thesis in court, with a view to overcoming any demand.

And the author presents:

¹⁷ Protagoras, born in the city of Abdera, lived between the years 490 and 420 B.C. As for the dates of birth and death, there is a slight variation between the testimonies. According to Guthrie, the sophist lived between 492 and 422 B.C. (Guthrie, 1995). Diogenes Laertios, on the other hand, states that Protagoras lived until the apogee of the 84th Olympiad, which, in turn, occurred in 441 B.C. According to Philostratus (*Lives of the Sophists* I, X, 1-4), Protagoras was a listener of Democritus, having been, among the Sophists, the first to charge for his office. Aeschius of Alexandria also testifies about the relationship between Protagoras and Democritus. In: *Life of Protagoras. Plato's Scholium to the Republic, 600c*. The following contributions to the history of rhetoric became known as belonging to Chalcedonium: the use of opposing or double discourses (*dissoi λόγοι*), the use of commonplaces, and the concern for the correctness of words (*orthoépeia*). In a general sense, and according to the testimonies of Plato and Sextus Empiricus, it was in the sphere of knowledge that Protagoras made the greatest impact by defending the thesis of [...] "Let man be the measure of all things, for those that are, that are, for those that are not, that are not." (Sixth Empiricus. *Pyrrhonic Hypotypes* I, 216). No less important is his thesis on religion, which has come down to us summed up by Sextus Empiricus as follows: "With regard to the gods, I am not able to say either whether they are or what they are. There are many obstacles." (*Against the Mathematicians* IX, 55). As a result of his ideas concerning the gods, Protagoras is said to have been sentenced to death. We may regard him as the most respectable representative of the so-called ancient sophistry. Since we do not have any of his writings at first hand and everything we have about Protagoras has its origin in the ancient testimonies, especially those of Plato, Aristotle and Sextus Empiricus, we emphasize that any attempt to reconstruct his thought will invariably suffer the influence of the suggested source

¹⁸[...] ait Aristóteles, cum sublatis in Sicilia tyrannis res privatae longo intervallo iudiciis repeterentur, tum primum, quod esset acuta illa gens et controversia natura, artem et praecepta Siculos Coracem et Tisiam conscripsisse: nam antea neminem solitum via nec arte, sed accurate tamen et descripte plerosque dicere. CÍCERO, M. Túlio. M. Tulli Ciceronis Retórica, Tomus II. A. S. Wilkins. Oxônio. e Typographeo Clarendoniano. [S. l.]: Scriptorum Classicorum Bibliotheca Oxoniensis, 1911.

¹⁹ PERNOT, L. *Rhetoric in Antiquity*. Paris: Le Livre de Poche, 2000, p. 42.

²⁰According to Pernot (2000, p. 42): "The Athenian oratorical practice develops under different circumstances, appearing for the first time in the legal and political framework. In court, the parties were obliged to plead their cases in person, without the possibility of being represented by a lawyer. There was no public prosecutor's office, so that accusations were necessarily brought by individuals: in private actions, by the injured party; in public actions, by any citizen."

²¹REBOUL, 2004.

At this time, rhetoric, understood as the art of persuasion, acquired more and more prestige, because there was a belief that those who mastered their techniques would be able to convince anyone of anything. Therefore, in that judicial context, praxis indicated that the winning cause in a judicial conflict did not necessarily have to be the fairest, but certainly the most efficiently sustained in court, which allows the observation that rhetoric does not argue from the true, but from the verisimilitude²².

According to Amossy²³:

From Sicily, then dominated by the Greeks, rhetoric migrated to Athens and there found fertile ground for the development of its postulates, with the flourishing of the Greek polis, where political decisions were made through broad popular participation, in collective debates organized so that people could exercise their right to free opinion and expression, within an institutional framework endowed with laws.

Socrates and Plato²⁴ were opposed to the idea of using Rhetoric, since this method of study had no basis of knowledge, but a crude mechanical way of elaborating speeches in such a way as to persuade anyone. Socrates criticized the Sophists who were the teachers who traveled from city to city teaching anyone who paid for the Rhetoric.

According to Ramsey²⁵:

Plato constructs a specific nomenclature for the persuasive practices of his opponents in order to combat them even more acutely, suggesting that it is easier to attack something that is defined. The act of naming would therefore already be, at least in the Gorgias dialogue, part of the strategy of disavowing rhetoric

According to the philosopher, rhetoric was the negation of philosophy, and this practice needed to be abolished from the study of the Greek people. Due to this, Socrates began to confront the supposed thinkers of the time and as a consequence, in addition to the accusation of corrupting the youth to worship other gods than those accepted by the Greeks, this led to his death.

²²*Ibid.*

²³AMOSSY, R. *New Rhetoric and Linguistics of Discourse*. In: KOREN, R. ; AMOSSY, R. (org.) *After Perelman: What Policies for New Rhetoric?* Paris: L'Harmattan, 2002.

²⁴The important passage in the Rhetoric (II, 24) which discusses the idea of probability (eikós) by attributing it first to Corax and Tthisias, and then to Protagoras, is as follows: "For that which is outside probability is produced in such a way that what is outside probability is also probable. If so, the improbable will be likely, but not at all. Just as in eristics, the failure to add to what extent, in relation to what, and in what way I make the argument specious, so it is the same in rhetoric, because the improbable is probable, but not absolutely, only relatively. It is from this topic that the Art of Corax is composed: "if a man gives no pretext for an accusation, for example, if, being weak, he is accused of violence (because it is not probable); but if it gives rise to an accusation, for example, if it is strong (it will be said that it is not probable, precisely because it would seem probable)". The same is true of other cases, since a man is bound or not to give rise to being accused. Both cases, therefore, seem probable, but the one will appear probable, while the other is not absolutely probable, except as we have said. Here, too, is to make the weaker argument stronger. Hence, with justice, men would be indignant at the statement of Protagoras, for it is a deception and a probability not true but apparent, and exists nowhere else but in rhetoric and eristics." "[...] (ARISTOTLE, Rhetoric II, 24).

²⁵RAMSEY, R. "A Hybrid Techne of the Soul? Thoughts on the Relation between Philosophy and Rhetoric in Plato's "Górgias" and "Phaedrus"". *Rhetoric Review*, n. 17, 1999, p. 247.

ROBERT ALEXY THEORY OF ARGUMENTATION

The Theory of Argumentation has been studied since classical antiquity, going through several phases of development from its historical context to the study of argumentation in the legal field. According to Rodriguez, the most evident efforts to study argumentation in law date back to 1970, when the legal philosopher Chaim Perelman began his course in argumentation at the University of Brussels²⁶.

But it was after the French Revolution, through the application of the differentiation of powers²⁷, that the judiciary began to be required to issue reasoned decisions. However, it was Robert Alexy who began the demonstration of the basic supports that present the development until he reached the conclusion of the main ideas that make up the legal²⁸ argumentation.

For the German philosopher, it would be rare that the judicial decision did not result from the logic that exists in the statements of the legal norms in force, accompanied by empirical postulates taken as true or demonstrated²⁹.

For Alexy, as if the difficulties related to the classification and the way of using the aforementioned canons were not enough, his main problem would also be the imprecision, since the rule is defined that can result in different conclusions if the interpreters have divergent understandings on the issue. Therefore, for the author to assume such canons of interpretation, although useful, cannot be used as sufficient rules for the foundation of legal decisions³⁰.

Robert Alexy's theory is based on a rational enterprise, in which sufficient rules of internal and external justification are presented to achieve consistent and controllable decisions. Rational knowledge of the discourse is possible through the observation of precepts that are indispensable for the achievement of any well-founded consensus, and the author teaches that the formal and traditional logic of how to interpret and apply the law often does not meet situations of conflict between norms

In view of the indispensability of evaluations in the Science of Law and jurisprudence, it cannot be concluded that in judicial decisions there is a margin of liberality for subjective moral beliefs of the applicators of Law. Therefore, there were several attempts to objectify the application of these value judgments³¹.

²⁶RODRIGUEZ, Victor Gabriel. *Legal Argumentation: persuasion techniques and informal logic*. 5. ed. São Paulo: Martins Fontes, 2011, p. 8.

²⁷Through the application of a system of checks and balances, prerogatives and duties were attributed to each of the branches of State Power.

²⁸ALEXY, 2011, p. 20.

²⁹*Ibid.*, p. 19.

³⁰*Ibid.*, p. 21.

³¹Four procedures are listed in the work: "1) to be based on physically existing convictions and consensus, as well as on non-legal norms physically in force or followed; 2) refer to valuations that, in some way, can be extracted from the existing legal material (including previous decisions); and (3) to have recourse to supra-positive principles. [...] 4) appeal to empirical knowledge [except the assumptions in (1)]" (ALEXY, 2011, p. 29).

Alexy, in general and historical terms, classifies legal arguments as follows:

The arguments that may be used in the legal reasoning can be classified in various ways. The choice of classification basically depends on the purpose pursued. For our purposes, a distinction can be made into four categories: linguistic, genetic, systemic, and that of general practical arguments. Linguistic arguments are based on the verification of a factually existing usual language. Often, especially in the large number of so-called simple cases, they lead to a definitive result. Then, the decision is set, and any other decision will only be possible if the law is developed against the literalness of the text. However, it is often only possible to say that the norm is vague or, in some way, misguided. Thus, a decision can be justified only by other arguments. Genetic arguments target the factual purposes pursued by the historical legislator. Often, they are not applicable because they cannot be found or because they are too vague or contradictory. Moreover, the power of the genetic argument is debatable, as shown by the controversy between subjective and objective theory as to the scope of interpretation. Systemic arguments are based on the idea of the unity or coherence of the legal system. They represent the correct central point of thought expressed, somewhat exaggeratedly, in the coherence model. They can be divided into eight subgroups that can only be defined but not explained here: (1) the arguments that ensure consistency, (2) the contextual, (3) the systematic-conceptual arguments, (4) the arguments of principle, (5) the special legal arguments, such as analogy, (6) the arguments of precedent, (7) the historical, and (8) the comparative. General practical arguments form the fourth category. They can be divided into teleological and deontological arguments. Teleological arguments are oriented to the consequences of an interpretation and based on an idea of what is good. Deontological arguments express what is legally right or wrong without looking at the consequences³².

Alexy points out that the critiques of Legal Discourse Theory are important because:

One of the main problems with discourse theory is that its system of rules does not offer a finite procedure of operations by means of which a rational agent can always arrive at a precise result. There are three reasons for this. Firstly, the rules of discourse do not contain any definition as to the starting procedures. Starting points are the normative convictions of the participants and the interpretations of interests. Second, the rules of discourse do not define all the steps to be taken in argumentation. Thirdly, a series of rules of discourse have an ideal character and can therefore only be carried out approximately, i.e., partially. To this extent, discourse theory does not offer determinate decisions³³.

Unlike Habermas, Alexy concludes that this deontological character of the normative system (legal principles and rules) does not imply *absolutes*, but can be understood as constituted, among other things, by *optimization mandates*³⁴.

³²Alexy (2011) points out that this is a very convergent finding at the level of legal theory, citing authors such as Karl Larenz, Friedrich Müller, Kriele, Engisch, among others.

³³ALEXY, Robert. The idea of a procedural theory of legal argumentation. Legal theory, caderno 2,1981.

³⁴Habermas (2012, p. 259) is explicit in arguing that: Principles and rules have no teleological structure. They cannot be understood as precepts of optimization - as suggested by the "weighting of goods" in the other methodological doctrines - because this would suppress their sense of deontological validity. The author argues that: In the course of the cases, a transitive order is established between the principles, without this scratching its validity, without pragmatically explaining, however, what he means by transitive order, because, on this point, he seems to agree with Dworkin in relation to the thesis that: in the conflict between principles, an "all or nothing" decision is not necessary. It is true that a particular principle enjoys primacy, but not to the point of nullifying the validity of the principles that give way. One principle takes precedence over the other, according to the case to be decided.

LEGAL ARGUMENTS FOR THE LEGAL PRACTITIONER

In the field of the judiciary, it is necessary to make good use of argumentation, that the discourse is formulated in a clear and precise manner and that one has the power to convince the interlocutor, since his role in the lawyer's case is to represent his client. Therefore, it is important to have an argument permeated by certainty in what is being transmitted in order to be successful in the dispute.

Legal logic is structured from legal knowledge, which consists of the dialectical reasoning used in Law to obtain success at the time of decision, because the judge will base himself on the thesis presented by the lawyer to create his convictions, that is, to analyze the concrete case, so that he will not analyze truths, but to value the closest and most admissible narrative that brings you conviction, the power of persuasion.

According to Foucault, "The production of discourse is at the same time controlled, selected, organized, and redistributed by a certain number of procedures and dangers, to dominate its random happening, to evade its heavy and fearful materiality."³⁵

Dialectical logic has great importance in discourse, since the work with law is eminently argumentative, and arguments are the basis of law.

In law, nothing is done without explanation. You do not make a request to a judge without explaining why, otherwise the request is said to be unreasonable. In the same way, no judge can render a decision without explaining the reasons for it, and for this he builds argumentative reasoning. Without argumentation, the law is inert and inoperative³⁶.

Soon. Argumentation tends to persuade the speaker to achieve success in legal argumentation.

FINAL THOUGHTS

In this work, forms of argumentation and rhetoric were presented. Initially, it was made the approach of what would be argumentation in general regarding the use of language, related to Rhetoric from the point of view of some philosophers and the paramount importance of realization in Legal Discourse, from the perspective of Robert Alexy's Theory of Argumentation.

It should be noted that legal norms are not only based on various orientations, but also on principles, to enable a new way of delimiting the Law, which is to know how to interpret and apply these norms in legal discourses, and how to make themselves understood by the legislator. For this reason, it is important that the speaker has the use of considerable premises, relating to the use of language techniques that guarantee them to reach reason and meaning, in the appropriate way of using the use of persuasion. We conclude that the study of the Theory of Argumentation is the basis

³⁵FOUCAULT, Michel. Ethics, sexuality and politics. Rio de Janeiro: Forense Universitária, 2004, p. 8-9.

³⁶RODRÍGUEZ, Víctor Gabriel. Legal Argumentation: persuasion techniques and informal logic. São Paulo: Martins Fontes, 2005, p. 5-6.




for the operator of Law, insofar as it points out ways to relate a legal reasoning in the search for persuasion and convincing of its audience.

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Socio-environmental disaster - Public prosecutor's office, civil defense and the guarantee of rights

 <https://doi.org/10.56238/sevened2024.010-014>

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ABSTRACT

The present study aims to present a new way of observing risk management and disaster management, seeking to understand better integration between agencies, and in the specific case of this article, the direct relationship between the Public Ministry and the Public Ministry. In this new perspective, the focus is on better guaranteeing fundamental rights, since it deals with disaster actions and is directly linked to the Public Ministry in terms of protecting the fundamental rights of people affected by various forms of socio-environmental disasters. It is worth noting that this new approach has a new way of articulating agencies in favor of better defending the fundamental rights of victims, but with a bias towards including disaster prevention and mitigation actions.

Keywords: Civil Protection and Defense, Public ministry, Risk management, Disaster Management, Public Disaster Management.

INTRODUCTION

This article aims to bring a new perspective of risk management and disaster management, through the integration and articulation between Civil Protection and Defense agencies, the community and the Public Prosecutor's Office, from a perspective focused on guaranteeing fundamental rights.

As institutions that seek the ideal of reducing the number of deaths and those affected by socio-environmental disasters, promoting the actions provided for in Law No. 12,608/2012 and Law No. 14,750/2023, accidents and disasters are an integrated field of action between the Public Prosecutor's Office and the Civil Defense bodies, today, of Protection and Civil Defense, possible and necessary, so that prevention, mitigation and resilience are instruments to guarantee rights.

Likewise, community participation is essential and in no way can it be excluded from the decision-making process, especially so that social capacities are strengthened, so that civil protection and defense actions are planned based on the hearing and needs of the recipients, under penalty of being inefficient. Civil Protection and Defense must develop a product provided for by law, which efficiently promotes the link between society and public authorities. This link can be well developed with community support through the calls by professionals in the area of civil protection and defense centers (NUPDEC), which has a similar foundation in Brazil (2012).

It also addresses the fragility of the financing of preventive and risk mitigation measures and the importance of municipal civil defense funds and their councils, according to SEGUIN (2012). From this point of view, there is no vertical and efficient system for transferring resources, in view of municipal responsibility in various actions such as prevention and mitigation. The municipal responsibility for applying resources in these actions is notorious, but in the face of the challenges, it is practically impossible to solve these zeugmas without the support of other federative entities.

Therefore, it is about the development of a culture of resilience and some successful initiatives in the Municipality of Petrópolis, which will be addressed in this study that will serve as a basis for a more accurate look at municipal actions related to the major areas listed in the research.

OBJECTIVE

The objective of this paper is to reflect on the extent to which the Public Prosecutor's Office and Civil Protection and Defense can form institutional and community arrangements to strengthen prevention, mitigation, preparedness, response and reconstruction actions in the field of disasters, under the bias of guaranteeing rights.

METHODOLOGY

The methodology applied is exploratory, with a bibliographic and documentary survey, using practice and stimuli to the understanding of the theme in the context of risk management and socio-environmental disasters SEDREZ (2013).

DEVELOPMENT

THE PUBLIC PROSECUTOR'S OFFICE, THE ENVIRONMENT AND CIVIL PROTECTION AND DEFENSE

The Public Prosecutor's Office¹, according to the Constitution of the Federative Republic of Brazil, is the permanent institution, essential to the jurisdictional function of the State, and is responsible for the defense of the legal order, the democratic regime and the unavailable social and individual interests.

And it is also the Constitution, which in article 129, III, entrusts the Public Prosecutor's Office with the defense of the Environment, in addition to other diffuse and collective rights, giving it instruments such as civil inquiry and public civil action to guarantee these rights. In this context, the socio-environmental disaster and risk management are inserted as a bias in the performance of the Prosecutors of Justice, especially the Prosecutors of Justice of collective protection of the environment and citizenship.

In the protection of the environment, disaster emerges as an element of study and action, as it represents the complete disintegration of the environment, affecting not only its natural or built elements, but above all affecting fundamental rights, such as life, health and safety of people. In this context, prevention and preparedness actions should be viewed with as much concern as response and reconstruction, according to Law No. 14,750/2023. BRAZIL (2023).

Thus, when the Constitution protects the environment so that it is balanced, as stated in article 225, what is being protected is not only the fauna, flora, air, water, soil, or even the city and its essential functions, but primarily the right to a healthy quality of life of the people is being guaranteed. For this and future generations, it is the quality of life of man that is the most relevant good and the greatest protection of environmental law. What is meant is that man is the center of environmental protection.

It is in this vein that environmental law is understood as a fundamental human right of the third generation. For Fiorillo (2001),² the environment is aimed at the satisfaction of human needs, the human person is the recipient of environmental law, which does not prevent the protection of life in all its forms. Says the author:

¹Art. 127 of the Federal Constitution

² FIORILLO, Celso Antônio Pacheco. Curso de Direito Ambiental Brasileiro. Saraiva. 2ª. Ed. P. 15..

If the National Environmental Policy protects life in all its forms, and it is not only man who has life, then everyone who has it is protected and protected by environmental law, and it is certain that a good, even if it is not alive, can be environmental, insofar as it can be essential to the healthy quality of life of man. since in an organized society he is the addressee of any and all norms.

Understanding the environment in an anthropocentric way, placing man and his dignity as the center of environmental protection, we come to the conclusion that the ecological and collective dimension of human dignity emerges in the context of the preservation of life, of the healthy quality of life of man.

From Pico Della Mirandola, in his work "The Dignity of Man", to Kant, in "Groundwork of the Metaphysics of Morals", the dignity of the human person is a concept subject to constant transformation due to the succession of historical events and social, economic and political changes. Nowadays, ecological values and environmental protection have become inseparable from the principle of human dignity. A minimum level of environmental quality is fundamental for the existence of human life with dignity, and for our species to develop its full potential in a situation of social and existential well-being³

Sarlet (2009)⁴ mentions the collective dimension as one of the dimensions of human dignity. Says the author:

Even if it is possible – in line with the previous developments – to maintain that the dignity of the person is, in some way, linked (also) to the human condition of each individual, there is no way to disregard the necessary communitarian (or social) dimension of this same dignity of each person and of all persons, precisely because they are recognized as equal in dignity and rights (in the enlightened formula of the Universal Declaration of 1948) and because of the fact that in this condition they live together in a different way. community. Moreover, as already announced, the ontological (although not necessarily biological) dimension of dignity itself assumes its full meaning in the context of the intersubjectivity that marks all human relationships and, therefore, also the recognition of the values (as well as fundamental principles) socially consecrated by and for the community of human persons.

In this context, taking into account the constitutional mission of the Public Prosecutor's Office, guardian of social interests, it is not difficult to reach the conclusion that civil protection and defense actions, recommended in the National Policy for Civil Protection and Defense, according to Laws No. 12,608/2012 and 14,750/2023 BRAZIL (2012 and 2023), are part of the set of protection of fundamental rights and, which, as a consequence, interact with ministerial action. It is explained:

Civil protection and defense is not defined in one body. In fact, civil protection and defense is a set of preventive, relief, assistance, and reconstructive actions aimed at avoiding or minimizing the

³ DE SÁ, Octávio Augusto Machado. Dignidade humana em sua dimensão ecológica. Disponível em: <file:///C:/Users/Membro%20Home/Downloads/unisantos_seer,+CAP8-135-154.pdf>. Accessed on: 02/14/2024.

⁴ SARLET, Ingo Wolfgang (org). Dimensões da Dignidade. Ensaios de Filosofia do Direito e Direito Constitucional. Livraria do Advogado. 2ª. Ed. P.23/24.

effects of socio-environmental disasters and those resulting from technological accidents, in addition to reestablishing social normality.

Law 12.608/12 defines civil protection and defense as:

A set of prevention, preparedness, response and recovery actions aimed at avoiding or reducing the risks of accidents or disasters, minimizing their socioeconomic and environmental impacts and restoring social normality, including the generation of knowledge about accidents or disasters; (Included by Law No. 14,750, of 2023).

To carry out these actions, the National Civil Defense Policy law structured a system (SINPDEC), whose central body is the National Secretariat of Civil Defense, an agency linked to the Ministry of National Integration, in addition to other bodies at the national, state and municipal levels, such as the State and Municipal Secretariats of Civil Defense; The Civil Protection and Defense Council; bodies that are part of sectoral policies, public and private entities and, last but not least, communities.

Law 12.608/12 provides:

Art. 11. The SINPDEC will be managed by the following bodies:

I - advisory body: CONPDEC;

II - central body, defined in an act of the Federal Executive Branch, with the purpose of coordinating the system;

III - regional, state and municipal civil protection and defense agencies; and

IV - sectoral bodies of the three (3) spheres of government.

Sole paragraph. Voluntary community organizations or other entities with significant role in local civil protection and defense actions may participate in SINPDEC.

Thus, even though the Public Prosecutor's Office is not expressly mentioned in Law 12.608/12 among the members of the SINPDEC, it is necessary to recognize that due to its constitutional mission and considering that civil protection and defense actions are aimed at guaranteeing fundamental rights, especially socio-environmental rights, it seems clear that the institution can act together with the Civil Protection and Defense agencies. in the promotion of fundamental rights and guarantees, especially those related to the prevention and mitigation of disaster risks.

As stated elsewhere, the Public Prosecutor's Office has the mission of guaranteeing fundamental rights such as life, safety, health, a balanced environment, among other unavailable collective and individual rights, which are included in civil protection and defense actions, therefore, the institution has a lot to contribute, whether in the judicial or extrajudicial sphere, to the issue of disasters and risk reduction.

It is understood that civil protection and defense is not an organ, but a system and a duty of all and all spheres. Thus, everyone has its function, its prerogatives and its attributions. Today, it is still understood that civil society has an important role in this process.

SOCIO-ENVIRONMENTAL DISASTERS

The Brazilian Classification and Codification of Disasters (Cobrade), described in Ordinance 260 of the Ministry of Regional Development, of February 2, 2022, is a list of what has been instituted as natural and technological disasters, subdividing them into groups and subgroups, with their typology and definition. For example: Group - Geological. Subgroup - Mass movement. Type - Sliding. Subtype - Landslide of soil and/or rock. Definition - They are rapid movements of soil or rock, presenting a well-defined rupture surface, of relatively short duration, of masses of soil generally well defined in terms of their volume, whose center of gravity moves down and out of the slope. Often, the first signs of these movements are the presence of fissures, according to DO NASCIMENTO (2022).

And how do you define disaster? Law 12,608/12, which establishes the national policy for civil protection and defense, with the recent changes addressed in Law 14,750/23, brought a legal concept of disaster. The law defines a disaster as:

Result of an adverse event, of natural origin or induced by human action, on vulnerable ecosystems and populations that causes significant human, material or environmental damage and economic and social losses; (Included by Law No. 14,750, of 2023).

Now, knowing that disaster, in the legal concept, is the result of the adverse event (threat) and vulnerability and that the natural threat cannot be avoided, it seems to us that the field of prevention and mitigation of disaster risks, as well as the search for the resilience of a city, through the strengthening of capacities and reduction of vulnerabilities, whether through structural or non-structural actions, it is a task that is incumbent not only on the Civil Defense Secretariat, but on society as a whole and, consequently, on the Public Prosecutor's Office, which defends social interests by constitutional determination, according to BECK (2022).

Normative Instruction MDR 36/20, according to BECK (2022), defines vulnerability as the socioeconomic or environmental exposure of a scenario subject to the threat of the impact of a natural, technological or anthropogenic adverse event and threat as a potential natural, technological or anthropic event, with a high possibility of causing human, material and environmental damage and public socioeconomic losses and Private.

More recently, Law No. 14,750/23 added to Law No. 12,608/12 the legal concept of vulnerability, treating it as the physical, social, economic, or environmental fragility of a population or ecosystem in the face of an adverse event of natural origin or induced by human action included by Law No. 14,750/2023, according to BRASIL (2023).

It should be noted that the disaster will not necessarily be triggered in scenarios of social and economic vulnerability, but may happen even in scenarios where there is a total absence of social fragility. In any case, vulnerability must always be present, even if only under the environmental

aspect (geographical, geological, hydrological vulnerability, etc.). The mega disaster in the mountainous region in 2011 is an example of this. As a rule, both vulnerabilities (social and environmental) occur in the disaster, which is why the nomenclature that seems more appropriate to us is "socio-environmental disaster".

The disaster, therefore, is not an end in itself, but rather the result of the event (natural or technological threat) on a scenario of vulnerability, which represents a complete disorganization of the territory, compromising all the social functions of the city (art. 182, CF): that of inhabiting, that of circulating (mobility), of leisure, of work; it also compromises essential services; it overwhelms the health, environmental and housing systems; It destroys assets, dreams, families, lives. All these consequences of the disaster are within the scope of action of the Public Prosecutor's Office and Civil Protection and Defense.

If the premise is the guarantee of fundamental rights, especially life, one cannot think of action only in the post-disaster period. Prevention is an important principle of environmental law, since damage to the environment is usually difficult or impossible to repair and is also one of the phases of disaster risk management.

In this line of reasoning, it seems to us that if the threat or adverse event cannot be avoided (although the threat can be identified and monitored), it is necessary to reduce vulnerability, exposure to risk, increase communities' understanding of the dangers to which they are exposed, i.e., their perception of risks.

It is in the interest of both the Public Prosecutor's Office and the Civil Protection and Defense, especially the Civil Defense Secretariat, that the damage caused by future disasters has the least possible impact on the lives and property of the inhabitants, on the functions of the city, on the environment, on the economy, among other types of disorganization generated by the disaster. It also allows the reestablishment of normality in the shortest possible time.

However, the impacts of the disaster on people and the city can only be reduced when prevention and risk mitigation measures are systematically implemented; when vulnerabilities are reduced and local coping capacity is increased, so that despite the intensity of the phenomena, the number of dead and affected people is as low as possible.

Eduardo Marandola Jr. and Álvaro de Oliveira D'antona (2014), citing HOGAN (2010), in the work Coordinated by CARMO and VALENCIO (2014), called Human Security in the context of disasters, recall that:

Vulnerability has been presented as a promising concept in this sense, as it incorporates, in addition to the areas and populations at risk, also their capacities and strategies for coping with adverse situations, incorporating other elements in addition to the material conditions for understanding the situations of families and households at risk. More than that, vulnerability has been shown to be a heuristic concept to deepen the sense of security and protection in contemporary society, functioning as its reverse, thus allowing its confrontation

to mean the promotion of security and sustainability, in its virtuous sense (HOGAN et al., 2010).⁵

It is intriguing to observe in the post-disaster period a great mobilization for relief actions, for the reestablishment of essential services, planning of emergency works for reconstruction, so that the city can return to having its essential functions restored, in addition to guaranteeing assistance and health care for those affected.

But it is curious, to say the least, to note that the "Achilles heel", i.e., prevention, is constantly forgotten and in the same way the measures of mitigation and preparation for the disaster are forgotten, until a new event occurs. However, it is these actions that will reduce, over time, the violation of fundamental rights. It is the resignification of facing the disaster that will make it possible to place man, his life, his dignity and his patrimony at the center of concerns and actions.

To relegate these measures to the background is an incongruity, it is a constant mistake, since prevention is cheaper than reconstruction. It is estimated that for every one (1) dollar invested in disaster prevention and preparedness, three (3) dollars are saved in reconstruction. The UN, for example, already states that four dollars are saved in resilient structures, compared to reconstruction.⁶ The beginnings of Japanese legislation also contribute to this process. KOBIYAMA (2004) reports that it is possible to compare that for every R\$ 1.00 spent on prevention and mitigation, R\$ 50.00 is saved on response and reconstruction. (evaluate if it fits)

In global projections of climate change and increasingly frequent extreme events⁷, there is a need to think more about prevention and mitigation than about response and reconstruction. At the heart of the discussion of climate change, disasters have gained importance because they deal directly with the consequences for the affected countries. The worsening of the climate change situation, the acceleration of global warming, the recent extreme heat waves and the intensification of mass movement phenomena caused by heavy rains raise an alert not only for Brazil, but for the whole world. It is necessary to invest more in prevention and mitigation than in post-disaster actions.

However, we still see, through empirical means, the actions of prevention and mitigation. In general, planning has focused on response and reconstruction measures, as well as the financing of actions. It is a logic that needs to be reversed, not only for economic reasons, but above all because it is with prevention, preparation and mitigation, it is repeated, that a greater number of deaths and those affected by the disaster will be avoided.

⁶ Available at: < Resilient infrastructure is four times more cost-effective than rebuilding after disasters | UN News > Accessed on: February 12, 2024.

⁷ Available at: < Facts about the Climate Emergency | UNEP - UN Environment Programme >. Accessed: February 12, 2024.

In this field of action, we see infinite possibilities for actions that converge to the missions of the Civil Defense Secretariat and the Public Prosecutor's Office, which can save lives, such as: identifying the need to expand, prepare and strengthen the so-called NUDECs or NUPDECs; tangibility and efficiency of contingency plans with greater integration between spheres of government; establishing the reliability of the monitoring, warning and alarm system; escape routes and support points planned for users and with community participation; environmental education focused on disaster prevention; induction of public policies and financing of actions; identification of areas that cannot be occupied or urban sprawled in municipal risk reduction plans, compatible with the Master Plan, among others.

In all these actions, the Public Prosecutor's Office can be an agent of social transformation in partnership and articulation with the Civil Protection and Defense agencies, mutually strengthening each other, especially in Municipalities where Civil Defense is only remembered at the time of the disaster.

On the subject of financing risk prevention and mitigation actions, it is worth mentioning that the Action Manual entitled "Socio-environmental Disasters and Climate Change produced by the CNMP (2024)",⁸ pointed out a serious failure in the financing of preventive actions. As noted:

The National Fund for Public Calamities, Protection and Civil Defense (Funcap) has an accounting and financial nature and its purpose is to fund, in whole or in part, prevention actions in risk areas, as well as the recovery of areas affected by disasters that have the emergency situation or the state of public calamity recognized.

In this case, the law provides for the transfer (of a mandatory nature) of Funcap resources directly to the funds constituted by the States, Federal District and Municipalities, without the need to enter into an agreement or other legal instruments.

It is important to note that Funcap, originally instituted by Law No. 12,340/2010, was later and partially regulated by Law No. 12,983/2014. However, by repealing provisions of the previous law, the latter law added that "the transfer of Funcap resources must comply with the provisions of the regulation" (article 9, paragraph 3). This regulation was not published until the launch of this Manual, which has hindered the implementation of the National Fund from a practical and effective point of view.

Parallel to the necessary regulation mentioned, there is the fact that, even with a legal provision, it is not possible to count on the appropriations set forth in the Annual Budget Law (LOA) of the Union (budget already suffers from contingencies and is practically all committed to response actions, including additional credits) or to donations (due to the lack of a donation culture in Brazil). Thus, currently, the fund has no resources.

As if that were not enough, there is also weakness in the National Council for Civil Protection and Defense, since it is a merely advisory council, however, the healthy criticism we make is that the Council also needs to be deliberative, it must have decision-making power.

⁸ Available at: <final_Mudanas-Clinticas---MANUAL-v3.pdf (cnmp.mp.br)> Accessed on: February 12, 2024.

See Decree No. 10,593, of December 24, 2020, in its Art. 14. CONPDEC is a collegiate body of a consultative nature, part of the structure of the Ministry of Integration and Regional Development, according to BRASIL (2020).

It is reaffirmed that the logic of financing civil protection and defense actions to reduce disaster risks should be inverted to encompass mainly prevention measures, according to DUTRA, A.C.D.; M.; KEMPERS, G. C. V. (2022). If there is no funding for preventive and mitigating actions, how can we reduce risk? Now, each and every action has a cost, which is why civil protection and defense agencies need secure budgetary sources to face the fulfillment of all stages of risk management.

Just to give an example, there are serious structural problems in cities, in general, such as disorderly occupation in areas susceptible to disaster, which need investments. It is unlikely that an inland municipality will be able to obtain enough budget to finance mitigation actions, especially when the subject is disorderly occupation in multiple areas, as urban mitigation and relocation measures are, as a rule, costly.

Even city planning and ordering actions, in order to prevent new occupations in risk areas (prevention), depend on costly studies and important plans to integrate the revisions of master plans, as an instrument for prohibiting new occupations in inappropriate areas, combined with intelligent supervision to curb disrespect.

In this area, that of financing, there is also the possibility of integrating the Civil Defense Secretariats with the Public Prosecutor's Office, especially for the creation of laws on municipal civil defense funds, in order to enable the transfer of resources on a regular basis and, thus, the funding of programs and projects aimed at civil protection and defense actions.

Although the national fund is not regulated, the municipal fund law may provide for other sources of revenue, which will certainly help in mitigation and prevention measures, in addition to which the previously established fund will be able to receive a transfer from the national fund as soon as possible.

THE DENATURATION OF THE DISASTER

Often, in the phase that follows the damaging event, there is an attempt to blame nature, especially the hydrological cycle, because, in most cases, it is either the excess or the scarcity of water, the cause attributed to most natural disasters, according to DUTRA, A.C.D.; BLAUDT, L. M. ; KEMPERS, G. C. V. (2023)

But disaster is conceptualized as the result of adverse events, natural, technological, or of anthropic origin, on a vulnerable scenario exposed to threat, causing human, material, or

environmental damage and consequent economic losses, according to DUTRA, A.C.D.; M.; KEMPERS, G. C. V. (2023)

In this aspect, not only the reduction of social and environmental vulnerability must be considered to mitigate the impacts of the disaster on people's lives, but also the need for an assertive vision of municipal governments for adequate urban development, as the current population is already more urban than rural and is on a growth trend.

In this sense, TAVARES and FERREIRA (2020):

Considering the impacts of precipitation as solely natural phenomena is certainly a mistake, since the process of accelerated and (dis)organized urbanization ends up creating conditions that potentiate these impacts. As Monteiro (1991, p.9) puts it, "landslides would not be calamitous in our cities if part of their inhabitants were not induced to spontaneous, precarious forms of urbanization in dangerous places". In this sense, considering the urban site on which cities are built and receive climatic inclement weather is fundamental, because "the urban space is identified from the site, maintaining intimate relations with the immediate regional environment in which it is inserted, TAVARES AND FERREIRA (2020, p.20).

That said, for example, heavy rain cannot be considered solely as an efficient cause of disaster. It is one of the causes, but not the only one. What is meant is to blame nature, it is not an admissible discourse.

Thus, once the threats are identified and the vulnerabilities and exposure to risk are mitigated, combined with better urban planning, the adverse impacts of a disaster will be less aggressive. In other words, even if extreme weather events are more intense and frequent due to climate change, the human, material, and environmental damage, and the economic losses resulting from it will still be less significant.

However, as long as nature continues to be blamed, public policies, especially civil protection and defense, will not be a priority in succeeding governments.

RESULT OF THE INSTITUTIONAL INTERACTION BETWEEN THE PUBLIC PROSECUTOR'S OFFICE AND CIVIL PROTECTION AND DEFENSE AND OTHER BODIES

In addition to prevention and mitigation measures, we must also think about strengthening local capacities. Forming resilient communities, capable of returning to their equilibrium after suffering some type of disaster is a task that cannot be achieved only through measures taken by the Government, but through joint, integrated work between the Government and the community.

The United Nations (UN) defines resilient cities as those capable of "resisting, absorbing, adapting and recovering from the effects of a hazard in a timely and efficient manner, according to DUTRA, A.C.D.; M.; KEMPERS, G. C. V. (2022)



The MCR 2030 initiative emerged from the Third UN World Conference on Disaster Risk Reduction, held in Sendai, Japan (2015), with the aim of achieving, over the next 15 years, "a substantial reduction in disaster risks and in the loss of lives, livelihoods and health, as well as economic, physical, social assets, cultural and environmental frameworks of people, companies, communities and countries", and the SENDAI 2015/2030 framework was then established, according to SILVEIRA, L. T. C. et al. (2013).

The objective of the Sendai Framework, although focused on disaster risk prevention and reduction, ends up contributing to another global action plan, the 2030 agenda, in particular to the Sustainable Development Goals 11 (SDG11), which aims to "Develop inclusive, safe, resilient and sustainable cities and human settlements", through the involvement of local leaders and with the mobilization of support for developing countries through international cooperation for the provision of means of implementation according to their national priorities, in addition to the urban agenda, according to SILVEIRA, L. T. C. et al. (2013).

The Sendai Framework (2015) brings seven goals for the evaluation of global progress, which will only be achieved by strengthening local leadership and capacities and which aim to:

- 1) substantially reduce mortality by 2030;
- 2) substantially reduce the number of people affected worldwide by 2030;
- 3) reduce direct economic losses from disasters relative to global gross domestic product (GDP) by 2030;
- 4) substantially reduce disaster damage to basic infrastructure and the disruption of basic services such as health facilities and education, including by increasing their resilience by 2030

But it also aims to substantially increase:

- 5) substantially increase the number of countries with national and local disaster risk reduction strategies by 2020;
- 6) substantially intensify international cooperation with developing countries through adequate and sustainable support to complement their national actions for the implementation of this framework by 2030; and
- 7) substantially increase the availability of and access to early warning systems for various hazards and disaster risk information and assessments for the people by 2030.

In the search for resilience, there is a strong field for integrated action of Civil Protection and Defense and the Public Prosecutor's Office, between these and other institutions and communities, especially in view of the perspective of reducing the number of deaths and those affected by disasters and in the articulation of other sectoral policies involved (health, assistance, housing), through the strengthening of local capacities.

It should not be forgotten, moreover, that the Public Prosecutor's Office can act not only in civil inquiries and public civil actions, but also as an inducer of public policies, instituting administrative procedures and monitoring the implementation of these policies, and in this respect it can contribute greatly to the effectiveness of rights.

The issue of disaster is complex and multidisciplinary and the confrontation of this issue cannot be fragmented, and cohesion of ideas and actions is necessary. There is a need for constant integration, institutional and community arrangements in dealing with the issue, otherwise less progress will be made than one could.

A simple and successful example in terms of local social capacity is the strengthening of community leaders for civil protection and defense actions, through the creation and training of community civil defense centers (NUDECs or NUPDEC'S).

NUPDECs are evidence that not only governments need to understand risk scenarios, threats, vulnerabilities and exposure, but above all those who live in this scenario, as a way to increase social capacity for resilience.

A very successful example was the one used in Petrópolis, with the creation of the NUDEC of the Cuiabá Valley, where the active community strongly contributes to civil protection and defense actions, knowing the risks and articulating ways of self-protection. This NUDEC has been structuring and strengthening every year, since the disaster that occurred in the Mountain Region in 2011, according to BECK (2023).

But undoubtedly, the strengthening of local capacities can also come from institutional unity. As an example of articulation and new institutional arrangements, it is worth sharing an initiative of the State Institute of the Environment-RJ (INEA), in partnership with the Public Prosecutor's Office of Rio de Janeiro.

From the disaster that occurred in the Mountain Region in 2011, as a paradigm shift for risk management and disaster management in the country, to frank discussions between the Public Prosecutor's Office and the environmental authority on the need to mitigate flood impacts of the rivers in the Cuiabá Valley region, in view of the degradation of the slopes in the region, INEA developed a "pilot project", based on technical studies for the implementation of reforestation of degraded areas, especially Legal Reserve areas and permanent protection areas (APP), aiming to reduce sediment transport to the region's watercourses, according to BECK (2023).

The initiative is undoubtedly an innovation, insofar as reforestation projects have always been thought of in times of water scarcity, in view of the ecosystem services of forests, but it is a novelty to think of reforestation as a potential hydrological regulator in times of excess water.



Well, although led by INEA (environmental agency), the initiative is evidently also an action of civil protection and defense and the construction of a resilient city, because it reflects on the mitigation of disaster risk, through nature-based solutions.

This institutional arrangement involving INEA and the Public Prosecutor's Office was made possible by a public civil action, which did not end the issue, but opened doors for joint thinking of possible solutions to the problem of degraded slopes in a round river basin, therefore susceptible to flooding.

Along these lines, it is necessary to recognize that the strengthening of institutional capacities is not only important for coping with the disaster at the time of the event, especially for the execution of measures planned and validated in a contingency plan for the response, but above all for measures that precede the event, involving institutions and communities, in mitigation, prevention, preparedness and resilience.

CONCLUSIONS

In view of the complexity of the effects that disasters bring to human, social, environmental and urban relations, there is a need for constant integration of institutions so that not only the post-disaster is in the context of action planning, but above all, for prevention and mitigation measures, which must be considered the most important measures to be carried out to avoid disasters. reducing costs and saving lives.

The Public Prosecutor's Office, as the guardian of social interests and guarantor of fundamental collective rights, can and should collaborate with civil protection and defense actions in an early and prudent manner, in favor of guaranteeing rights, especially in a context of disasters and risk reduction, to the extent that the disaster affects several fundamental rights.

In this context, risk prevention and mitigation are measures that should be prioritized in civil protection and defense interventions, not only because of their cost-effectiveness, but also because of their efficiency in reducing the number of deaths and those affected, inverting the logic of financing actions, usually focused on response and reconstruction actions. The focus of investments should be on measures that result in the reduction of vulnerabilities and exposure, placing the human being and respect for his dignity at the center of any and all actions.

Disasters are the result of an extreme event on a vulnerable scenario, which disaggregates and compromises the social functions of the city, in addition to compromising human security, therefore, it is essential to debate the integration of other agents, in addition to the Civil Defense Secretariats, aiming to find solutions to this serious structural problem, in search of the ideal of reducing the number of deaths and those affected.



In this sense, the Public Prosecutor's Office, Civil Protection and Defense and the agents of the other sectoral policies involved (health, assistance and housing), as they have common objectives, must increasingly integrate themselves to understand the structural problem as a whole, without fragmentation, to identify vulnerabilities and possible solutions. It is also necessary to develop a culture of resilience and prevention, which include actions in schools and universities to guarantee the future of this process on a continuous basis, as well as a breeding ground for new contributions.

In addition, the Public Prosecutor's Office, more than an inspector of actions, can be a partner of Civil Protection and Defense in the implementation of public policies that aim to ensure the effective quality of life of the population.

Still about disasters, the nomenclature "natural disasters" was reflected, with a better understanding of the use of the term "socio-environmental disasters". To the extent that, although disasters are classified as natural or technological, the terminology "natural disasters" does not necessarily reflect the phenomenon, insofar as other aspects such as the process of urbanization and human occupation (artificial environment) contribute significantly to the number of deaths and affected and, consequently, to the expressiveness of the damages and losses borne by the individual, for the community of people, for the environment and for the city. Therefore, the terminology "socio-environmental disasters" is more appropriate.


It is concluded that increasing resilience involves, in the first place, the strengthening of social and community capacities. Those suffering the effects of the disaster must be at the center of discussions and involved in decision-making.

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Woman, women, all of us: Plural feminism

 <https://doi.org/10.56238/sevened2024.010-015>

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ABSTRACT

This work aimed to bring the discussion about plural feminism to highlight the history and its developments over time, the different claims and how difficult it has been to promote transformations in societies. However, despite the difficulties, there have been many women in all times who have fought for rights. And finally, it brought some Brazilian women who continue to be tireless in this fight. There are many of us in this battle and our daily lives show how our strength is expressed.

Keywords: Women's Rights, Plural Feminism, All of us.



INTRODUCTION

A woman's place
it's wherever she wants.
Barbi; Averbuck; Messias

Plural feminism refers to different ideologies and demands, although in some cases there are complementary issues. I will make a brief exposition of some of these movements below, seeking to highlight some points of divergence and convergence between feminisms. It is worth making it clear, from the beginning, that the goal is to briefly bring some of them, as this theme is complex. I will also bring the historical contextualization of these movements.

When talking about Women's Rights, it is essential to know how we have been seen throughout Western history. For centuries and centuries we were forbidden to participate in public spaces and were not considered citizens. The reserved space was that of the house, the private space and the chores were restricted to housework and family care.

In Western antiquity, societies such as Greece and Egypt denied reading, writing, and any kind of formal education to all. In the Middle Ages we were still away from any political rights, freedom and social independence. The Middle Ages were marked by the Inquisition and the brutal persecution of its opponents, contestants and anyone who dared to be different from the social prescriptions, who did not fit the model prescribed by the Catholic Church. Those who dared to subvert the position reserved for them were regarded as witches, dangerous and, as a rule, sentenced to death and burned at the inquisitorial stake (Politize; Mattos Filho, undated).

In 1789, during the period of the French Revolution, the first rights were created of women. These were a consequence of the denunciations and claims that political activists such as Olympe de Gouges and Mary Wollstonecraft have made on the European continent. They criticized the exclusion suffered by many who lived without access to basic rights such as education, for example. Their struggle was for education and equal rights. Olympe de Gouges drafted the first Declaration of the Rights of Women Citizens in 1791. In 1793 she was sentenced to death by guillotine. The fight for these rights has grown all over the world. It was only a century after the French Revolution, in 1893 in New Zealand society, after a period of protests and campaigns, that they won the right to vote for the first time. As can be seen, these rights have been a huge challenge in terms of their materialization and recognition. It is important to point out here that while the wealthiest women fought for the right to paid work in the public sphere, the poorest always worked in exchange for wages, as this would be the only way to support themselves (Politize; Mattos Filho, undated).

In 1789 James Madison, the fourth U.S. president, drafted the Declaration of the Rights of Man and of the Citizen, and his wife Dolley Madison congratulated him on this action, while reminding him to be at fault with the ladies, for these rights should be extended to them as well. Even



he, who showed a more advanced consciousness for his time, found the request to draw up a Declaration of the Rights of Women and the Citizen to be absurd. As we have seen above, even in the France of the Revolution where the agendas were Liberty, Equality and Fraternity, the "revolutionaries" did not include women in these demands, demonstrating their conservatism (Politize; Mattos Filho, undated).

In 1945, with the creation of the UN – United Nations Organization – these rights were recognized, with the elaboration of the Universal Declaration of Human Rights, which aimed to defend the dignity of all people, without exception, based on the premise of equality. It was from this achievement that the recognition of the particularities and needs of vulnerable groups gained prominence, as in the case of the female gender (Politize; Mattos Filho, undated).

In 1975, at the First World Conference on Women, organized by the UN, the importance of creating instruments to guarantee these rights at the international level was discussed. As a consequence of this action, the Convention on the Elimination of All Forms of Discrimination against Women was created in 1979. The document aimed to promote the confrontation of gender inequalities and existing discriminatory practices, defining that: "Discrimination against women shall mean any distinction, exclusion or restriction based on sex". This was the pioneering document that broadly addressed the issue of gender in relation to the civil, political, economic, social and cultural rights of us women. This Convention is still the main international treaty on these rights. It was with this document that our sexual and reproductive rights were internationally recognized, as it sought to bring us autonomy over our own bodies and the right to freely express our sexual orientation. This achievement aims to contribute to our physical, mental and social health and well-being, thus allowing the free expression of our sexuality. This right also contributes to confronting sexual violence such as female genital mutilation, which, according to data from the WHO - World Health Organization, affects 200 million women worldwide, including adolescents and children. (Politize; Mattos Filho, undated).

In Brazil, the Federal Constitution represents a milestone and an advance in the legislation regarding our rights, as its text speaks of protection and access to health services, contraceptive methods, information and sex education and the possibility of freely expressing one's sexual orientation. These rights involve the issue of abortion, according to the Penal Code. Abortion is authorized when the life of the pregnant woman is at risk, in cases of rape, and when the fetus is anencephalic. CF/88 is the main document for the defense of these rights and deals with gender equality. It also prohibits discrimination against women in the labour market, speaks of access to goods and services as a guarantee of dignity. Unfortunately, CF/88 has not been materialized in government actions, nor in daily life that has high rates of domestic violence, femicide, misery, hunger, discrimination of all kinds, including in the labor market, low wages, remuneration below

those received by men, devaluation and vulnerability. In spaces of power such as the National Congress, women account for 15% of the presence, despite the 1997 law establishing that political parties must fill their candidacies with 30% of women.

Among the victims of femicide, every day in the country, the Atlas of Violence (2021) shows that 68% of those who are murdered are black. We currently have the Maria da Penha Law that aims to combat this type of violence in the country. Yet we continue to die for this crime. The Law, as a set of norms and rules to discipline conduct, needs to be more agile and open to the difficulties and demands of the various movements in favor of women's rights, because it will not be possible to consolidate democracy with racism, inequalities, violence, hierarchization of people and groups. The guarantee of rights is closely linked to behaviors, stereotypes, prejudices, discrimination based on social class, race, sexual orientation and that make many women access fewer rights than others. It is urgent to develop public policies aimed at the protection of all, observing their needs and diversity, in addition to together, in solidarity, proposing actions that can rethink and tension actions, behaviors, language, discourses in order to deconstruct these social relations formatted in patriarchal, oppressive, violent and dominating capitalism.

A brief summary of the feminist movements identified from the nineteenth and early twentieth centuries is described below. During this period, many organized themselves to win political rights. After the Second World War, they claimed the right to their own bodies, pleasure and against patriarchal ideology. In the 1990s, the demand was made aiming at the diversity of women, which materializes in different intersections, in which oppression is experienced with different intensities and forms. In recent times, what we have are collective demonstrations for the maintenance of conquered rights and the fight against violence and rape culture, as we are experiencing a rise of fascist ideas and positions (Pedro, 2018).

More recently, we have under construction the decolonial women's movement that deals with social transformation in a radical way and that aims, through solidarity and its internationalization, to critically analyze societies. Their quest is for social justice, emancipation, and freedom. Among its assumptions is anti-racism, anti-imperialism and the struggle for the dismantling of patriarchal society and the regime of heterosexuality, seen as ideology. I will deal briefly with this movement later.

Plural feminism involves the diversity of movements that have been identified throughout human history. In the literature, there is the so-called Liberal or hegemonic Feminism, which conceived women as homogeneous, in addition to not having the participation of black and indigenous women. Their demands were for universal suffrage and it was mobilized in large part by protagonists from the wealthier class, white and educated, without making reference to so many others, from different social classes and with different urgencies. Therefore, there is currently a discussion about overcoming this feminism, as it does not encompass a significant number of women such as

indigenous, black, lesbian, and those living in colonized countries (Ribeiro, 2017).

Lélia Gonzalez recognized the importance for Decolonial Black Feminism to have theory and practice as instruments to combat inequalities and confront the capitalist order and patriarchy, placing itself in search of new ways of being a woman. However, she argued that criticisms of patriarchal capitalism, although necessary, are insufficient as a response to black and indigenous women in Latin America, as it would need to include another type of discrimination as serious as the others mentioned: "racial oppression" (Gonzalez, 2020; Ribeiro, 2017, p.17). Speaking of Lélia Gonzalez, Djamila Ribeiro (2017, p.17) says:

Gonzalez highlighted the different trajectories of resistance of these women and defended an Afro-Latin American feminism highlighting the legacy of struggle, the sharing of paths of confrontation with racism and sexism already traveled. Thus, more than sharing experiences and colonialism, these women share processes of resistance.

Lélia Gonzalez proposes the decolonization of knowledge, refuting any epistemological neutrality. It reflects that dominant language can be used as a strategy to maintain power, as it disqualifies other modes of language, typical of people who have not accessed quality educational opportunities within a fair system. Depending on how language is used, it can represent an obstacle to understanding and create spaces of power, in addition to preventing the construction of a transgressive education. What we have here is the valorization of the knowledge of the original peoples and of all the peoples who were subjected to colonization (Ribeiro, 2017).

LGBT Feminism seeks to include itself in some heterosexual standards, because even though they come out as lesbians, gays and trans, they seek compulsory marriage, the adoption of children and the recognition of the State in the face of their identities and way of life. They do not question heterosexuality as a regime of power and ideology.

For Ochy Curiel (*apud* TEIXEIRA, 2017, p.112), Decolonial Lesbian Feminism aims to end all the inhumane oppressions that are done to many people. Heterosexuality is not only the coexistence of couples of different sexes, "but as a form of appropriation of women's lives, of bodies, including the appropriation of work." In her work "La Nación Heterossexual" the proposal is not only for feminists, but for social movements, because the idea is that they understand how the regime of heterosexuality works and its power, so that the fight against it can be "of co-responsibility of all those who propose a social transformation".

Curiel (*apud* Teixeira, 2017, p.112) speaks of the heterosexual regime as "the complexity of social, economic, political, subjective, interpersonal relations. I believe when it is said that the regime of heterosexuality generates a binary." Curiel continues (*apud* Teixeira, 2017, p.113):

[...] It's not just about how society separates men and women and makes them homogeneous. That is to say, what kind of social relation there is in this regime, which is fundamentally appropriation. And this appropriation is of some specific bodies – more especially, in this



case, of our own, who were constructed as women, remembering that some of us, lesbians, also reproduce this in our relationships. This appropriation is within and acts in the legal and economic dimension. This was something I was interested in visualizing: the potential of this category and this proposal to understand how we have reproduced racism. Racism is structural, localized, contextualized, as is the functioning of the heterosexuality regime. (...) And for me, I think that one of the things that feminism lacks, at a general level, is to understand this structural dimension of this regime.

Curiel (*apud* Teixeira, 2017, p.116) questions:

Who produced the black woman? We would have to ask ourselves, in a political proposal for transformation. Who produces the woman? Who produces the poor? Fundamentally, they are the regimes of oppression. Intersectionality does not cope, does not arrive at these analyses, and places the differences as almost innate, already given.

It is important to highlight that there are authors who, although they agree that intersectionality is not enough to arrive at critical analyses, say that this is an important and useful concept for understanding the complexity of this issue.

Decolonial Feminism fights for social transformation, for the elimination of a matrix that has the power to judge which knowledge is valid or not; which bodies are human or not. This is a struggle for social justice, emancipation, and freedom. It is a feminism that has come to serve 99% of the population. Petrone brings in the preface of the work "Feminism for the 99%: A Manifesto", authored by Cinzia Arruzza, Tithi Bhattacharya and Nancy Fraser published in 2019, eleven theses that support this struggle. Let's see what are the theses pointed out by Petrone (2019):

1) A new feminist wave is reinventing the strike; 2) Liberal feminism is bankrupt. It's time to get over it; 3) We need an anti-capitalist feminism – a feminism for the 99%; 4) We are experiencing a crisis of society as a whole – and its original cause is capitalism; 5) Gender oppression in capitalist societies is rooted in the subordination of social reproduction to production aimed at profit. We want to subvert things in the right direction; 6) Gender-based violence takes many forms, always enmeshed in capitalist social relations. We promise to fight them all; 7) Capitalism tries to regulate sexuality. We want to set her free; 8) Capitalism was born out of racist and colonial violence. Feminism for the 99% is anti-racist and anti-imperial; 9) Fighting to reverse the destruction of the Earth by capital, feminism for the 99% is ecosocialist; 10) Capitalism is incompatible with true democracy and peace. Our answer is feminist internationalism; 11) Feminism for the 99% calls on all social movements to unite in a common anti-capitalist insurgency.

In the work "Women's Memory: women in history; history of women" by Assis and Santos (2016) we find reference to so many women who were protagonists of history and who show us an important feminine heritage that we have to take care of and preserve. They were and are in various areas such as painting, sculpture, poets, writers of short stories, novels, dramaturgy, science, teaching, politics, music, etc. and who rebelled and fought for a common collective cause: female emancipation,



freedom, equal rights. Below we have brought some of them:

- Tarsila do Amaral stood out in painting with a modernist style and because she believed that her art had something to say, she went to seek her destiny with an unusual freedom. His name reverberates beyond the borders of his country (ABREU, 2016, p.72).
- Djanira Motta e Silva artist who worked with painting, handicrafts, drawing, illustration and Brazilian scenography. And in the words of Mario Pedrosa "Djanira is the earth, which as *a mother*, gives and steals lives, but, above all, raises human beings to dreams" (GOMES, 2016, p.).
- Margarida Maria Alves was a reference in the organization of rural workers and carried a history of resistance to the world order. He is the protagonist who inspires the March of the Daisies, a movement that fights for the dream of a better life, claiming rights and denouncing the neoliberal project that has long left a trail of hunger, poverty, sexist violence and barbarism. She was murdered for confronting the forces of the dominant power with her actions (Aguiar, 2016).
- Nise da Silveira, who graduated in medicine, was the only woman in her class in the 1920s. He produced original reflections for the study of psychology and psychiatrists, linking art to the need for expression of human beings trapped in schizophrenia. It has become a reference in mental health and psychiatry studies in Brazil.
- Leila Diniz, a kindergarten and kindergarten teacher, became an actress and divided her time between cinema, theatre and television. She became a symbol of Brazilian women's rebelliousness and yearning for freedom, breaking pre-established patterns of behavior and revolutionizing the traditional model of women in Brazil (Godinho, 2016, p. 20).

Throughout the text, she brought fragments of poetry by Brazilian writers of various origins in order to reaffirm the richness of feminine thought in our Brazil. With this, I hope to strengthen the bonds that unite us and to raise the recognition of the sensitivity, intelligence, knowledge and strength of women. We must never forget that our contribution to Brazilian society and other societies around the world was and is invaluable. Obviously, many, many personalities have not been mentioned here, and the reason is that there are so many that it is impossible to pay homage to them all in a single text.

THE BRAZILIAN WEALTH EXPRESSED BY WOMEN IN THINKING, FEELING, DEEDS AND MILITANCY

The woman who listens to her intuition, who perceives her dreams, who listens to the inner voice of the old women and warriors of her ancestry, and who has the suspicious look of the suspicious, is indeed a threat to the natural predator of history and culture.
Eliane Potiguara



Eliane Potiguara, as the first indigenous writer in Brazil, received in December 2021 the title "Honoris Causa" from the Federal University of Rio de Janeiro. She is the Universal Ambassador for Peace in Geneva, Switzerland. She is a teacher, writer, poet, activist, social entrepreneur. Graduated in Letters from UFRJ - Federal University of Rio de Janeiro - and extension in Education and Environment from the Federal University of Ouro Preto -UFOP -.She is a storyteller. She has participated in several seminars on Indigenous Rights at the UN, government organizations and national and international NGOs. Eliane Potiguara was named one of the "Ten Women of the Year 1988" by the Women's Council of Brazil, for having created the first indigenous women's organization in Brazil: GRUMIN (Women's Group-Indigenous Education), and for having worked for the education and integration of indigenous women in the social, political and economic process in the country and worked on the drafting of the Brazilian Constitution. He has published seven books and had texts published on several *national and international websites*, anthologies and *e-books*. Awarded by the Pen Club of England and the Free Expression Fund (USA). Author of "Half Face, Half Mask" (Potiguara, undated).

Eliane Potiguara in this work talks about how the bodies of indigenous women were seen by the colonizer. It emphasizes that to talk about indigenous women's bodies is to deal with the history of Brazil, women's bodies in Brazil, miscegenation and the violence inflicted on them to this day. Their work is extremely relevant to bring the indigenous tradition to visibility and show the importance of their way of living, thinking and feeling that they can transform societies into a place of peaceful coexistence in which happiness can be built in proportion to the reconnection of the human being to the woods and forests. to the environment and to all kinds of life.

The epigraph draws our attention because it reveals the close connection with the ancestors, the ancestral knowledge of sensitivity and intuition, of self-knowledge that cannot be neglected, because we run the risk of being slaughtered when we lose the "suspicious look of the suspicious" so dear to the preservation of our existence and that of others.

We see women as the beginning of everything, you can't come into the world if it's not through a woman's womb. This relationship with the land is directly related. Our veins in the body can be compared, in nature, to the roots, which is where trees take hold. If we look at each part of our body, there is something similar to nature. This way of engaging with nature, (...), is much more than a relationship of objects. When dealing with an animal we are not dealing with an object, when dealing with another person we are not dealing with an object, we are dealing with sacred things.

Raquel Kubeo

Raquel Kubeo tells us about the 520 years of resistance and struggle of indigenous women for decolonization. Women make up half of the indigenous population and suffer the violence that all other women go through. In a report released by the UN about a decade ago, indigenous women are more likely to be raped than others and, as a rule, the aggressor is not a family member or someone



close to them. This violence is marked by prejudice, harassment and invisibility of these people and women who fight tirelessly for the legalization of their lands, a right that is constitutionally guaranteed, and recurrently violated with the consent of the State and the interests of politically and economically powerful groups (Marko; Reinholz, 2020)tag.

Raquel Kubeo, a student at the Federal University of Rio Grande do Sul (UFRS), is a descendant of the Tukanos and Kubeo ethnic groups, of maternal lineage, and was born in Amazonas. Graduated in Pedagogy, she currently holds a master's degree in Inclusive Education at UFRGS. The quota system favored access to university, since many indigenous women, due to precarious work similar to slavery, are unable to study. He talks about the difficulty until recently for an indigenous child to have the ethnic denomination in his name, as is his culture, because the laws of civil society do not accept the indigenous name. The indigenous struggle is added to the struggles for education, health, human rights, materialization of rights conquered in the law, preservation of the environment, food without poison, among others that are collective agendas and that encompass the interest of civil society, of the national population. Raquel also talks about the intense work of indigenous women at the university, such as Alice Martins, from the Guarani ethnic group, and Iracema Nascimento (Marko; Reinholz, 2020)tag.

When dealing with the machismo observed and experienced in villages, Raquel Kubeo says that it is a consequence of the patriarchy inherited from white Western culture. On the occasion of the contact between the white European and the indigenous cultures, diplomatic and leadership issues were discussed only with men from the village. They teach children that men are superior, they will be the leaders, and women are inferior. However, she says that within the indigenous territories the role of women in the resistance is much stronger, because even with all the suffering and genocide they manage to maintain this tradition. Indigenous Women's Day is September 5th. March 8 is another day of struggle and resistance to make visible the importance and value of women, as well as to fight for their dignity (Marko; Reinholz, 2020)tag.

By abdicating the idea that he is part of nature, urban man has lost the ability to read its signs. That is why almost all of his attempts to tame it end in destruction. The earth is the spirit and body of the indigenous; We feel what she feels. [...]. And the planet is feverish, beginning to convulse.

Sonia Guajajara

Sonia Guajajara is from the Northeast and indigenous and composed, as vice-president, the ticket that ran for the Presidency of the Republic with Guilherme Boulos in 2018. She was the first indigenous deputy elected by São Paulo. Today in the third, 2023 to 2027, term of President Luiz Inácio Lula da Silva, she assumed the portfolio of the Ministry of Indigenous Peoples, being the first indigenous person to occupy a ministry. He is at the head of the Executive Coordination of the Articulation of Indigenous Peoples of Brazil – APIB – and is one of the largest environmental leaders



in the country, unifying more than 305 peoples around agendas that combat the interests of the most powerful sectors of Brazilian society. He is of the Guajajara/Tentehar ethnic group, and inhabits the Arariboia Indigenous Land, in Maranhão. Graduated in Letters and Nursing, she has a postgraduate degree in Special Education. He has been an indigenous militant since his youth and has been fighting for causes related to the environment. It is resistance against projects that take away indigenous rights and threaten the environment.

In 2010, Sonia Guajajara presented the Golden Chainsaw award to the then Minister of Agriculture Kátia Abreu in protest against the changes to the Forest Code, as she has a voice in the UN Human Rights Council, and received many awards and honors given by former President Dilma Rousseff (PSOL, 2018).

In 2019, Sônia Guajajara published a text in which she addresses the urgency of discussing and taking action in relation to the climate issue, caused by the irresponsible action of human beings and their capitalist logic of production and social organization. He highlights the gloomy diagnoses of science and states that "they are not definitive and that there is still time, but we know that the urban man, one of the main agents of the disease, will not be able to cure it alone". And it says:

We, indigenous Brazilians, want to help.
We fight not only for the fulfillment of the 1988 Constitution, but also for a healthy planet.
We are aware that it would do little good to guarantee our right to land if the rest of the world were devastated.
We want to take care of the forest for everyone, because we know how important it is to the health of the planet – and we have the knowledge to do so. In addition to humanitarian issues and justice itself, what happens to the Wajãpi or any other indigenous people concerns everyone.
The indigenous women's movement has grown a lot in this decade. For the first time we had an indigenous woman on a presidential ticket, we have an indigenous woman in the National Congress, Deputy Joênia Wapichana, and a woman, Nara Baré, is at the head of the Coordination of Indigenous Organizations of the Amazon (COIAB).
We realize that our struggle cannot be restricted to Brazil. At the last Free Land Camp, held in April, we decided that in August we would hold a meeting of women's leaders and activists, the Indigenous Women's March. The theme chosen for the event was "Territory: our body, our spirit", as one of the central issues will be the care of mother earth.
The planet is going through an unprecedented crisis and it is no wonder that women are rising up all over the world: we are the ones who suffer the most not only from the effects of wars, hunger, disease and intolerance, but also from climate change. Munduruku mythology speaks of a time when women ruled. We don't want to be in charge, we want to be heard (Guajajara, 2019).

Márcia Wayna Kambeba belongs to the Omágua/Kambeba ethnic group, born in the Ticuna village, in Belém do Solimões, Amazonas. Under the influence of her grandmother, who was a teacher and poet, at the age of fourteen Marcia began to write her first verses.

She is a poet and geographer graduated from UEA – State University of Amazonas -, specialist in Environmental Education and then did a master's degree dealing with the culture of the Kambeba people from the sixteenth century to the present day at UFAM – Federal University of Amazonas. Today he lives in Pará and has an artistic career with poetry that talks about violence



against indigenous peoples, in addition to the conflicts generated by life in the city. He turned his master's thesis into poetry. The poem "Ser Indígena, Ser Omágua" was born from this work (Kambeba, 2021), which I bring below:

To be indigenous, to be omágua

I am a daughter of the jungle, my speech is Tupi.
I carry it in my chest,
the pains and joys of the Kambeba people
and in the soul, the strength to reaffirm our identity that has long been forgotten,
diluted in history.
But today I revive and rescue
the ancestral flame of our memory.
I am Kambeba and I do exist. In the touch of all
Drums
In the strength of all bows,
In the spilled blood that still colors
This land that is ours.
Marcia Kambeba

Marcia Kambeba rescues in her work:

... Women in many ways, as writers, singers, storytellers, leaders, sages and guardians of the forest. As for feminism, although she does not see it in indigenous culture, she believes that the feminine is very present: there is a scenario that allows women, spokespersons and representatives of the nation, to present themselves in various ways (Kambeba, 2021).

This collective consciousness and connection between everything and everyone is necessary and the only one capable of radically transforming the conditions of existence of millions of people around the world, as well as reversing the serious degradations to which the environment has suffered for centuries until today.

Women's Voices

My great-grandmother's voice echoed as a child
In the ship's holds wails echoed
of a lost childhood.

My grandmother's voice echoed obedience
to the whites – owners of everything.

My mother's voice echoed softly in revolt
In the back of other people's kitchens
Underneath the Brings
Dirty whites clothes
Down the dusty road
Towards the favela.

My voice still echoes bewildered verses with rhymes of blood
and hunger.

My daughter's voice collects all our voices
it collects within itself the mute and silent voices.

My daughter's voice
it collects in itself the speech and the act
The order – the today – the now.



In my daughter's voice the resonance will be heard
The echo of life – freedom.

Conceição Evaristo
Poems of Remembrance and Other Movements (2008).

Conceição Evaristo, born in Belo Horizonte, had her childhood and adolescence marked by misery, having lived during this period in the favela called Pindura Saia in the capital of Minas Gerais. She holds a bachelor's degree in Letters from UFRJ. In 1990 he had some poems included in the Cadernos Negros Collection, volume 13, where he disclosed his work of Afro-Brazilian production in the form of poetry and prose. She holds a Master's degree from PUC in Rio de Janeiro in 1996 and a PhD in Comparative Literature from UFF – Fluminense Federal University – in 2011. He had some texts translated into English and French and in 2018 he received the Literature Award from the Government of Minas Gerais (Brandino, undated).

She is an important reference author of contemporary Brazilian literature. She was awarded the Jabuti award in 2015 and 2019, respectively. She worked as a teacher in the public school system in Rio de Janeiro. He is a novelist, poet and short story writer. The raw material of her works deals with the experience of black women, bringing deep reflections on Brazilian racial inequality. Her works denounce racial and gender oppression and violations and seek to rescue the ancestry of the black race erased by the colonization and enslavement of black people (Brandino, undated).

Dizziness from hunger is worse than that from alcohol.
The dizziness of alcohol impels us to sing.
But that of hunger makes us tremble.
I realized that it's horrible to have only air inside your stomach.
Carolina María de Jesús

Carolina Maria de Jesus, one of the most prominent black Brazilian writers, was born in Sacramento, Minas Gerais. She was the daughter of an illiterate woman who worked as a laundress and the granddaughter of enslaved blacks. He had seven other siblings in his family. With the encouragement of one of her mother's clients, Carolina went to school, attending only two years. Even with the short time of school, he began to enjoy reading and writing.

In 1930 she moved to France where she worked in the fields and then as a maid. When she was 23 years old, her mother died and she decided to go to the capital of São Paulo, working as a cleaner and, later, as a maid. She went to live in the Canindé favela and had three children from different relationships. As a favela resident, at night she would pick up paper and when she found magazines, she would collect them and read them. He developed the habit of writing down what he lived on a daily basis. She began to dream of becoming a writer. And so, once he went to the newsroom of the Folha da Manhã newspaper with a poem dedicated to Getúlio Vargas. Then his



poem and his photograph are published in the newspaper. In 1958, Audálio Dantas, appointed by the *Folha da Noite* newspaper to do a story about the Canindé favela, visited Carolina's house and was enchanted by Carolina's story. In 1960 his first book *Quarto de Despejo: Diário de uma favelada* was published, edited by the journalist Audálio. Her book was very successful in allowing Carolina to leave the favela. Three more publications will follow at a later date. However, even with the success of her first book, the writer returns to her condition as a paper collector, returning to live in the favela. His stance and his works denounced the political neglect of people in vulnerable situations in Brazilian society (LITERAFRO, 2021).

My daily struggle is to be recognized as a subject,
impose my existence in a society
who insists on denying it.
Djamila Ribeiro

We fight for a society in which women can be
considered persons,
that they are not violated
because they are women.
Djamila Ribeiro

Djamila Taís Ribeiro dos Santos is a philosopher, social activist, teacher and writer and a militant voice of singular importance in contemporary Brazilian society. The feminist movement entered the philosopher's life at the age of 19, when she met the NGO Casa de Cultura da Mulher Negra, in Santos, where she worked for about four years. There she had contact with works by feminists and black women and began to study themes related to gender and race. She graduated in Philosophy from UNIFESP – Federal University of the State of São Paulo, in 2012, and became a Master in Political Philosophy at the same institution, in 2015, with an emphasis on feminist theory. In 2005, she interrupted a degree in Journalism. Her main activities are on the following topics: racial and gender relations and feminism (Abreu, 2019).

She is an online columnist for *Carta Capital*, *Blogueiras Negras* and *Revista Azmina* and has a strong presence in the digital environment, as she believes that it is important to appropriate the internet as a tool in the militancy of black women, since, according to Djamila, the "hegemonic media" usually makes them invisible (Abreu, 2019).

She was appointed Assistant Secretary of Human Rights and Citizenship of the city of São Paulo during the administration of Mayor Fernando Haddad. She prefaced the book "Women, Race and Class" by the black philosopher and feminist Ângela Davis, an unpublished work in Brazil translated and released in September 2015. Among the books she has written are "What is a place of speech?" in which she addresses the urgency of breaking the established silences, also bringing to the public's attention intellectual productions of black women throughout history. Another work of hers was entitled "Who's Afraid of Black Feminism?" (Abreu, 2019).



She courageously denounces racism, inequality and recurrent violence against blacks and women. His work "Small Anti-Racist Manual" deals with structural racism in this society and won the Jabuti Award. He analyzes the performance of the Judiciary and says that it reaffirms the bias of judging, because it has not achieved the necessary impartiality when it acts, as it condemns young black people without evidence, fulfilling an agenda of mass incarceration of the undesirables. It proposes that the training given to military police officers be rethought, since in order to work with civil society, these cannot coincide with military training. She is a great reference in decolonial black feminism.

Black

A beautiful woman is the one who goes to the fight!
Those who have their own opinion and are not scared.
When the thousandth person points to your hair and laughs
saying he's "standing."
And this poor woman's ignorance doesn't allow her to see...
Standing, armed.
Fuck it! So be it!
For me it's magnificence!
Because black hair isn't just tough,
It's resistance.

Mel Duarte
(excerpt from the poem "Melanin Girl")

Mel Duarte was born in São Paulo in 1988 and is a writer, *slammer*¹ and cultural producer. At the age of eight, he began his work in the literary world, participating in soirees in his city in 2006. She has a degree in Social Communication and has worked in the area before dedicating herself completely to the life of a writer. (LITERAFRO, undated).

In 2013, he published his first book, *Fragmentos Dispersos*. In 2016 she released the work "Negra Nua e Crua" which is recommended reading on the Literafro Portal. The Rio Poetry Slam won the International Poetry Championship, which is part of FLUP – Literary Festival of the Peripheries – declared Cultural Heritage of an immaterial nature in the state of Rio de Janeiro, which began in 2012. In 2017, she was invited to represent Luso-Afro-Brazilian literature – Festilab Taag in Luanda, Angola. Her book "Negra, Nua e Crua" was published in Spanish. Mel Duarte is one of the organizers of the São Paulo edition of the "Slam das Minas" aimed at the female gender. He was a member of the collective "Poetas Ambulantes", which distributes and recites poetry on public transport (LITERAFRO, undated).

Don't let yourself be destroyed...
Gathering new stones and constructing new poems.
Recreate your life, always, always.
Remove rocks and plant rose bushes and make sweets.

¹ Slammer - name given to those who participate in the "poetry slams", or, in Portuguese, poetry battles. "In the *slam*, you speak your poem and you get a score, then there's a vote that decides whether you won or not.

Resumes.

Make your petty life a poem. and you will live in the hearts of the young and in the memory of the generations to come.

This fountain is for the use of all thirsters.

Take your share. Come to these pages.

And do not hinder its use to those who are thirsty.

Cora Coralina

Cora Coralina (1889-1985) began writing poems and short stories when she was 14 years old and published them in 1908 in the journal of poems "A Rosa" created with some friends. Her short story "Tragedy of the Roça" was published in the "Historical and Geographical Yearbook of the State of Goiás", when she used the pseudonym Cora Coralina. In 1911 she went to live with her husband in Jaboticabal, in the interior of São Paulo. In 1922 she was invited to participate in the Modern Art Week, but was prevented by her husband. After his death in 1934, she became a confectioner to support her four children. However, he did not stop writing. In 1934, in São Paulo, she became a book seller. In 1936, living in Andradina, São Paulo, he wrote for the city's newspaper. In 1951 she ran for city councilor. In 1959, at the age of 70, he went to learn typing to prepare his poems and deliver them to publishers. In 1965 he managed to publish his first book "O Poema dos Becos de Goiás e Estórias Mais". In 1970 she took office in chair no. 5 of the Women's Academy of Letters and Arts of Goiás. In 1976 he released his second book "Meu Livro de Cordel". When he received praise from the poet Carlos Drummond de Andrade in 1980, the interest of the general public aroused his works. She was awarded the title of Doctor Honoris Causa by UFG – Federal University of Goiás (Frazão, undated).

His works are marked by the poetics of everyday life and the simplicity of small things (Fuks, undated).

Dilma Rousseff (1947), born in Belo Horizonte (MG), was interested in socialist ideals as a teenager and brought indignation about inequality and historical injustices that occur daily in the country. She fought intensely against the Military Dictatorship and was imprisoned and tortured. However, she always showed herself to be a strong woman of fiber and of great dignity and loyalty to her ethical principles. In 1977 he graduated in economics from the Federal University of Rio Grande do Sul. He entered politics in the state of Rio Grande do Sul, joining the PDT. She was Secretary of Finance of the Municipal Government of Porto Alegre between 1985 and 1988. In the early 1990s, he served as president of the Foundation for Economics and Statistics of Rio Grande do Sul.

In 1993 she became Secretary of Energy, Mines and Communications of Rio Grande do Sul, in the government of Alceu Colares. From 1999 to 2002, she was Secretary of Mines and Energy of the state government. In 2001, she joined the Workers' Party (PT), when it was chaired by Luís Inácio Lula da Silva and was one of the mentors of the government plan. She served as Minister of Mines and Energy in the PT presidential administration until 2005. (Frazão, undated). She is the first woman to hold the position of President of the Republic in 2010 and was re-elected in 2014. In 2016,



Brazil suffered another coup d'état, as conservative elites alleged that the president had committed irregularities. However, the political movements that resulted from this *impeachment* and the national depredation reveal to us in an intense and clear way that, once again, the country was victimized by external colonizing forces, which aim to appropriate national wealth, increasing the poverty of the Brazilian people. In addition, the mentality that prevails in the Brazilian National Congress is sexist, retrogressive, subservient to US interests, without any feeling of appreciation for the Brazilian people and for Brazil, as already denounced by sociologist Jessé de Souza in the work "The Elite of Delay: from slavery to Lava Jato (2017)".

My mother thought study was the finest thing in the world.
Right.
The finest thing in the world is feeling.
That night, her father was having an evening, and she said to me:
Poor guy, up to this hour in heavy duty!
He arranged bread and coffee, left a pot on the fire with hot water. He didn't talk to me about love, that word of luxury.
Adélia Prado

Adélia Prado (1935) was born in Divinópolis (MG) and graduated as a teacher in 1953. Subsequently, he graduated in Philosophy in 1973. His first poems were published in the *Jornal de Divinópolis* and *Belo Horizonte*. In 1975 he sent the originals of his new poems to the literary critic Affonso Romano de Sant'Anna, who gave them to Carlos Drummond de Andrade for his consideration. Delighted with the work, Drummond sent it to Imago Publishing. That same year, the book "Baggage" was published with his poems. In 1978 he won the Jabuti Award with the publication of "Coração Disparado". In 1979, she began to dedicate herself solely to her career as a writer, publishing in prose: "Solte os Cachorros" (1979) and "Cacos Para Um Vitral" in 1980. In the same year, he directed the amateur theatrical group "Cara e Coragem" in the staging of the play "O Auto da Compadecida" by Ariano Suassuna. In 1981, he directed the play "A Invasão", by Dias Gomes, and returned to poetry with "A Terra de Santa Cruz". Also in 1981, the first of a series of studies on the work of Adélia Prado was presented at the Department of Comparative Literature of Princeton University (Frazão, undated).

Between 1983 and 1988. Adélia held the position of Head of the Cultural Division of the Municipal Department of Education and Culture of Divinópolis. In 1985, Adélia participated, in Portugal, in a cultural exchange program between Brazilian and Portuguese authors. In 1988 he performed in New York at the Brazilian Poetry Week, promoted by the International Committee for Poetry. In 1993, Adélia returned to the Municipal Department of Education of Divinópolis. It premiered in SESC theaters in Belo Horizonte, São Paulo and Rio de Janeiro. The characteristics of his work are direct, stripped-down language that recreates the concerns and life of the interior of Minas Gerais. She was consecrated the most feminine voice in Brazilian poetry (Frazão, undated).



Chiquinha Gonzaga (1847-1935) was a composer, pianist and conductor. The daughter of a military man, her mother was mixed-race and her grandparents were enslaved. She had access to quality education and was fascinated by music since she was a child. He married twice, the first time he had three children and the second time he had a son. The marriages didn't work out, but he fulfilled his dream, which was to make a living from music. He traveled around Brazil, composed and gave piano lessons. The famous carnival march "Ô Abre Alas que eu quero passar" is of his authorship. Among his works are: White Moon; Quaint; Foam Flower; Sultana. His personality was that of a very decisive person who knew both what he wanted and what he didn't want. He still impresses today with the delicacy of his works and his originality.

Dream

Be what you want to be,
'Cause you only have one life
And there's only one chance
to do what you want. [...]
Clarice Lispector

Clarice Lispector (1925-1977) was born in Ukraine, became a naturalized Brazilian, graduated in Law, wrote novels, short stories and poems. Considered one of the biggest names in Brazilian literature. Of Jewish descent, he studied and spoke several languages such as Portuguese, French, Hebrew and Yiddish, and studied piano. With the death of his father in 1940, he began his career as a journalist. In the following years, she worked as a writer and reporter at Agência Nacional, Correio da Manhã and Diário da Noite. In 1943 she married a diplomat. He has lived in several countries. He has received several awards, including the Cultural Foundation of the Federal District Award and the Graça Aranha Award. Among his works we find: Near the Wild Heart (1942); The Chandelier (1946); The Besieged City (1949); Family Ties (1960); The Apple in the Dark (1961); The Foreign Legion (1964); The Passion According to G.H. (1964); The Mystery of the Thinking Rabbit (1967).

Many other personalities could have been mentioned, but as I pointed out at the beginning of this text, it would not be possible, because at all times women have left their marks and transformations with their daily actions making tensions, social struggles of different dimensions and of inestimable importance.

FINAL THOUGHTS

We are many and we are everywhere, some have projected themselves and gained visibility in the social arena, many others have contributed and continue to contribute to the dynamics of the world, acting tirelessly in daily life, in the invisibility of public life, but their actions, their presences offer other contours wherever they go. Throughout the history of humanity, women from all social classes have fought against the oppressions of their time, claimed rights, and died murdered for this




daring claim, but this legacy inspires us to this day to continue defending equitable, respectful, and supportive relationships so that it is possible to build a truly democratic world in which we can all be happy. We all bear the mark of resistance in our stories, inspired by the dream of freedom, equity, emancipation, solidarity, happiness and full fulfillment in our lives.

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OBMEP in numbers: A quantitative analysis of the awards of schools in Piauí

 <https://doi.org/10.56238/sevned2024.010-016>

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ABSTRACT

The problem-solving methodology is one of the most studied trends in mathematics education in recent years. Based on this, this article aims to analyze the contributions of this methodology in the teaching of Mathematics through a bibliographic study on the performance indices of students and schools in Piauí in the Brazilian Public School Mathematics Olympiad (OBMEP). The bibliographic references were found through an advanced search on the Oasis Platform, which had three descriptors (Mathematics Olympiads, OBMEP and performance analysis) and generated a result with thirteen journals, which provided the methodological and bibliographic basis for the development of this study. It is justified by its relevant contribution to the understanding of the impact of the Olympiad on the learning and performance of the target students. Concerning this, this study will prove that the Olympiad studied stimulates interest and improvement in the teaching of Mathematics, the discovery of talents and continuing education, and also expands academic and professional opportunities.

Keywords: Mathematical Olympiads, OBMEP, Performance analysis.

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INTRODUCTION

Mathematics is a science of fundamental importance for the process of human, scientific, technological and social development. In view of this, it is necessary to highlight its relevance for various social groups, since the development of Mathematics happens at the same time as the development of science and human history. It makes sense, therefore, that mathematics education researchers talk so much about trends in teaching this science. (SKOVSMOSE, 2001).

Among the most used trends, problem solving, which promotes meaningful learning and develops essential skills for life in society, through the development of complex problem-solving skills and decision-making based on quantitative information, is one of the approaches that have been gaining prominence as a trend in mathematics teaching.

Juan Ignacio Pozo is a Doctor of Psychology with extensive educational experience. In his books, *The Solution to Problems - Learn to Solve Problems*, *Solve Problems to Learn*, Pozo organized his ideas and those of several other authors as ideas and guidelines for introducing problem-solving methods into the school curriculum. According to the author:

"Problem-solving is based on the presentation of open and suggestive situations that require students to have an active attitude or an effort to seek their own answers, their own knowledge. Problem-based teaching presupposes promoting in students the mastery of procedures, as well as the use of available knowledge, to respond to variable and different situations." (Pozo, 1998)

The author further states that it is not enough to provide students with effective skills and strategies, they also need to develop the habit and attitude of seeing learning as a problem to which the answer must be found.

According to Polya (1945), problem-solving emphasizes the development of strategies to solve real, situational problems rather than the rote memorization of formulas and algorithms. This approach has been identified as a way to make the teaching of mathematics more relevant and interesting for students, as it allows for the practical application of the concepts learned. (VAN DE WALLE, 2013).

Additionally, research shows that problem-solving has a positive impact on students' math performance. Research by Jonassen and Strobel (2006) shows that students who learn mathematics through problem-solving score better on standardized tests and on critical thinking and problem-solving skills.

It is worth mentioning that it is necessary to arouse the interest of students before they are asked to get involved with Mathematics. In this sense, D'Ambrósio (1993, p.7) states that "(...) Mathematics is the only school subject taught in roughly the same way and with the same content for all children in the world." To enjoy learning Mathematics, learning must be meaningful and students



must take an active role and ownership of their own knowledge. A school event should be an experience where people can compare, explain, build hypotheses and debate.

Therefore, problem solving is one of the methods to promote the progress of the dynamic teaching of Mathematics. In the process of finding solutions to mathematical problems, ideas need to be organized in terms of representations of mathematical objects and the relationships between them. The objectives of mathematical problem solving include providing the student with the construction or reconstruction of concepts, as well as providing the student with the opportunity to develop different types of reasoning and strategies in solving the proposed problems, such as expanding their knowledge to make sense of mathematical concepts and properties. (JOSELITO ELIAS, 2017)

In this context, the Mathematical Olympiad has been standing out as a trend in the teaching of the discipline through problem-solving approaches. These competitions promote the development of skills that are important for academic and professional success, such as the ability to think logically, solve complex problems, and be creative. In addition, math olympiads are able to motivate and challenge students to explore mathematical concepts more deeply and autonomously.

Several studies point to the importance of mathematical olympiads in developing mathematical skills and improving student performance. For example, a study conducted by Ribeiro e Silva (2018) showed that students who participate in math olympiads perform better on math tests, compared to those who do not. In addition, participation in Mathematics Olympiads has also been associated with greater student interest in the subject, according to a study by Muniz and Araujo (2018).

However, it is important to emphasize that participation in mathematical Olympiads should not be seen as an end in itself, but rather as a way to stimulate problem-solving and conceptual understanding. As such, it is essential for schools and teachers to adopt teaching approaches that encourage problem-solving and critical thinking, as a way to prepare students for success in the Olympics and for life.

The Mathematical Olympiad to be studied in this article is the Brazilian Public School Mathematics Olympiad (OBMEP), which is a national program that aims to encourage the study of mathematics and identify talents in this area among public school students in Brazil. The OBMEP is held annually and consists of two phases: the first is held in schools and the second is held in application centers designated by the organization of the Olympiad.

Students who excel in the two phases of OBMEP can receive awards in recognition of their performance. Among the awards offered are gold, silver and bronze medals, as well as honorable mentions. The criteria for the award vary according to the student's grade level and their ranking in the competition.



According to data released by the OBMEP organization, throughout its editions, the Olympiad has awarded more than 51 thousand students with gold, silver and bronze medals, in addition to granting more than 439 thousand honorable mentions. The awards are an incentive for students to dedicate themselves to the study of mathematics and also for schools to encourage their students to participate in the competition.

The OBMEP award is an important recognition for students, as it can open doors to future academic and professional opportunities. In addition, the Olympiad also offers other opportunities for students, such as the Junior Scientific Initiation Program (PIC), which aims to stimulate students' interest in mathematics and science.

Based on the data presented, this article aims to develop, through a bibliographic study, a systematic review through the analysis of performance data of the municipalities of Piauí in the Brazilian Public School Mathematics Olympiad (OBMEP) and highlight those with the best results in the last ten editions of the referred Olympiad. Data analysis will be done through graphs that compare the state's performance in the last ten editions of the Olympics.

This systematic review aims to analyze existing research on the relationship between participation in OBMEP and student and school performance rates. Research published in national and international scientific journals on participation in OBMEP and its impact on school performance will be included in the review. In addition to manual searches of relevant journals, the Oasis, Scopus, and Web of Science databases will be used.

This systematic review is justified in its relevance to understanding the impact of OBMEP on student learning and performance in Brazilian public schools. It is hoped that the findings of this review will contribute to the discussion of the importance of OBMEP as a public policy to encourage mathematics education and may support political decisions for investment in the program.

METHODOLOGY

A literature search is a research methodology that involves searching, selecting, and critically analyzing existing literature on a particular research topic or problem. In this type of research, the researcher uses bibliographic sources to obtain relevant and current information on the topic in question. This methodology is fundamental in several stages of the scientific research process, from the literature review, theoretical basis, the identification of gaps, the foundation of knowledge to the contextualization of the study.

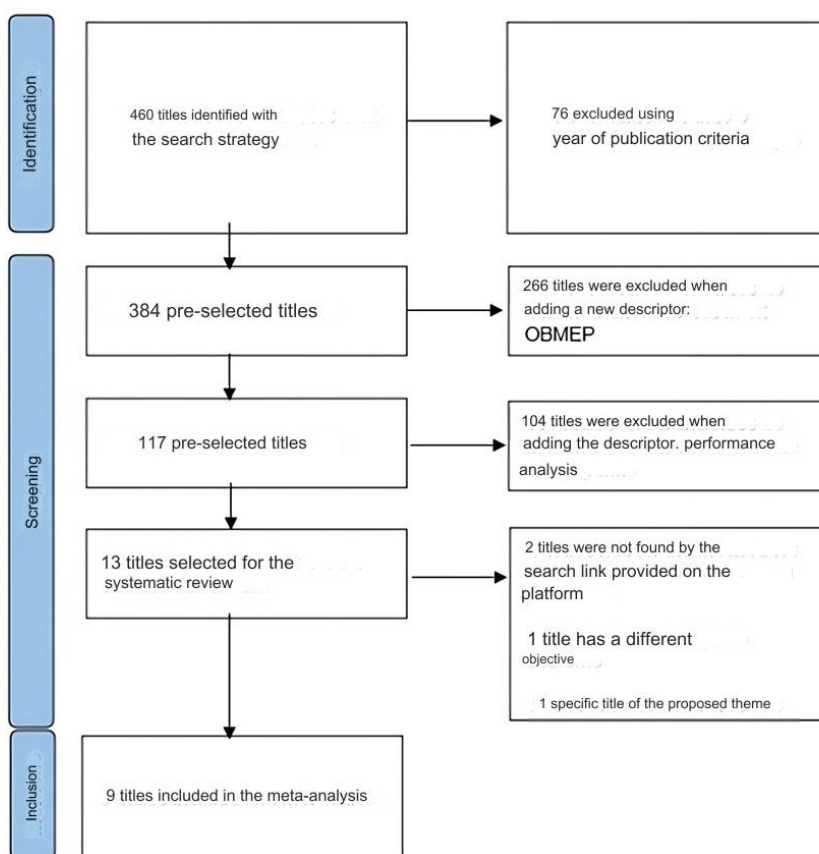
According to Severino (2007, p. 122), "bibliographic research is that which is carried out from the available record, resulting from previous research, in printed documents, such as books, articles, theses, etc." Based on this, this research is characterized as a qualitative and bibliographic approach of the systematic type.

A systematic literature search is a method of literature review that seeks to identify, solve, analyze and synthesize in a systematic and transparent way the available evidence on a given topic or research problem. This type of research follows a rigorous and transparent protocol, with pre-defined criteria for study selection, methodological quality assessment, and synthesis of results, and aims to gather and critically evaluate existing evidence, identify knowledge gaps, and support decision-making.

The present research began with an advanced search on the Oasis Platform. The search had the following descriptors: Mathematical Olympiads, OBMEP and Performance Analysis. When applying the first descriptor, 459 journals were initially found, but when the others were added, the results were reduced to 128 and 15, respectively.

For the development of this study, only journals published in Portuguese of the types article, dissertation and course completion work published between the years 2013 and 2023 will be taken into account. In enforcing these requirements, thirteen journals remained. The journals were read and, by means of inclusion and exclusion criteria, one journal evaded the proposed theme, another presented a different objective, and two titles were not found through the access link provided in the Oasis Platform.

Figure 1 – Flowchart of the selection of journals



Source: The authors.

The flowchart above details the steps of identification, screening, and inclusion of the journals generated through the advanced search. After analyzing the journals generated in the search, nine titles were selected to reference the present study.

In addition to the periodicals, this study will investigate data regarding the awards in the last 10 editions of the Brazilian Public School Mathematics Olympiad (OBMEP) in Piauí and the distribution of these in the federal, state and municipal education networks.

Such data were collected on the official website of OBMEP, then redistributed and organized in Excel spreadsheets and, from there, graphs were generated to facilitate the analysis and organization of the samples obtained.

ANALYSIS AND DISCUSSION OF RESULTS

PARTICIPATION OF PIAUÍ

The participation of Piauí in the editions of OBMEP (Brazilian Public School Mathematics Olympiad) has been remarkable over the years. OBMEP is a national mathematics competition held annually, whose objective is to stimulate the study of mathematics among students from public schools in Brazil, seeking to identify talents and promote the development of logical reasoning and mathematical thinking.

The state of Piauí has stood out both in the number of participating students and in the awards won. Year after year, there is a significant number of enrollees, demonstrating the interest and engagement of students from Piauí in the curricular component of Mathematics.

The performance of students from Piauí in OBMEP has been satisfactory, since throughout the editions of the Olympiad, the state has won a significant number of medals in the most diverse categories (gold, silver and bronze). These are a recognition of the excellent performance of the students and also of the efforts of the schools and teachers in preparing the students for the competition.

In addition to the medals, OBMEP also awards students with honorable mentions, which are a way of recognizing the performance of the students who stand out the most in the competition. Piauí obtained a significant number of honorable mentions, which reinforces the quality of Mathematics teaching in the state.

The participation of Piauí in OBMEP has contributed to arouse interest in mathematics and encourage research and studies in related areas. The Olympiad also contributes to the motivation for students to enter studies in mathematics and to pursue a career in the area, stimulating the creation of projects and programs aimed at teaching this science in the state and awakening talents in the area.

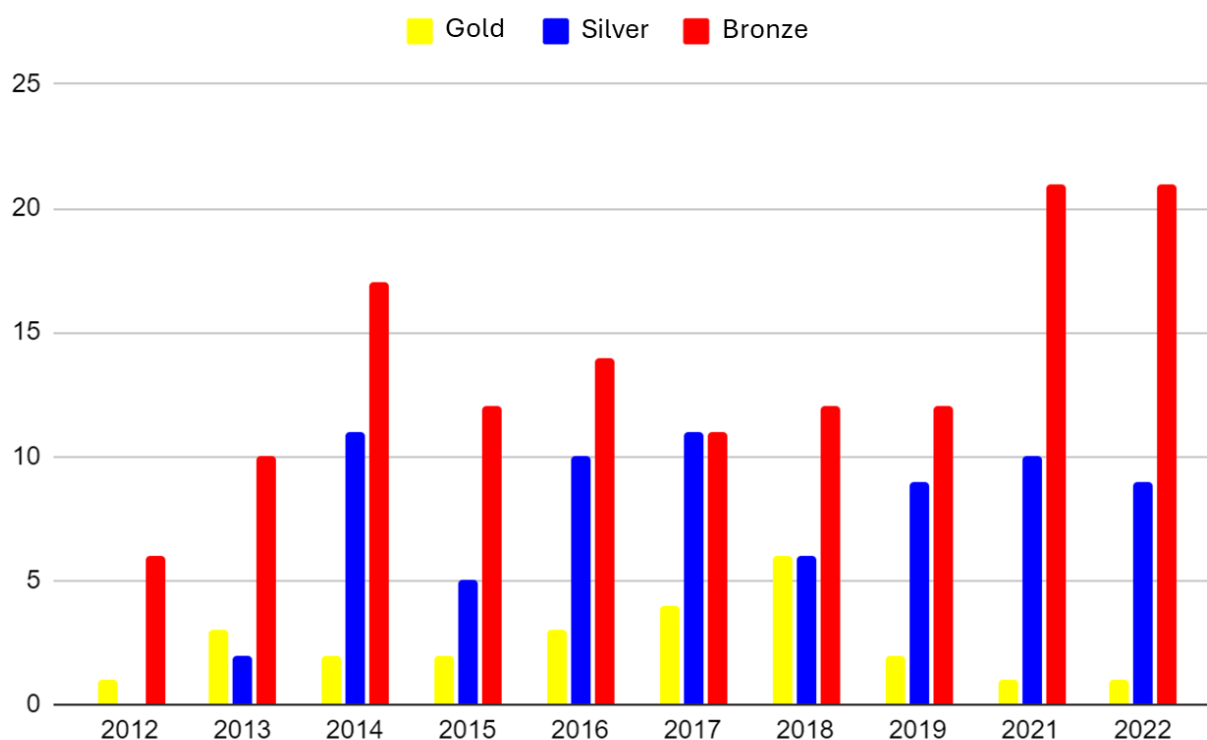
In summary, the participation of Piauí in the editions of OBMEP has been marked by a significant number of registered students, a good performance in the tests and in the achievement of

medals and honorable mentions. Such participation contributes to the stimulation of the study of mathematics, the strengthening of the teaching of the discipline and the formation of new talents in the state.

The education networks that participate in OBMEP include municipal public schools, that is, schools linked to municipal governments; state public schools, those linked to the state departments of education; federal public schools, those linked to the Union, such as Federal Institutes (IF's) and Technical Colleges (CT's), for example; and also, private schools, which participate in the competition with criteria and number of vacancies different from the others mentioned above.

The following graph shows the distribution of awards in each school system. It is noticeable that the distribution of these awards is mainly concentrated in the state education network, since it houses a large part of the high school students in the state of Piauí. The federal school system appears as the other school system that stands out in the awards, however, in terms of the number of awards, it always appears below the state network.

Figure 2 - List of Award-Winning Schools



Source: The authors.

DISTRIBUTION OF PRIZES

This analysis will be divided into two stages. The first consists of analyzing the distributions of gold, silver and bronze medals, while the second will focus on the distribution of honorable mentions of the OBMEP editions studied.

Gold, silver, and bronze medals

The following is a breakdown of the data obtained through research on the official website of the Public School Mathematics Olympiad (OBMEP). Sufficient data and information were collected for the transposition of these into a graph, where the average number of awards in each category and their distribution in the federal, state and municipal education networks will be exposed. The 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2021 and 2022 editions will be considered, since the exponential growth of the COVID-19 Pandemic prevented the holding of the Olympics in 2020.

The figure above shows the distribution of awards in the last 10 editions of OBMEP. The highlight is red, which represents the number of bronze medals distributed in each edition studied. It is noticeable that such awards are more frequent than the other categories, with the exception only in the 2017 edition, whose number equaled the silver medals.

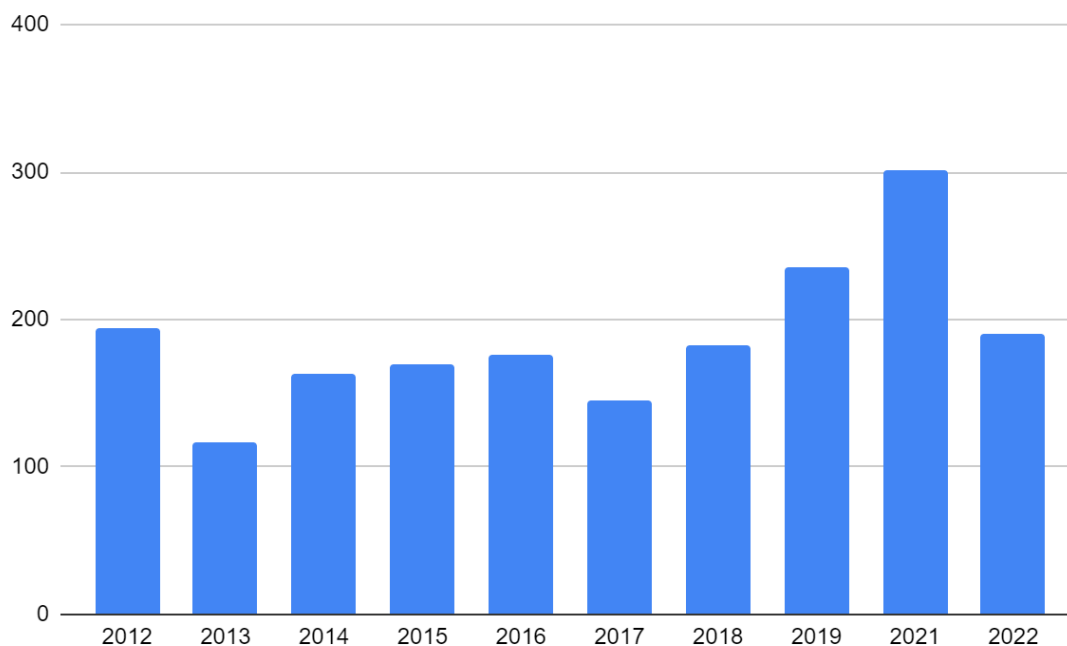
Analyzing the silver medals now, it can be seen that their distribution was carried out in practically all editions, except for the 2012 edition, the first edition considered in this study. From the 2013 to the 2014 edition, the great growth in the number of winners in the category is noticeable. From then on, in the following editions, there was a slight variation in relation to the quantities distributed. In the 2018 edition, the number of awards in this category equaled the gold ones.

Regarding the gold awards, the graph shows that this occurred in all editions studied, but in a much smaller amount than the other categories. In the 2013 edition, the gold awards exceeded the number of bronze awards, and in 2018 the two categories had the same number of students awarded.

Honorable mentions

The surveys on the official website of OBMEP also provide data regarding the distribution of honorable mentions in each of the editions considered in this study. These data were organized in tables and transposed into the following graph.

Figure 3 - Distribution of Honorable Mentions (2012 – 2022)



Source: The authors.

The state of Piauí, since the edition of OBMEP held in 2012, has obtained an excellent number of students awarded with honorable mentions. The number of students awarded in each edition is more than 100 and in most editions it shows growth in relation to the number of awards of the previous year, except in the 2013, 2017 and 2022 editions.

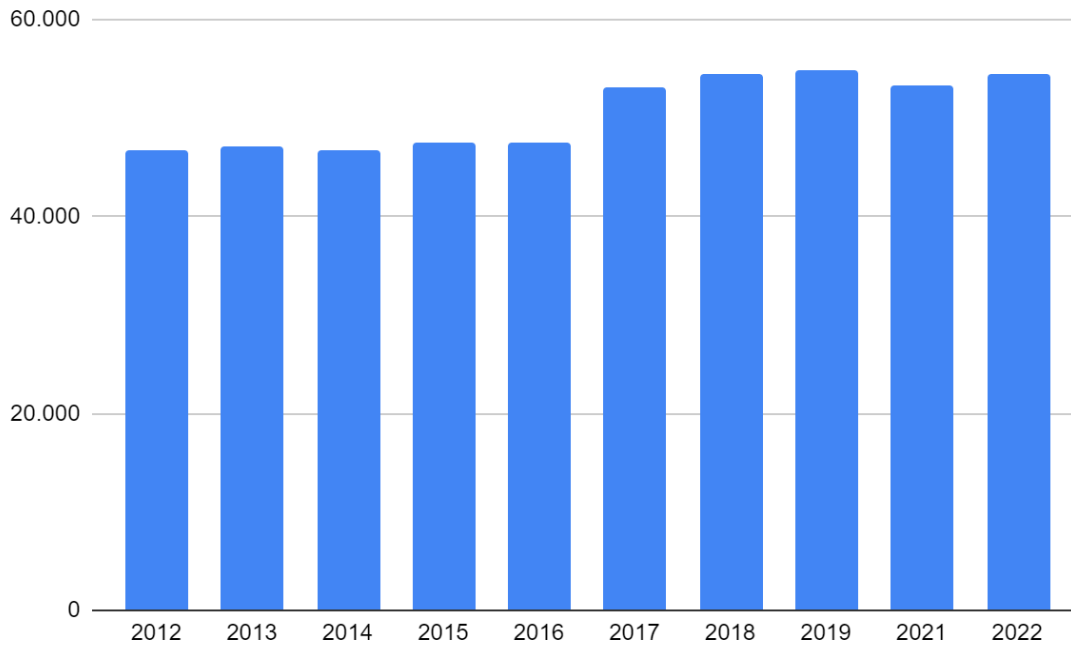
The highest number of awards recorded in this study is found in the 2021 edition of the Olympiad, with approximately 300 honorable mentions distributed among the participating students. The lowest record, in turn, was found in 2013, which had just over 100 awards in the category.

In the years 2017 to 2021, the state network stood out even more. Numerically, the number of awards continued to grow and higher than that of the federal school system.

PARTICIPATING SCHOOLS

In order to further deepen the data collected in this research, the following graph details the number of schools participating in each edition of the OBMEP considered in the present study.

Figure 4 – Total Participating Schools (2012 - 2022)



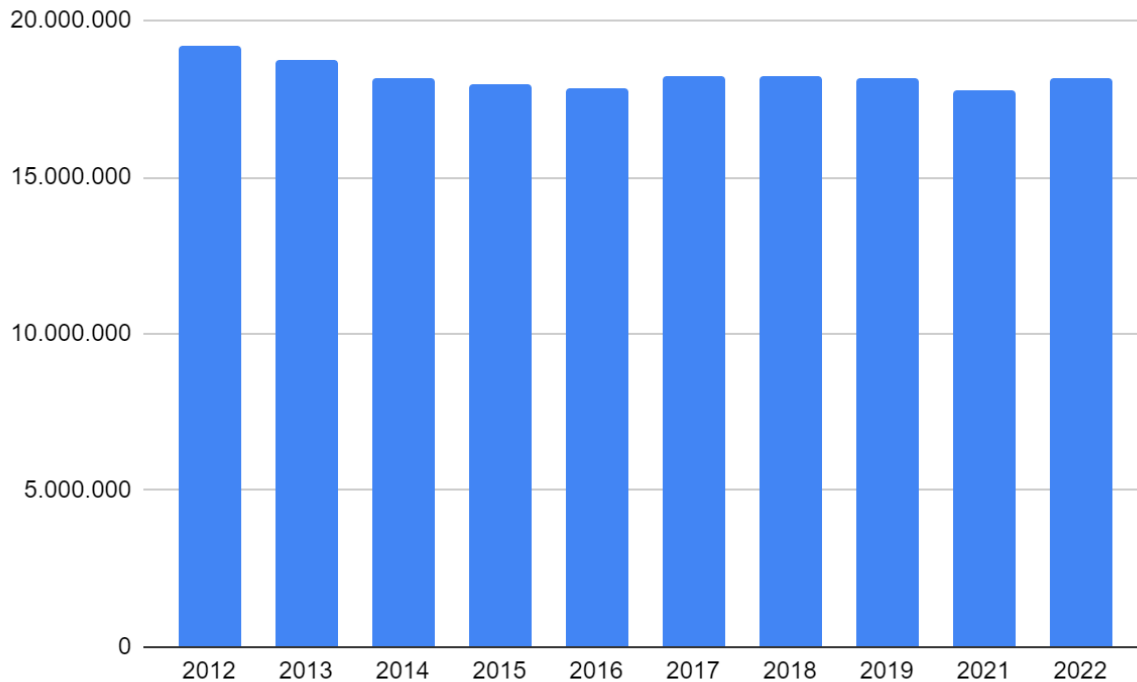
Source: The authors.

The figure above shows in detail the number of schools registered in the editions of the Brazilian Public School Mathematics Olympiad (OBMEP). It is noticeable that there was little variation in the number of participating schools between 2012 and 2016, the same happening between 2017 and 2019. In 2021, after the Covid-19 Pandemic, there was a significant decrease, but this decrease was repaired in the following edition.

The number of participating schools in Brazil is close to the range of 40,000 to 60,000 and varies between the editions studied. None of the variations are outside the range mentioned above. If this pattern continues in subsequent editions, it is likely that the number of participating schools will get closer and closer to 60,000.

When proceeding with such analyses, it is also necessary to verify the number of students participating in OBMEP. The following graph depicts the growth or decline of these during one of the 10 editions of the Olympiad seen in the present study.

Figure 5: Total number of students participating (2012 - 2022)



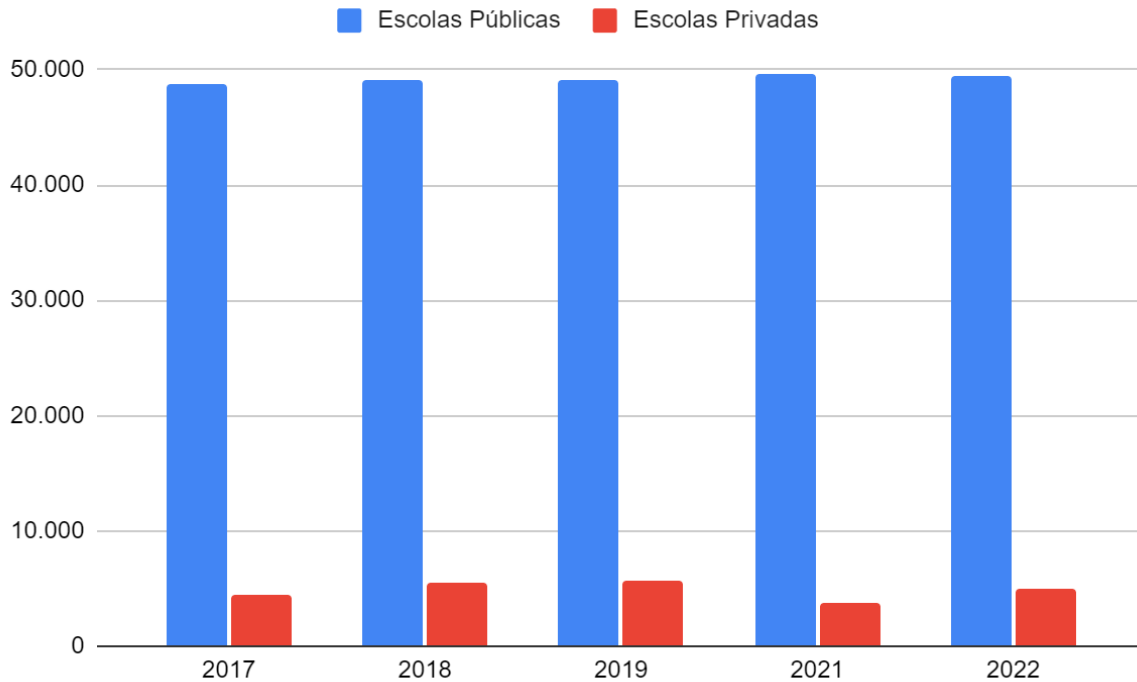
Source: The authors.

It can be seen through the analysis of the graph above that the quantities presented vary little between one edition and another. There are also some intervals in which this variation remained almost constant, with little growth or decrease. The edition that obtained the largest number of students was the one in 2012, which reached very close to 20,000,000.

The Brazilian Public School Mathematics Olympiad (OBMEP) is a mathematics competition aimed at elementary and high school students in Brazil. Participation in the Olympiad is open to both public and private schools, although most of the participants are students from the public school system.

The participation of private schools in the Olympiad was effective in 2017. The following graph compares the number of private and public schools participating in OBMEP. The 2017, 2018, 2019, 2021 and 2022 editions will be taken into account.

Figure 6: Comparison between the number of public and private schools (2017 - 2022)

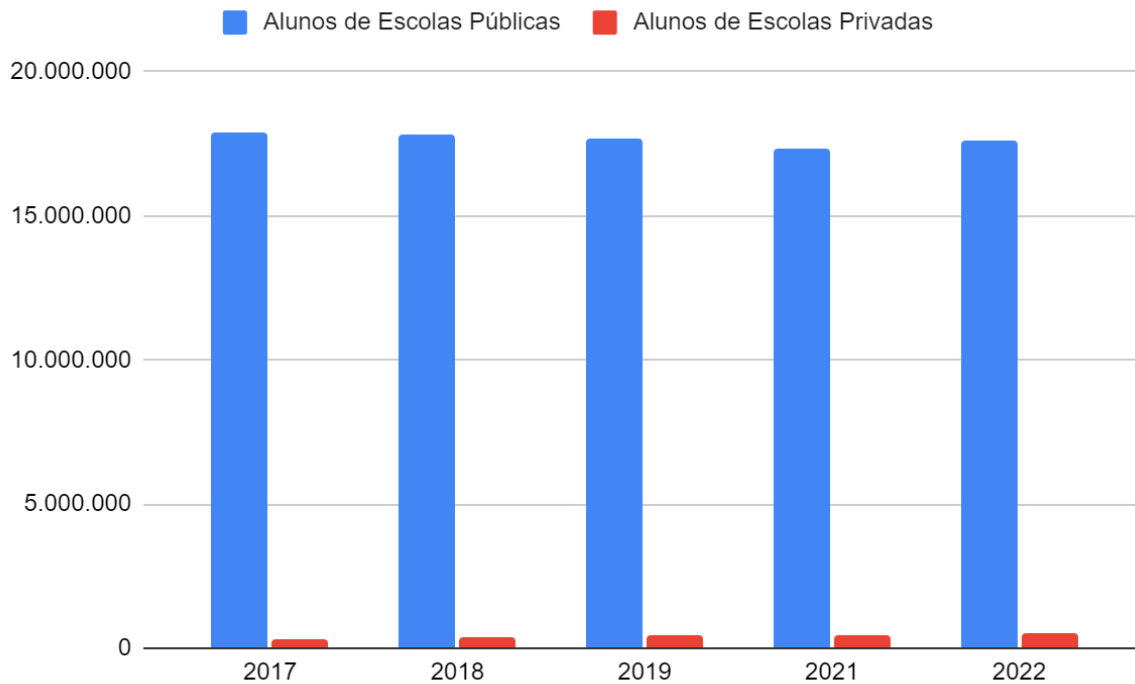


Source: The authors.

In all editions, it is common for the number of participating public schools to be significantly higher than the number of private schools. Numerically, the number of public schools is close to 60 000 and the number of private schools is less than 10 000.

In fact, it is also observed that the number of students participating in OBMEP is concentrated in public schools. The following chart numerically represents such data for better analysis.

Figure 7 – Comparison between the number of students from public and private schools (2017 - 2022)



Source: The authors.

The graph shows that the number of students from public schools participating in the Olympiad is significantly higher than that of the private network. While the number of students in the public school system reaches 20,000,000, those in the private school system are well below the 5,000,000 line.

FINAL THOUGHTS

Mathematics plays a fundamental role in people's daily lives. It is present in many aspects of daily life, in basic activities such as counting and calculating change, and also in more complex tasks such as financial planning, decision-making, understanding statistics, and problem-solving.

In this sense, enhancing the expansion of Mathematics teaching is crucial to promote a broader and deeper understanding of this discipline, enabling students to face challenges of the modern world.

According to Silva (2017), OBMEP has proven to be an extension tool that can enhance the teaching of mathematics in Brazil with the active participation of students, teachers, and employees. In this expansion through competition, reward actions can be seen as satisfactory, since "Personal development, success, well-being serve as a reason for the student to learn, which can be explored by OBMEP by stimulating through its awards." (Alves, 2010, p. 30).

The development of this study promoted the knowledge of the importance of problem solving as a trend in mathematics teaching and based on this, it elected the Brazilian Public School



Mathematics Olympiad (OBMEP) as an excellent instrument to offer improvements in teaching, especially in public schools.


OBMEP stimulates interest in mathematics, the discovery of mathematical talents, encouragement of the continuing education of teachers, promotion of the improvement of mathematics teaching and the expansion of academic and professional opportunities. In this sense, the Olympiad has proven to be a valuable initiative for the promotion of quality mathematics education in Brazil.



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Analysis of the main labor problems faced by human capital within the marble factories of Tepexi de Rodríguez, Puebla

 <https://doi.org/10.56238/sevened2024.010-017>

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ABSTRACT

According to the General Directorate of Mining Development (2015), the antecedents of the exploitation of marble in Mexico date back to the last years of the Porfirista period (1876-1911), particularly in the last two decades of the nineteenth century and in the first years of the twentieth century, there was a growth of the most representative cities around the world. with the consequent dynamism of the demand for construction materials, as well as industrial metals. In this context, some businessmen showed interest in taking advantage of this conjunctural moment, investing resources in our country in the exploitation, not only of traditional minerals such as gold, silver or copper, but also of other minerals that were in growing demand, among which was marble. Valles and Márquez (2004) state that the discovery of the marble in Tepexi de Rodríguez occurred during the construction of the highway in 1963 when General Antonio Nava Castillo was Governor of the State of Puebla. The extraction of marble began around 1964, based on the use of pickaxe, bar, spikes, train ladder jacks, and marro. According to Ros (2016), in the marble sector there are several labor problems that affect human capital. These issues can have a significant impact on worker productivity and well-being. The study carried out was of a mixed type with the purpose of analyzing the main labor problems faced by human capital within the marble factories of Tepexi de Rodríguez, Puebla, in order to define the current factors that affect the human capital in the work that is carried out in the marble industry of this locality, having an exploratory-descriptive scope. through a case study of a company located in that place, which began operations in 1970, taking a sample of 206 employees who worked in it. As identified in the study, the human capital within the analyzed company faces several problems that limit their labor well-being, it was also identified that there are still bad practices in the management of Human Capital, as well as the lack of training that is an important aspect in any industry or company. In addition, it should be noted that three of the main problems faced by human capital according to the mentions made by workers, firstly, are poor salaries and lack of benefits, secondly, health because there are no long-term disease prevention programs, and thirdly, the lack of occupational safety since there are no hygiene and safety programs that allow them to prevent latent risks throughout the country. the processing of marble.

Keywords: Human capital, Marble industry, Problems, Labor.

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INTRODUCTION

According to Abad (2018), the extraction and working of natural stone, in its varieties of marble or marble limestone, has had a long historical trajectory, as attested by the great artistic and architectural works since ancient times. The pyramids of Egypt, built with huge blocks of earthy-brown limestone that can be seen today, were covered with white limestone from Tura, or even marble like that of Cheops. But without a doubt, it was Rome that was the great promoter of marble, which was used to cover and adorn a multitude of rooms such as Agrippa's Pantheon, monuments, temples, triumphal arches or columns such as Trajan's made of the most famous marble of all; Carrara. Although Rome was the first with the technical capacity to have great territorial impacts with open-pit marble mines throughout the empire, as is the case of Macael, in Almeria. The purpose of this study is of a mixed type, which had the purpose of analyzing the main labor problems faced by human capital within the marble factories of Tepexi de Rodríguez, Puebla, in order to define the current factors that affect the human capital in the work carried out in the marble industry of this locality. having an exploratory-descriptive type of scope,

According to the General Directorate of Mining Development (2015), the history of marble exploitation in Mexico dates back to the last years of the Porfirista period (1876-1911). Indeed, particularly in the final two decades of the nineteenth century and during the first years of the twentieth century, there was a growth of the most representative cities throughout the world, with the consequent dynamism of the demand for construction materials, as well as industrial metals. In this context, some businessmen showed interest in taking advantage of this conjunctural moment, investing resources in our country in the exploitation, not only of traditional minerals such as gold, silver or copper, but also of other minerals that at that time presented a growing potential demand, among which, in addition to marble, there were also asbestos, granite, salt, graphite, talcum powder and a few more.

Valles and Márquez (2004) state that the discovery of the marble in Tepexi de Rodríguez occurred during the construction of the road that connects Tepexi de Rodríguez with the federal highway in 1963 when General Antonio Nava Castillo was Governor of the State of Puebla. The extraction of marble began around 1964, based on the use of pickaxe, bar, spikes, train ladder jacks, and marro. This process, despite the fact that in some cases sophisticated techniques and technological advances such as diamond wire and heavy machinery are already used, continued to represent the most common form of extraction, around 80% of the total exploitation of this form in recent years.

The work was generally carried out in crews of 10 to 12 people, although some could be found with only 4 people. There are currently around 40 crews in the municipality's quarries that employ an average of 400 people. On the other hand, in terms of marble processing, we find that the



first factory was installed in 1977, thus initiating a series of installations that, in size and small, are currently approximately 14 factories. On average, the parking factories employ a total of 36 people per day, distributed in three shifts, that is, around 500 people work daily in these rolling mills, highlighting the role of women who participate actively and in large numbers in these factories. The material that is processed in these factories is not only that extracted in the municipality, but also material from other places, the most common: Classic and dark Travertine Tepexi, Travertine Gold or Tepexi, Dorado Tepexi, Crema de Agua de la Luna de Tepexi, Boig Mega de Atlixco, Negro y Haspe de Tepeaca, Blanco Vego de Chiautla, Travertine Marble, Oaxaca Red, Tical Green from Guatemala and Quarry Stone from Hidalgo.

According to Industrias Gromaz (2018), the material is extracted from mountain outcrops and open pits. Initially, a drilling investigation is carried out in search of the ore and to determine if the terrain is suitable. For this, an explosion technique is carried out, which consists of digging a 15 cubic meter pit in the ground and carrying out an inspection of the ore. The second method does not use explosives, but is done by means of diamond wire plows, which is a steel wire with diamond powder, which rubs the rock until a perfect cut is achieved and in this way extract the blocks. Once the marble has been obtained, with the help of a payload machine, it is moved to an empty space on the ground for storage. According to David (2017), marble is cut on looms or block cutters. This will depend on the dimensions of the block, this means, the large blocks will go to the loom while the irregular and smaller ones will go to the block cutter, this is done in order to make the most of the measurements of the material and achieve less waste. Once the marble bands are obtained, they pass through the polishing machine, through an abrasion system the marble is given one aspect or another. Marble tends to have imperfections (voids), to correct these irregularities the recapping process has to be carried out, which consists of filling the gaps with white cement and special coloring to achieve the shade required by the marble slab achieving a uniform surface. Subsequently, the washing and packaging is carried out, the marble slabs are introduced into the machine, which will be responsible for eliminating residues impregnated in the slab. Subsequently, the plates will be palletized or packaged and stored pending loading.

Throughout its history, the marble industry has witnessed numerous labor problems that have affected the human capital employed. From ancient times to the present day, the quarrying and transformation of marble has been an activity that requires considerable physical exertion and presents a number of unique work challenges. According to Abad (2018), the marble industry has been plagued by hazards and accidents since its inception, whether in the quarry, which works with large tonnage blocks, with cutting and sawing machines, or even in factories. According to Ros (2016), in the marble sector there are several labor problems that affect human capital. These issues can have a significant impact on worker productivity and well-being. On the other hand, Huancahuari

(2019), explains that some of them are: *poor working conditions*: Workers in the marble sector often face difficult working conditions, such as long working hours, lack of workplace safety, and exposure to toxic substances. These conditions can have a negative impact on the health and well-being of workers. *Low wages*: Many workers in the marble sector receive low wages, which can hinder their ability to meet their basic needs and improve their quality of life. Low wages can also contribute to poverty and inequality in the industry. *Lack of training and professional development*: In some cases, workers in the marble sector may face a lack of training and professional development opportunities. This can limit their ability to acquire new skills and advance their careers, which in turn can affect their long-term employability. *Job insecurity*: Workers in the marble sector often face job insecurity, such as temporary or informal contracts, lack of social protection, and lack of job stability. This can lead to stress and anxiety among workers, as well as difficulties in planning for their future and ensuring their economic well-being.

For Niosh (2019), in marble factories, there are several *risk factors* that can affect the health and safety of workers, the most important of which are the following: *Exposure to silica dust*: Exposure to silica dust is a major risk in marble factories. The process of cutting, polishing, and finishing marble can generate dust containing crystalline silica, which can be harmful to workers' respiratory health. Long-term exposure to high levels of silica can cause respiratory diseases, such as silicosis. *Harsh working conditions*: Marble factories can exhibit adverse working conditions, such as high temperatures, intense noise, and vibrations. These conditions can affect the health and well-being of workers in the long run. *Ergonomic hazards*: Repetitive tasks, heavy lifting and awkward postures can lead to ergonomic hazards in marble factories. These risks can cause musculoskeletal injuries, such as back pain and limb injuries. *Chemical hazards*: In addition to silica dust, there are other chemicals used in the marble manufacturing process, such as adhesives and solvents. Exposure to these chemicals can have negative effects on workers' health if proper safety measures are not taken. *Fall hazards*: Marble factories can have slippery surfaces and elevated areas where workers may be exposed to fall hazards. It is important to implement safety measures, such as the use of personal protective equipment and the installation of safety guardrails, to prevent accidents and injuries. *Electrical hazards*: Marble factories use electrical machinery and equipment that can pose electrical hazards to workers. It is essential that regular inspections are conducted, equipment is maintained in good repair, and electrical safety procedures are followed to prevent accidents.

METHOD DESCRIPTION

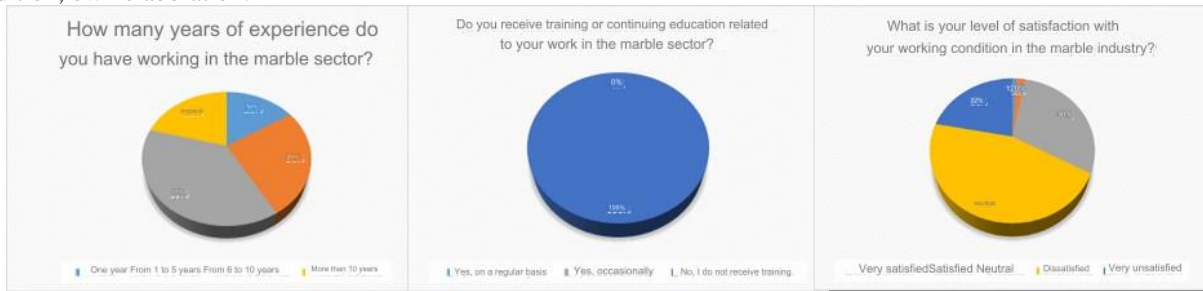
The purpose of this study is of a mixed type, which had the purpose of analyzing the main labor problems faced by human capital within the marble factories of Tepexi de Rodríguez, Puebla, in order to define the current factors that affect the human capital in the work carried out in the

marble industry of this locality. Having an exploratory-descriptive scope, the research work was carried out through a case study of a company located in the town of Tepexi de Rodríguez, which was established in 1970, for which a sample of 206 employees who worked in it was taken, to whom a survey was applied through a digital form which consisted of ten items. which were divided into three factors, as the first factor were the working conditions with seven items, second factor problematic and risk prevention with two items, third factor technification with one reagent, having a design of closed questions with multiple choice, some with five Likert scale, the questionnaire applied was distributed digitally using the Microsoft Forms platform; Subsequently, the analysis was carried out by concentrating the responses in a Microsoft Excel spreadsheet through which pie charts and histograms were obtained, which served as support in the representation and interpretation of the data.

According to the study carried out, the following results were obtained, in the first factor working conditions, of the surveyed population 60% are full-time workers, this means that they work a full day and one of their main characteristics is that they have a family to support, while the other 40% are part-time workers and these are usually students of upper secondary and higher education, who do it to support themselves in the maintenance of their studies. In question 2 time of experience in the marble industry, 37% answered that they have between 6 to 10 years in this industry, another 26% are workers who have already been working between 1 and 5 years, 21% have more than 10 years working in this industry and who have the characteristic of being mostly adults, and 16% are workers who have just entered the marble sector and have minimal experience, as shown in Figure 1. In the question asked "In what part of the marble production process do you perform your functions?", 54% of respondents are in the transformation process, while 45% are involved in the extraction of marble in quarries, and only 1% participate in sales and marketing.

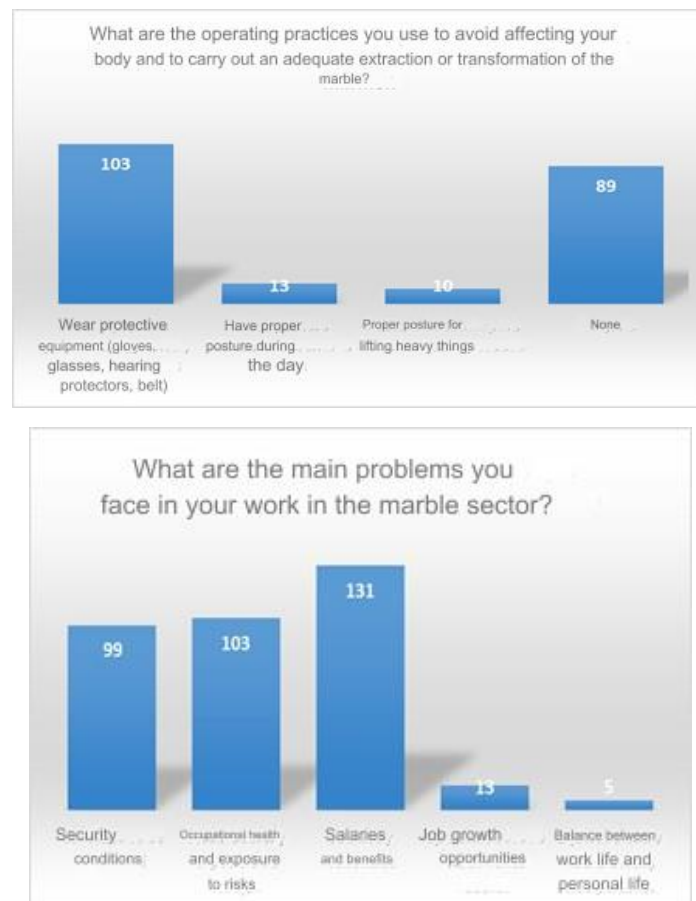
In question five levels of job satisfaction, 45% are dissatisfied with the working conditions they face, while 30% are adapted to the conditions and do not take it seriously, 22% are very dissatisfied with the working conditions and would like to have better conditions, only 2% feel satisfied with the working conditions they have, and only 1% are very satisfied, as shown in Figure 1. In the case of question seven, they receive additional benefits at work, 100% of workers do not receive social security, bonuses or benefits as established by the Federal Labor Law, the only thing they receive is their weekly salary that is granted to them according to the position they have. In question eight, 69.9% consider that their work within the marble sector is not valued or recognized, they consider that they are just another worker within the industry, while the other 30.1% are not clear if they are valued.

Fig. 1 Graphs of results first factor working conditions, years of experience, training, satisfaction with their working condition, own elaboration.



In the second factor, according to the respondents in the main questions they face in their work, 131 of them consider that the low salary they receive due to the high risk they are exposed to in the industrial and mining activities of marble, while 103 of them fear for their long-term health due to exposure to dust or lessons. Only 99 consider that safety conditions are also a work problem, only 13 of the respondents considered job growth as a problem, and only 5 of them consider the balance between their work and their personal life as problematic, since the working hours are long and they cannot enjoy time for family or friends, as shown in Figure 2.

Fig. 2 Graphs of the second factor problems and risk prevention, the first histogram refers to the main problems faced by workers within the company, the second histogram shows the main practices that workers carry out to prevent accidents. Own elaboration.





In the third factor, technification of the workers surveyed considered 37.4% that technification is important, but with the lag that has been going on for years it is a very big challenge for the owners of companies, another 34.5% commented that technification is very important and would be a significant advance for the industry, since it would cause a better quality of production and better conditions for human capital. while 20.4% consider that the marble industry is doing well as it is.

CONCLUSIONS AND RECOMMENDATIONS

As identified in the work carried out, the human capital within the analyzed company faces several problems that limit its labor well-being, as well as the development of the labor market of the marble industry of Tepexi de Rodríguez, since taking this company as a case study and that has more than 50 years of operation, bad practices still persist in the management of Human Capital. giving clear evidence that the working conditions of the employees of this type of companies have unfavorable working conditions, as well as the lack of training was identified, which is an important aspect in every industry and company to develop the skills of the staff and which contributes to improving the labor market, in addition to enabling workers as a fundamental element for the success and efficiency of the processes that are carried out in the marble industry of Tepexi de Rodríguez, because unfortunately for the sample studied, it was identified that employees learn over time with experiences in their work and that their practices are rudimentary, they do not use adequate or professional techniques. It also highlights the need for close collaboration between the marble industry and local educational institutions, in order to establish technical or vocational training programs, so that these institutions can be the key to closing the identified training gaps and preparing the human capital of the marble industry, which is one of the main in the region's economy.


In addition, it should be noted that three of the main problems faced by human capital according to the mentions made by workers, firstly are poor salaries and lack of benefits, secondly, health because there are no long-term disease prevention programmes, because of all the risks they have in the processes that are carried out, and thirdly, the lack of occupational safety, since there are no hygiene and safety programs that allow them to prevent latent risks throughout the processing of marble. Also, the urgent need to modernize operations in the extraction and transformation of marble is evidenced in order to improve productivity and competitiveness in the market and thus offer greater quality, as well as reduce occupational accidents. The technification of the marble sector not only benefits the efficiency and quality of the products offered, but can also have a positive impact on the local economy, the improvement of operations can attract investments, generate employment and contribute to a sustainable development of the municipality of Tepexi de Rodríguez.



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Association between dietary carbohydrate quality index, obesity markers and mammographic findings in women treated by the Brazilian public health system

 <https://doi.org/10.56238/sevened2024.010-018>

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ABSTRACT

Obesity is a risk factor for breast cancer and diet can be a risk factor for this disease as well as contributing to overweight. Dietary carbohydrates are always under discussion as to potential harms in this context. There are no studies that identify obesity and dietary carbohydrates in relation to alterations present in mammographic examinations. The aim of this study was to evaluate whether there is an association between mammographic findings, carbohydrate quality index (IQC) and obesity. Methodology: The sample consisted of 620 women stratified according to the Breast Imaging Reporting and Data System (BI-RADS) into two groups: and with abnormal mammographic findings. The following obesity markers were used: Body Mass Index, Waist Circumference, Waist/Hip Ratio, Waist/Height Ratio, A Body Shape Index, Body Roundness Index and Body Fat Percentage, the latter defined by ultrasound. The IQC was determined from two 24-hour food recalls and was composed of the following components: fiber, glycemic index, whole grain/total grain ratio, and solid/total carbohydrate ratio. Results: There were 219 (35.3%) women with abnormal mammographic findings. There was no difference between the two groups of women considering markers of obesity, except for waist circumference, with greater accumulation of abdominal fat among women with altered mammographic findings. There was no difference between the groups considering IQC and markers of obesity. Conclusion: In the group of women evaluated, there was no association between mammographic findings, obesity and carbohydrate quality index. Women with abnormal mammographic findings exhibit greater accumulation of abdominal fat, estimated by the waist circumference indicator.

Keywords: Obesity, Diet, Carbohydrate, Quality, Mammography.

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INTRODUCTION

Currently, the population has been suffering from the increase in chronic diseases, including breast cancer, which is the second most common of all cancers. Obesity stands out as one of the risk factors implicated in the onset of the disease, especially when there is an accumulation of fat in the central region (1).

Anthropometry is the most widely used method for diagnosing obesity, involving the determination of several indices or body relationships, in order to reduce the limitations of each one in terms of accuracy. The WCRF/AICR (2018) recommend that at least the body mass index (BMI), waist circumference (WC) and waist-to-hip ratio (WHR) be used, but there is also the waist-to-height ratio – WHtR (2), the A Body Shape Index – ABSI(3), the BodyRoundness Index (BRI) (4), among others.

In addition to obesity as a risk factor for breast cancer, a healthy diet has been recommended, with a higher intake of whole grains, fruits and vegetables and a reduction in the consumption of *fast foods and processed foods rich in fat, starch and sugar, as well as sugary drinks* (1). *From this perspective, it may be useful to evaluate the dietary carbohydrate quality index, as proposed by Zazpe et al.(5). Such an index determines a better quality for diets that are higher in fiber, whole grains and solid carbohydrates, as well as low glycemic index. In addition to controlling risk factors, there are screening methods for prevention or early detection of breast cancer. To this end, mammography has been used and, for its interpretation, in 1993 the American College of Radiology (ACR) developed a standardization system, the Breast Imaging Reporting and Data System (BI – RADS), with periodic updates, the last one being in 2015(6).*

The evaluation of obesity and dietary quality, specifically considering carbohydrates, has not yet been performed based on mammographic findings. Thus, the objective of the present study was to evaluate the association between dietary carbohydrate quality index, obesity markers and mammographic findings in women treated by the Unified Health System (SUS).

METHODOLOGY

This is a cross-sectional, analytical, quantitative study with women treated at a reference institution in mastology, located in Fortaleza, Ceará, Brazil. Data collection took place between June 2016 and February 2017.

The study followed all the recommendations of Resolution 466/12 of the National Health Council (7), and all procedures were approved by the Human Research Ethics Committee of the institution responsible for the study, under CAAE18054613.0.0000.5534 and under opinion No. 1,135,819.

The sample was a convenience sample, comprising 620 women. As inclusion criteria, women had to be over 18 years of age, without diagnosed cancer, not pregnant and not breastfeeding and participate in all data collection activities.

The participants were interviewed to obtain demographic, socioeconomic and dietary data. The mammographic reports were compiled. The presence of obesity was investigated by anthropometry and ultrasonography.

The mammographic reports were in accordance with the BI-RADS categories determined by the ACR (6):0 - incomplete evaluation, requiring a new examination; 1 - negative result; 2 - benign results; 3 - probably benign results; 4 - suspicious anomalies, biopsy indicates; 5 - highly suggestive results of malignancy, biopsy and definitive clarification indicated; 6 - known biopsy, proven malignancy. Women in the latter category were not included in the study.

The participants were stratified into two groups according to the above-mentioned reports: without (BI-RADS categories 1 and 2) and with (BI-RADS categories 0, 3, 4 and 5) abnormal mammographic findings. Categories 0 and 3 were included as altered because it is not possible to guarantee normality of the findings based on the examination.

Regarding anthropometric data, weight, height, WC and hip circumference (HC) were collected, according to the recommendations of the Centers for Disease Control and Prevention (CDC) (8).

With the measurements taken, the following anthropometric indices were calculated:

- Body Mass Index (BMI) = Weight (kg)/Height² (m), and adults are classified according to the World Health Organization - WHO (9; 10) and the elderly according to the Pan American Health Organization - PAHO(11), In relation to the adult participants, the different degrees of thinness were grouped as thinness and the different degrees of obesity were grouped as obesity.
- Waist-to-hip ratio (WHR) = WC (cm)/HC (cm), and the normal value adopted by the WCRF/AICR (1) was adopted, which is < 0.85;
- Waist-to-height ratio (WHtR) = WC (cm)/height (cm), classified as adequate up to 0.5 (2);
- The Body Shape Index (ABSI) = CC/(IMC^(2/3).height^(1/2)), classified as adequate up to 0.083 (3);
- BodyRoundness Index (BRI) = 364.2 – 365.5 x eccentricity, where eccentricity = 1/2 CC/π or 1/2 HRC/π, rated as adequate up to 5 (4);

WC was also evaluated in isolation, and was considered normal if it < 80 cm (1).

Body fat percentage (BF%) was determined by ultrasonography, using the BX2000 device (BodyMetrix Pro – IntelaMetrix, Inc.) and the protocol of Jackson et al.(12), which defines the

abdomen, triceps and suprailiac region on the right side of the body as anatomical points for measurement. A fat percentage of up to 32% was considered adequate (13).

Food consumption was investigated through the 24-hour food recall (24hR), performed on two non-consecutive days, including one weekend. The first recall was performed in the first contact with the participant. For the second 24-hour R, the patients were contacted via telephone call (14).

This information was obtained from home measurements and converted into grams according to Brazilian tables (15; 16).

Food consumption data were initially entered into the Brazil Nutri Platform and later released into the *Statistical Analysis System* (SAS) (17). The data of the two days of 24h R24 were adjusted for intrapersonal variance using the *MultipleSourceMethod* (MSM) statistical program (18).

The carbohydrate quality index (IQC) was calculated according to the protocol developed by Zazpe et al.(5), taking into account dietary fiber intake (g/d), glycemic index, whole grain/total grain ratio, and solid carbohydrate/total carbohydrate ratio in the diet. The consumption of whole grains represented the consumption of whole grains and their whole derivatives and the sum of grains and whole grains with grains and refined derivatives constituted total grains. Solid carbohydrates in the diet were represented by the amount of carbohydrate contained in solid foods and, in order to consider total carbohydrates, solid carbohydrates were added to net carbohydrates (those contained in sugary drinks and fruit juices). The values were summed to calculate the IQC, ranging from 4 to 20 points (5). The authors do not establish a cut-off point, but higher values mean better carbohydrate quality.

The determination of the GI of the meals followed the protocol proposed by the Food and Agriculture Organization - FAO/ World Health Organization - WHO Expert Consultation(19).

Statistical analysis was performed using SPSS software, version 20.0, and for all analyses, $p < 0.05$ was adopted as the level of significance. The Kolmogorov-Smirnov test was used to verify the normality of the distribution of continuous variables. Categorical variables were evaluated using the chi-square test. The comparison of the means of the variables studied was performed using the ANOVA test. Spearman's correlation test was used to correlate the variables studied with the mammographic findings.

RESULTS

Regarding mammographic findings, 401 (64.68%) patients were diagnosed with unaltered mammographic findings and 219 (35.32%) with abnormal mammographic findings. The mean overall age of the women was 52.47 ± 9.83 years, with 52.08 ± 9.16 years with unaltered mammographic findings and 52.74 ± 9.08 years with altered findings. Table 1 shows the demographic and socioeconomic characteristics of the participants, according to mammographic

findings. The majority were 50 years of age or older, with up to 8 years of schooling, married, non-white and with an income of up to 3 minimum wages per month.

Table 1 - Demographic and socioeconomic characteristics of the patients evaluated (n = 620), according to mammographic findings. Fortaleza, 2019

Variables	Mammographic findings ¹	
	Not Changed (n=401)	Changed (n=219)
Age range		
< 50	185 (46,13)	88 (40,19)
50-59	133 (33,17)	85 (38,81)
≥ 60	83 (20,70)	46 (21,00)
Years of study		
≤ 8	199 (49,62)	108 (49,31)
9 – 11	163 (40,65)	84 (38,36)
≥ 12	39 (9,73)	27 (12,33)
Marital status		
Married	213 (53,12)	114 (52,05)
Not married	188 (46,88)	105 (47,95)
Self-reported color		
White	84 (20,95)	43 (19,63)
Not White	317 (79,05)	176 (80,37)
Monthly income (SM) ²		
≤ 1	25 (6,23)	15 (6,85)
1 – 3	284 (70,82)	165 (75,34)
> 3	77 (19,20)	34 (15,53)

¹According to BreastImagingReportingand Data System – BI-RADS (ACR, 2015); ²One woman in the group of unaltered mammographic findings did not report her age; ³Brazilian minimum wage in 2016: R\$ 880.00 and in 2017: R\$ 937.00; 45 people with abnormal mammographic findings and 18 people with non-altered mammographic findings were unable to report monthly income.

Table 2 shows the proportion of women evaluated who had elevated values of obesity markers, according to mammographic findings. A high proportion of high values was observed in both groups, considering the more traditional markers, especially BMI. Considering ABSI, the proportions were low. There was a difference between the groups in relation to WC, with a higher proportion of women with abnormal mammographic findings having higher values ($p < 0.001$).

Table 2 - Proportion of elevated obesity markers (%) among the patients evaluated (n = 620), according to mammographic findings. Fortaleza, 2019

Obesity Markers ¹	Mammogram Findings ²	
	Not Changed (n=401)	Changed (n=219)
BMI	78,80	80,37
WC	56,11	73,97
WHR	41,15	44,29
WHtR	51,12	58,45
ABSI	0,75	1,37
BRI	38,90	43,38
%BF	64,59	67,12

¹BMI: Body Mass Index; WC: Waist Circumference; WHR: waist-to-hip ratio; WHtR: Waist-to-Height Ratio; ABSI: A Body Shape Index; BRI: BodyRoundness; %BF: body fat percentage; ²According to BreastImagingReporting and Data System – BI-RADS (ACR, 2015)

Table 3 shows the IQR data of the diet of the women evaluated, according to mammographic findings. Regarding these components, there is a low intake of fiber per day, a diet with an inadequate GI (moderate), with a low ratio of whole grains/total grains and solid/total carbohydrates. These data have repercussions on the overall IQC, which is also low.

Table 3 - Distribution of patients evaluated according to dietary carbohydrate quality index (IQC) and mammographic findings. Fortaleza, 2019

IQC Components	Mammographic findings ¹			
	Not changed n = 401		Changed n = 219	
	Average	DP	Average	DP
Fibers	15,0	7,72	14,0	7,21
Sugar level	67,2	6,06	66,8	6,79
Whole/total grain ratio	0,34	0,24	0,34	0,26
Solid/total carbohydrate ratio	0,55	0,13	0,53	0,13
IQC global	12,2	2,90	11,9	3,31

¹According to Breast Imaging Reporting and Data System – BI-RADS (ACR, 2015)

Table 4 shows the relationship between the analyzed variables and the IQC tertiles. There was no difference considering mammographic findings, demographic and socioeconomic data, and obesity markers. As expected, there was a difference considering the components of the IQC, since they were distributed in tertiles of consumption.

There was no correlation between IQC, mammographic findings, and obesity markers (Table 5).

Table 4 - Relationship between mammographic findings, demographic and socioeconomic variables and obesity markers according to the tertiles of the dietary carbohydrate quality index (IQC) in the women evaluated (n = 620). Fortaleza, Brazil, 2019

Variables	Carbohydrate Quality Index			p*
	1° tertile	2° tertile	3° tertile	
Mammographic findings, altered ¹	62 (29,4%)	88 (38,8%)	78 (37,1%)	0,093
Age, ≥ 60 years ¹	43 (20,5%)	48 (21,1%)	45 (21,4%)	0,184
Education, ≤ 8 years ¹	106 (50,2%)	108 (47,6%)	107 (51,0%)	0,816
Skin color, white ¹	45 (21,3%)	48 (21,1%)	37 (17,6%)	0,560
Family income, 1 to 3 SM ¹	161 (76,3%)	157 (69,2%)	147 (70,0%)	0,349
BMI (kg/m ²) ²	28,9 (5,2)	28,8 (4,6)	28,9 (4,7)	0,942
BMI, overweight ²	163 (78,4%)	179 (79,2%)	166 (80,2%)	0,900
Waist circumference (cm) ²	86,2 (11,1)	86,4 (10,0)	86,0 (10,5)	0,938
High waist circumference ²	109 (52,7%)	141 (62,3%)	121 (59,0%)	0,083
RCQ ²	0,8 (0,1)	0,8 (0,1)	0,8 (0,1)	0,511
high WHR ¹	81 (39,1%)	90 (40,2%)	87 (42,5%)	0,757
%GC2	32,9 (4,4)	33,2 (4,2)	33,3 (4,0)	0,608
High BF% ¹	125 (62,2%)	141 (63,2%)	142 (70,2%)	0,174
RCE ²	0,6 (0,1)	0,6 (0,1)	0,6 (0,1)	0,832
ABSI ²	0,07 (0,00)	0,07 (0,00)	0,07 (0,00)	0,341
BRI ²	4,7 (1,7)	4,8 (1,4)	4,7 (1,4)	0,801
Glycemic index (%) ²	70,8 (6,1)	67,1 (6,1)	62,9 (4,8)	<0,001
Dietary fiber (g) ²	9,7 (4,8)	13,9 (6,0)	19,5 (7,7)	<0,001
Whole/total grain ratio ²	0,2 (0,2)	0,3 (0,2)	0,5 (0,2)	<0,001
Solid/total carbohydrate ratio ²	0,5 (0,1)	0,5 (0,1)	0,6 (0,1)	<0,001

Values expressed as 1n(%) or 2mean (standard deviation). *Chi-square test or ANOVA.

Table 5 - Relationship between obesity markers, carbohydrate quality index and mammographic findings of the women evaluated (n = 620). Fortaleza, Brazil, 2019

	Mammographic Findings						
	Not Changed						
	BMI	WC	WHR	WHtR	%G	ABSI	BRI
Carbohydrate Quality Index	0,030 (0,544)	0,003 (0,955)	-0,003 (0,946)	0,013 (0,791)	0,035 (0,485)	-0,032 (0,521)	0,021 (0,677)
	Changed						
	BMI	WC	WHR	WHtR	%G	ABSI	BRI
Carbohydrate Quality Index	-0,025 (0,706)	0,028 (0,675)	0,035 (0,601)	0,017 (0,795)	0,012 (0,864)	0,018 (0,789)	-0,012 (0,858)

Spearman's correlation. Values expressed in r(p).

DISCUSSION

In the present study, the proportion of women with excess weight and body fat was high, as evidenced by the obesity markers evaluated. The presence of obesity compromises the quality of the mammographic examination and can lead to false positive results. Castro-Ibarra et al.(20) evaluated 9061 mammographic reports, adopting a stratification different from that adopted in the present study: BI-RADS 4 and 5, which were called positive findings, versus BI-RADS 1, 2 and 3, which were called negative. The authors found, among the altered (positive) findings, 40.9% of false positives, finding a significantly higher proportion of obesity among them, diagnosed based on BMI.

Total body fat and abdominal fat and weight gain during adulthood are recognized as risk factors for the development of postmenopausal breast cancer (1), although the effect is not yet well explained for premenopausal women (1, 21, 22, 23). However, there was no association between mammographic findings and these markers, except for WC, which was higher among women with abnormal findings.

Studies have suggested that waist circumference can predict total mortality (24; 25), and the incidence of certain cancers, including breast, endometrial, and colorectal cancers, better than BMI (26; 27).

Not only WC, but measures of abdominal adiposity have shown stronger associations with metabolic risk factors, including insulin (28), which in turn is linked to increased risk of breast and colorectal cancers (29). It has been seen that the BRI predicts the risk of cardiovascular disease and is able to show more clearly the location of excess fat mass in the individual, when considering WC in its formula (4). Maessen et al. (30) state that the BRI better reflects total adiposity and the location of visceral fat than BMI, and that, therefore, its increase better predicts the impairment of total individual health.

Another anthropometric indicator that is being used and that was measured here is the ABSI. The presence of altered values was very low, but this indicator was developed to estimate total mortality (3), so that in healthy women, as in the case of the present study, it may have limited value in diagnosing nutritional status. A study by Kabat et al.(31), which evaluated the association of



obesity markers with cancer risk, also did not detect an association between ABSI and breast cancer risk. These authors evaluated data from the Women's Health Initiative, with 7039 women who developed breast cancer at a 12.7-year follow-up.

It seems appropriate to follow the WCRF/AICR recommendation regarding the measurement of BMI, WC and WHR as a way to monitor the nutritional evolution of the population from the perspective of cancer prevention. In this study, the markers used were not useful in differentiating women with altered findings from those with unaltered findings, but the fact that there was a difference in WC points to the importance of measuring it in mammography screening routines. Usually, WC measurement is not part of such routines.

On the other hand, the data point to the general non-influence of obesity on mammographic findings, so that the involvement of its markers in the onset of cancer does not necessarily involve a previous alteration of mammograms.

There was also no relationship between obesity markers and dietary carbohydrate quality index. However, the diet of the women evaluated needs improvement in this regard.

The solid or liquid form of carbohydrates is an important component, and studies suggest that there is a direct relationship between sugar-sweetened beverages and long-term weight gain, as well as obesity-related diseases (32; 33). Consumption of foods such as whole grains, fruits, and vegetables are inversely associated with weight gain (34; 35; 36). In the study by Kim et al.(37), IQR was inversely associated with the prevalence of obesity.

In addition, carbohydrates are linked to cancer risk. In a review by Ludwig et al.(38), consumption of grains with high GI, potato products and added sugars were found to be associated with obesity, diabetes, cardiovascular disease and some cancers, while non-starchy vegetables, whole fruits, legumes and whole grains appeared as protective foods. According to Eslamian et al. (39), diets with high GI and GL increase the risk of developing breast cancer, while high fiber intake decreases this risk. A review by Makarem et al.(40) pointed to the deleterious effect of sugars and sugary drinks on cancer risk.

A study conducted in the Black Women's Health Study showed that women who did not consume sugary drinks when compared to those who had intake levels ≥ 250 g/day had a significant 27% reduction in the risk of breast cancer (41).

In a systematic review with meta-analysis by Xiao et al.(42), it was demonstrated that the consumption of whole grains was inversely associated with the risk of breast cancer. The authors suggest that reduced insulin response and blood glucose control may be a potential pathway through which whole grains may reduce the risk of breast cancer.



In the present study, no association was found between mammographic findings, obesity and IQR, indicating that, although both nutritional status and diet require improvement, the indicators used do not interfere with the type of finding.

This is the first study to evaluate the effect of breast cancer risk factors on mammographic findings. Although the relationship has not been demonstrated in relation to these findings, a high proportion of the women evaluated are obese, with accumulation of abdominal fat and a low-fiber diet, with inadequate GI and low ratio of whole grains/total grains and solid/total carbohydrates, compromising the IQC. It should also be noted that the only proven relationship, which is greater WC in women with abnormal mammographic findings, needs further investigation.

CONCLUSION

In the group of women evaluated, there was no association between mammographic findings, obesity and carbohydrate quality index. Women with abnormal mammographic findings exhibit greater accumulation of abdominal fat, estimated by the waist circumference indicator.



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Fanconi anemia: Diagnostic methods and the applicability of laboratory genetics

 <https://doi.org/10.56238/sevned2024.010-019>

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ABSTRACT

Fanconi Anemia (FA) is an autosomal recessive or X-linked hereditary disease that manifests itself in the first years of life, being responsible for congenital anomalies and progressive bone marrow failure, with aplastic anemia (AA) as its main characteristic. This review article aimed to identify the diagnostic methodologies used to detect AF involving genetic, clinical and laboratory applicability. For this study, electronic scientific databases were consulted, such as the Portal States National Library of Medicine National Institutes of Health (Medline/PubMed), Web Of Science, and Scientific Electronic Library Online (SciELO). A total of 1563 scientific articles were found in English, Spanish and Portuguese, 6 of which were included for analysis. It was demonstrated that there are two chromosomal fragility tests, a molecular biology method and a DNA sequencing method, and that the degree of specificity found in the Western blot and mitomycin C (MMC) methods complement the diagnosis of AF. Diepoxybutane (DEB) differs from Western blot and MMC by being more specific in chromosomal breaks, with next generation sequencing (NGS) being the most specific and most informative as it leads to a personalized approach due to ease of access to somatic variations in tumors and changes in gene expression. Therefore, it is concluded that these methods provide greater diagnostic specificity by identifying the genetic association of SCA and somatic mosaicism, understanding the levels of severity, bringing greater agility in taking therapeutic measures.

Keywords: Fanconi Anemia, Aplastic Anemia, Genetic variation, Mosaicism, Research.

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INTRODUCTION

Fanconi Anemia (FA) is an autosomal recessive hereditary disease that appears in the first years of life causing hematological abnormalities, capable of triggering aplastic anemia (AA) and can lead to progressive bone marrow failure in addition to congenital anomalies which lead to malformation or even the absence of bones in the individual (Shimamura & Alter, 2010; Crossan & Patel, 2012). SCA is described as a rare disease with heterogeneous characteristics, which can be found in several ethnic groups with a predominance of 1 in every 360 thousand births. The cause of its appearance lies in several genes responsible for triggering it, related to inheritance linked to the X chromosome, which controls the repair mechanisms of deoxyribonucleic acid (DNA) (Zen, Moraes, Rosa, Graziadio, & Paskulin, 2011).

FA is known for its specificity in causing the hematological system to collapse, due to widespread and progressive bone marrow failure with a high risk of cancer, in addition to being an invariably fatal disease with onset of clinical manifestations in the first years of life, resulting in an expected of life between 16-25 years of age or, depending on the level of severity, this expectancy can vary between 0-50 years with an average of 23 years of life (Nowzari, Jorgensen, Ta, Contreras, & Slots, 2001; Joenje & Patel, 2001). The reduction in lifespan is associated with a highly variable phenotype, which makes the diagnosis of the disease difficult, especially regarding clinical aspects (Auerbach, 2009).

Bone marrow failure can range from asymptomatic cytopenia to severe bone marrow aplasia, which is associated with complications in the hematological system resulting from a deficit in the production of blood cells (Alter, 2003). The increased risk of neoplasms in addition to hematological changes that appear throughout life leads to successive complications such as thrombocytopenia with granulocytic changes, anisocytosis, macrocytosis, thrombocytopenia, neutropenia, poikilocytosis, elevated fetal hemoglobin, elevated alpha protein and clinical manifestations that vary due to abnormal hematopoiesis (Alter, 2003; Kutler et al., 2003). Furthermore, the appearance of hyper or hypochromic skin spots, hypoplasia in the bones of the upper limbs such as the radius and thumbs, changes in the male gonads, abnormalities in the endocrine system with prevalence of hypothyroidism, changes in metabolism, dyslipidemia and syndrome are associated. metabolic (Auerbach, 2009).

Among patients, it is common for some to present a reserved phenotype, with normal progress of the skeletal system, hematological changes initially without apparent signs and little longer survival that can reach more than 30 years of age. Others, due to developing more expressive phenotypic manifestations, will present more severe abnormalities, with early appearance of bone marrow dysfunctions with a strong chance of triggering cancer, which in most cases lead to death



within the first decade of life (Crossan & Patel , 2012; Kee & D'andrea, 2012; Garaycoechea & Patel, 2014).

The clinical manifestations of SCA are grouped into four large groups: physical anomalies existing at birth; endocrinopathies and growth retardation; emergence of solid tumors and hematological abnormalities (Sagaseta de Ilurdoz, Molina, Lezáun, Valiente, & Durán, 2003). Among other abnormalities found at the beginning of their lives, skin pigmentation stands out, with café-au-lait spots and short stature found in more than 50% of cases (Alter, 2002). These spots are the result of melanin deposition (De Kerviler, Guermazi, Zagdanski, Gluckman, & Frija, 2000). In 10 to 40% of cases, one can also find the absence of the first metacarpal, hypoplastic fingers and ulna, congenital dislocation of the hip, absent or horseshoe-shaped kidneys revealed on imaging exams, malformation in the female reproductive system, hypoplasia or absence of ovary, bicornuate uterus, changes in the digestive system with imperfect folds, obstruction in the intestine and narrowing of the esophagus, duodenum and anus that make the digestive process difficult, in addition to tracheo-esophageal fistula, lip hypoplasia, microcephaly, insufficient hormone production (GH) responsible for growth, visual defects, cardiac structural abnormalities, hearing problems, developmental delay, low birth weight, changes in insulin and glucose metabolism, in addition to a series of events that can trigger other pathologies resulting from the type of genetic inheritance (Alter, 2002; De Kerviler, Guermazi, Zagdanski, Gluckman, & Frija, 2000; Sagaseta de Ilurdoz, Molina, Lezáun, Valiente, & Durán, 2003; Auerbach, 2009; Shimamura & Alter, 2010).

The most common cause, which leads to the emergence of AF, is directly associated with gene mutations that occur through DNA repair and genomic stability (Nowzari, Jorgensen, Ta, Contreras, & Slots, 2001). Currently, the genetic characterization of the disease includes the identification of at least 19 genes that are groups that have several different mutations each. In some countries, such as Brazil, the frequency in certain ethnic groups varies due to their greater occurrence (Gille et al. al., 2012). Associated with genetic characterization is pancytopenia, which can appear, in a less serious way, through somatic mosaic. This condition is characterized by genetically different somatic cells, that is, normal and altered, probably triggered by the appearance of new mutations or by spontaneous reversions arising from groups of complementations, as established in table 1 (Gregory et al., 2001).

Table 1- Complementation groups (genetic subtypes) of Fanconi Anemia.

<i>SUBTYPES</i>	<i>GENES</i>	<i>FUNCTION OF PROTEINS</i>	<i>CHROMOSOME LOCATION</i>
<i>FA-A</i>	FANCA	It constitutes the main FA complex and performs ubiquitination of the FA-ID complex	16q24.3
<i>FA-B</i>	FANCB (FAAP95)	It constitutes the main FA complex and performs ubiquitination of the FA-ID complex	XP22.31
<i>FA-C</i>	FANCC	It constitutes the main FA complex and acts on cytoplasmic functions with ubiquitination of the FA-ID complex	9q22.3
<i>FA-D1</i>	FANCD1 (BRCA2)	Doubles BRC – recruitment of RAD51 in addition to acting as a mediator of HR, activated by the FA-ID complex	13q12-13 13q13.1
<i>FA-D2</i>	FANCD2	Monoubiquitinated FANCD2 – association with BRCA2, BRCA1 and MRE11 complex ubiquitination occurs after DNA damage	3p25.3
<i>FA-E</i>	FANCE	Formation of the AF main complex recruitment of FANCD2 direct binding to ubiquitinated FANCD2	6p21-22
<i>FA-F</i>	FANCF	Formation of the main complex Homology with ROM - binding to nucleic acids Ubiquitination of the FA-ID complex	11p15
<i>FA-G</i>	FANCG (XRCC9)	Formation of the AF main complex Removal of the AF complex after replication Ubiquitination of the FA-ID complex	9p13
<i>FA-I</i>	FANCI (KIAA1794)	monoubiquitinated FANCI – associated with FANCD2, forms Complex downstream on the AF/BRCA pathway Ubiquitinated after DNA damage	15q26.1
<i>FA-J</i>	FANCI (BRIP1/BACH1)	Helicase – uncoils DNA in the 5'→3' direction BRCA1 membership Helicase, activated by the FA-ID complex	17q23.2
<i>FA-L</i>	FANCL (PHF9)	WD40 repeats – stabilization of the AF complex PHD – ubiquitin ligase Associated with E3 ligase in the ubiquitination of the FA-ID complex	2p16.1
<i>FA-M</i>	FANCM (Hef/FAAP250)	Formation of the AF main complex Helicase, DNA translocase Helicase, localizes the main complex to DNA	14q21.3
<i>FA-N</i>	FANCN (PALB2)	BRCA2 association/stabilization Activated by the FA-ID complex	16p12
<i>DO IT</i>	RAD51c	Activated by the FA-ID complex	17q23
<i>FA-P</i>	SLX4, MUS312	Activated by the FA-ID complex	16p13.3
<i>FA-Q</i>	XPF, ERCC4	Activated not elucidated, only that it interacts with FANCP	16p13.12
<i>FA-R</i>	RAD51	Responsible for protecting the new DNA strand	15q15.1
<i>FA-S</i>	BRCA1, BRCC1	Cancer susceptibility protein	17q21.31
<i>FA-T</i>	UBE2T, E2	Associated with E2 ubiquitinase, involved in the ubiquitination of the FA-ID complex	1q32.1

Source: Adapted from Gurtan & D'Andrea (2006); Taniguchi & D'Andrea (2006).

Mosaicism is a genetic phenomenon of FA that results in the reversion of harmful hereditary mutations, involved in two cell populations when it is discovered that there is one within the normal range and another outside it, in the same individual (Hirschhorn, 2003). There are several types of mosaicism, in SCA the most common is the presence of a mutation in which the allele presents with emphasis on normal functioning in a range that varies from 15 to 25% of patients affected by the

syndrome and who demonstrate some type of spontaneous mosaicism. (Hirschhorn, 2003; Gregory et al., 2001).

Mosaicism is characterized through the chromosomal break test, in this test the presence of two subpopulations of lymphocytes is verified, confirmation is made when sensitivity to DNA cross-link inducing agents occurs in one of them, the other will present a condition of normality that satisfies more than 50% of the cells analyzed (Gregory et al., 2001). With the progress of the abnormalities found in the hematopoietic system, the individual will present a condition of AA responsible for bone marrow failure associated with an increase in malignant predisposition, which reduces life span, especially when clinical manifestations begin in the first years of life, making this expectation around 16 to 25 years of age. Each of the groups of genes involved carries several different mutations, which allows controlling DNA repair mechanisms (Nowzari, Jorgensen, Ta, Contreras, & Slots, 2001; Porto et al., 2011).

The most impactful clinical complications triggered by AF occur in the hematological system and massively affect patients during their fight against the disease. It is believed that at least 90% of them develop progressive medullary insufficiency that can lead to severe AA. severe in which the bone marrow stops producing quantities of blood cells, resulting from a congenital condition of AF leading to a decrease in erythrocytes, granulocytes and megakaryocytic cells found in the bone marrow. Generally, in laboratory tests carried out at birth, normal peripheral blood counts are found, and over time they tend to change and worsen, leading to pancytopenia around seven years of age due to the progressiveness of the disease. (Tulpule et al., 2010).

There is also a high percentage of patients with the potential to develop acute myeloid leukemia (AML) and myelodysplastic syndrome (MDS) that appear in the middle of their lifespan, that is, between 10 and 15 years of age, which are due to complications due to the evolution of the patient's clinical condition. MDS is a clonal hematopoietic disease that induces cytopenias, imbalance in hematopoietic cell differentiation and a high risk of progressing to AML (Hasle, 2016). AML is a typical SCA neoplasm that is characterized by an 800 times greater risk of progression when compared to the general population. This disease that occurs in the bone marrow is defined by the disordered growth in the number of immature leukocytes and low production of platelets (Alter, 2003; Rosenberg, Huang, & Alter, 2004). Typically, progressive bone marrow failure occurs when a reduction in hematimetric values in peripheral blood is noticed, which involves thrombocytopenia, leukopenia and anemia. Severity begins with excessive chromosomal breaks responsible for damaging DNA repair, apoptosis and mutations that selectively benefit the growth of progenitor cells (Mathew, 2006). With regard to AA, AML and MDS developed in patients in the first years of life, it is important to investigate the probable occurrence of AF, even if clinical manifestations resulting from the disease are not apparent (Alter, 2003).

With the advances that have occurred in recent years in technologies involving the health field, mainly diagnostic techniques and treatment of abnormalities found in the hematological system associated with hereditary factors, new methods that deal with the diagnosis of rare diseases have been widely debated. In addition to the fact that there are already methodologies capable of replacing or complementing existing ones due to the need to avoid difficulties, rework and diagnostic confusion, and that several of them are already used in different parts of the world, especially when it comes to their discoveries. Thus, the objective of this article is to analyze, through an integrative review, the diagnostic methodologies used to detect Fanconi anemia involving genetic, clinical and laboratory applicability.

METHODOLOGY

The development of this integrative review took place through qualitative bibliographic research, which consists of a type of research capable of answering the study question in a broad way, and which includes structured qualitative techniques that cover studies related to the research topic (Prodanov, 2013). This includes the interpretation of events defined in other studies, mainly those of investigative origins that attribute important meanings in the process of detailing the results as well as being a main characteristic of a qualitative study (Pereira, Shitsuka, Parreira, & Shitsuka, 2018). Therefore, in order to research and interpret the results obtained by studies related to the topic, as well as the objective of this review, a search and selection of scientific articles published in electronic scientific databases such as *Portal States National Library of Medicine National Institutes of Health (Medline/PubMed)*, *Web Of Science*, and *Scientific Electronic Library Online (SciELO)*.

As this is a topic that seeks to evaluate the main FA diagnostic methodologies of genetic characterization, studies published between 2000 and 2019 were considered eligible, as there is a scarcity of work carried out on the chosen theme. To select these studies involving the evolution of diagnostic methods for SCA, as well as medullary aplasia, the following Health Sciences Descriptors (DeCS/MeSH) in Portuguese, English and Spanish were used: erythrocyte aplasia, fanconi anemia, leukemia acute myeloid, myelodysplastic syndrome, diagnosis, genetic diversity, mosaicism, hematopoietic stem cells, diagnosis of fanconi anemia and bone marrow/ *erythrocyte aplasia, fanconi anemia, acute myeloid leukemia, myelodysplastic syndrome, diagnosis, genetic diversity, mosaicism, hematopoietic stem cells, diagnosis of fanconi anemia and bone marrow* / erythrocyte aplasia, fanconi anemia, acute myeloid leukemia, myelodysplastic syndrome, diagnosis, genetic diversity, mosaicism, hematopoietic mother cells, diagnosis of fanconi anemia and bone marrow. As exclusion criteria, theses, thesis chapters, books, book chapters, congress or conference proceedings, technical and scientific reports, as well as other study designs and gray literature were not analyzed.

Table 1 - Search strategy and results in databases.

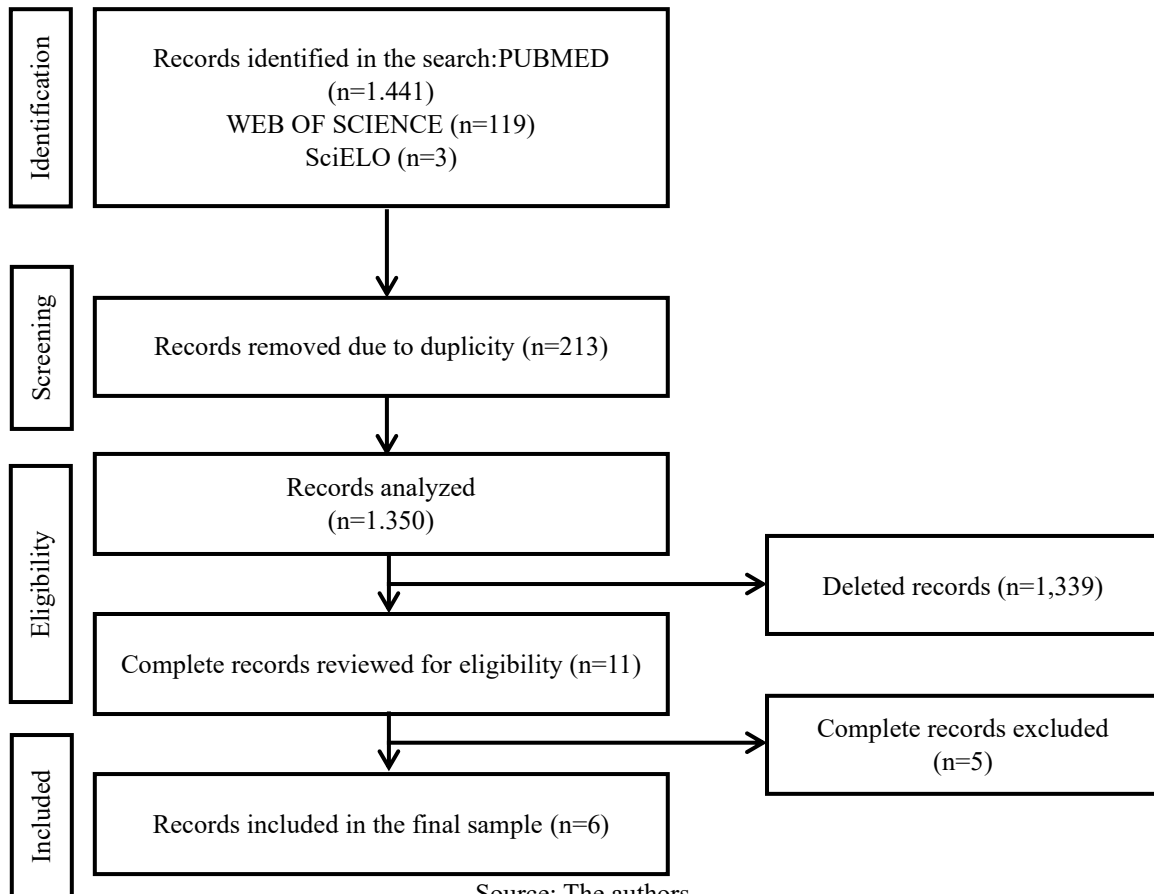
Search date	Search strategy		Results
PubMed			
06/11/2020	#1	Fanconi anemia OR Diagnostic	127,989
	#two	((“ <i>fanconi anemia</i> ” OR “ <i>erythrocyte aplasia</i> ” OR “ <i>acute myeloid leukemia</i> ” OR “ <i>myelodysplastic syndrome</i> ” OR “ <i>diagnosis</i> ” OR “ <i>genetic diversity</i> ” OR “ <i>mosaicism</i> ” OR “ <i>hematopoietic stem cells and bone marrow</i> ”) AND (<i>genetic</i> OR <i>tic diagnoses of fanconi anemia</i>))	1,629
	#3	#1 AND #2 Filters: text availability (Free full text and Full text); article type (Clinical Trial); article language (English, Portuguese and Spanish) and publication date (20 years).	1,441
Web Of Science			
06/15/2020	((((((((ALL=(<i>fanconi anemia</i>)) AND ALL=(<i>erythrocyte aplasia</i>)) OR ALL=(<i>acute myeloid leukemia</i>)) OR ALL=(<i>myelodysplastic syndrome</i>)) OR ALL=(<i>diagnosis</i>)) OR ALL=(<i>genetic diversity</i>)) OR ALL=(<i>mosaicism</i>)) OR ALL=(<i>hematopoietic stem cells and bone marrow</i>)) OR ALL=(<i>genetic</i>)) AND ALL=(<i>diagnosis of fanconi anemia</i>))		119
	Filters applied: Years of publication (2000-2019); Meso creation topics (all); Researcher profiles (All); Document types (<i>Article</i>); <i>Web of Science</i> Categories (All); Publication titles (All); Editor (All).		
SciELO			
06/15/2020	Fanconi anemia AND Diagnosis		3
	Filters applied: All Open Access (Open Access and Gold), Year (2000-2019), Author Name (All), Subject Area (All), Document Type (Article), Publication stage (Final), Language (Spanish).		

Source: The authors.

At the end of the search stage, a total of 1,563 articles were found in the respective databases. These studies were analyzed by two reviewers and, before that, 213 duplicate studies were removed, leaving 1,350 articles for analysis and selection based on reading titles and abstracts.

After applying the eligibility criteria, 1,339 articles were excluded as they were not relevant to the study question, leaving 11 of them to be read in full. After reading, 6 studies were included in the final sample as shown in figure 1.

Figure 1 - Identification of studies through databases and records.



RESULTS AND DISCUSSION

In the end, with 6 studies included, relevant information was extracted and organized in a table to answer the study question. The selected studies are investigative, descriptive and observational, described and ordered according to table 2.

Table 2 – Characterization of the studies.

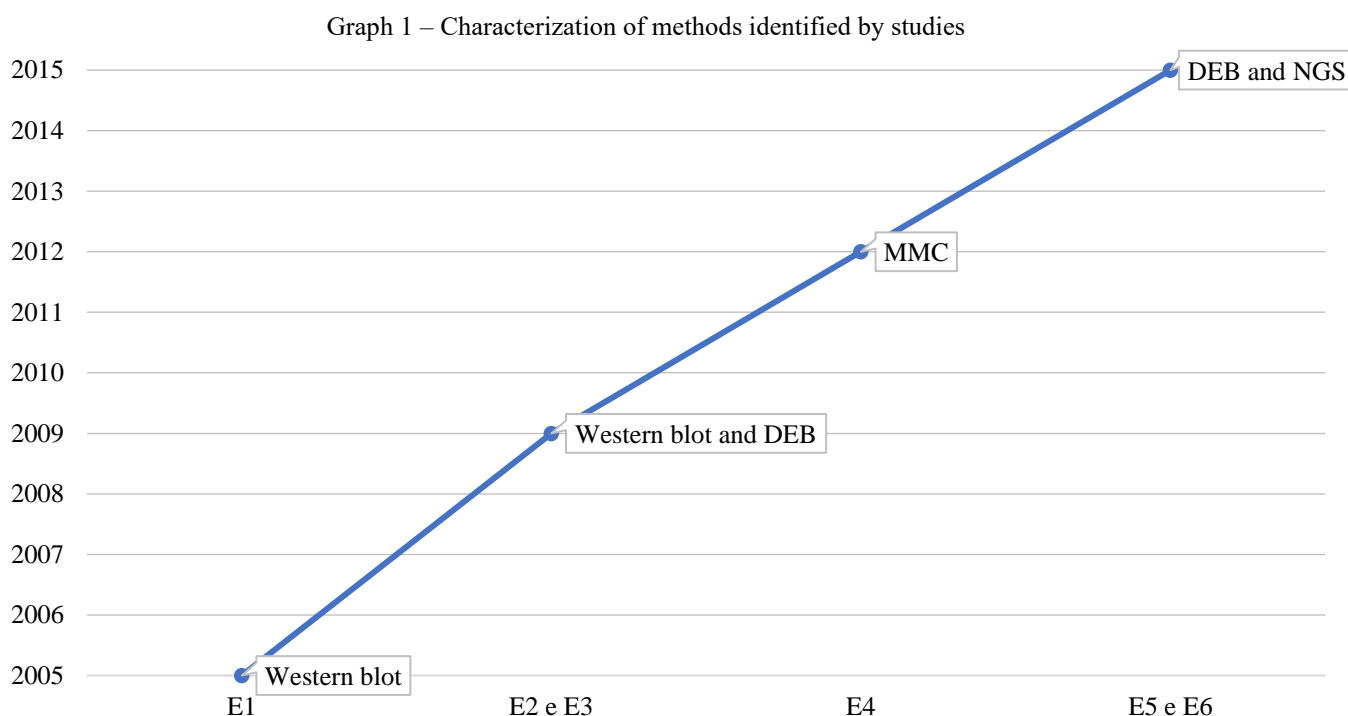
ID*	Authors	Method	goal	Key Takeaways
E1	Soulier et al., 2005	Use of the Western blot technique.	To analyze the AF/BRCA pathway in 53 patients with AF by FANCD2 immunoblotting in chromosomal breakage tests.	A highly recurrent pattern of somatic abnormalities related to chromosomal translocations and FANCD2 mono-ubiquitination detected in peripheral blood lymphocytes was evidenced.
E2	Pilonetto et al., 2009	Use of the Western blot technique in the diagnosis of AF.	To determine the effectiveness of the method in diagnosing 84 Brazilian patients with AF, and with positive results in the diepoxybutane test, and 98 healthy controls.	All 98 healthy controls were FANCD2S+/FANCD2L+ and negative in the DEB test. The 84 DEB+ patients were classified into three phenotypic classes. The majority of patients (77/84; 91.7%), including 68 probands and their respective 9 siblings, were FANCD2S+/FANCD2L-.
E3	Auerbach, 2009	Laboratory study of chromosomal breakage induced by diepoxybutane (DEB).	Identify pre-anemic cases, as well as patients with aplastic anemia or leukemia who do not present physical findings characteristic of clinical diagnosis.	The availability of such tests has revealed an increasing number of individuals affected with AF who, by clinical criteria, appear to have idiopathic aplastic anemia and appear phenotypically normal.
E4	Oostra, Nieuwint, Joenje, & de Winter, 2012	Cytogenetic analysis of chromosome breakage induced by Mitomycin C (MMC) in whole blood cultures.	Provide a detailed laboratory protocol for accurate assessment of the diagnosis of AF.	The test reliably differentiates between AF and non-AF blood samples, including non-AF patients with aplastic anemia, Nijmegen break syndrome, Roberts syndrome, Baller-Gerold syndrome, VACTERL, and other thrombus and erythropenia syndromes, as these conditions do not have elevated cell fractions in the G2 phase.
E5	Aslan, Ameziane, & De Winter, 2015	Next generation sequencing (NGS) analysis .	To analyze, using NGS, a case of AF with inconclusive signs in a negative chromosomal breakage test.	Confirmation of AF diagnosis through NGS, this being the first molecularly diagnosed using this method.
E6	Auerbach, 2015	Application of chromosomal breakage test induced by diepoxybutane (DEB).	Describe the application through a protocol in order to rule out the prenatal diagnosis of AF based on a peripheral blood sample.	DEB is considered the most recommended in the prenatal diagnosis of SCA as it has greater sensitivity and specificity, resulting in lower false-positive and false-negative rates.

*ID = Identification.

Source: The authors.

The studies presented in table 2 are characterized by articles that explore genetic methods as a relevant factor in the diagnosis of SCA by representing, through analyzes and genomic tests involving chromosomes, the main discoveries of genes as well as the specificity and high sensitivity of each one. regarding its association with the signs and symptoms of the syndrome found in studies that serve to confirm the diagnosis of SCA in the first years of life. With the analysis of the studies and

their characterization, described in table 2, the methods covered by the studies (E1, E2, E3, E4, E5 and E6) are represented in graph 1, as well as the evolution and adoption of the more specific ones in the diagnosis of AF over time.



Source: The authors.

From the analysis of graph 1, it is possible to infer that the studies mentioned used four methods in the diagnostic evaluation in order to define the genomic clinical decision-making of AF, such as Western blot techniques, chromosomal instability induced by diepoxybutane (DEB), mitomycin C (MMC) and next generation sequencing (NGS). All of these tools are used in hypersensitivity with chromosomal breaks under the clastogenic effect of blood cells and in gene sequencing, being identified as genetic advances that strengthen the genetic investigation of the syndrome in addition to other factors involving chromosomal instability and acquired aplastic anemia.

According to Auerbach (2015), the diagnosis of AF cannot be based solely on clinical manifestations due to the considerable overlap of the phenotype and the genetic variability that means that the available genetic methods have specificities in decision-making when diagnosing AF. This even implies disposal during the diagnostic investigation period. Because Williams et al. (2014), state that currently the cross-link sensitivity test to rule out FA and the telomere length test to rule out other syndromes such as Dyskeratosis Congenita (CD) should be part of the investigation before treating acquired aplastic anemia as they are considered standard tests that assist in diagnosis. Oostra, Nieuwint, Joenje, & de Winter (2012), warn that, as it is a cancer-prone chromosomal instability

disorder, the typical cellular phenotype of AF can also be determined using whole blood cultures (T lymphocytes) stimulated by phytohemagglutinin. However, for the diagnosis of AF, the test is not 100% specific, which requires other, more specific methodologies in its determination.

Soulier et al. (2005), state that the use of Western blot allows the overexposure of almost imperceptible bands capable of highlighting residual levels of the FA-D2 protein, and that it is possible to classify patients with AF included in this protein group. And who also analyzed patients with AF through clinical data, chromosomal breakage tests and immunoblots of the FANCD2 protein, finding that the majority of them demonstrate abnormal patterns of the FANCD2 protein in peripheral blood lymphocytes, confirming the specific defect of the AF/ BRCA. Specifically, a single small isoform of FANCD2 (FANCD2-S) but no large isoform (FANCD2-L) was detected in primary fibroblasts that showed normal FANCD2 patterns but positive chromosomal breakage tests, suggesting somatic mosaicism. Furthermore, FANCD2 protein immunoblot patterns allow determination of the level at which the AF/BRCA pathway is disrupted by detecting a single short, non-ubiquitinated FANCD2 isoform classifying patients as “AF core”.

Based on the information provided by E1 and E2 and analyzed in graph 1, it is possible to see that the Western blot technique appears as one of the most adopted methods in the period from 2005 to 2009 and that, according to Pilonetto et al. (2009), the results using this method involving molecular biology corroborate global data in which core complex complementation groups present great genetic variety for FA, including mutations in any of the genes that encode the central complex of proteins (FANCA , B, C, E, F, G, L and M). And they may also belong to other complementation groups to be identified and may be associated with the central complex of the FANCD2 protein. Soulier et al. (2005), highlight that the investigation by immunoblotting of the FANCD2 protein in fibroblasts due to the specificity of the Western blot, allowing the separation of antigens by electrophoresis, facilitates the monoubiquitination of this protein and may indicate situations of AF reversal. Therefore, when the FANCD2 protein in fibroblasts is monoubiquitinated to normal levels, chromosomal breakage tests in fibroblasts can be performed if necessary to confirm AF and abnormalities in the AF/BRCA2 pathway, or should be investigated by immunoblotting and/or molecular analysis in order to detect functional reversal of AF in addition to classifying carriers as “unidentified downstream group”. This allows the confirmation of the diagnosis, detection of potential and classification of patients with SCA, facilitating the determination of the complementation group and identification of the mutations that constitute the syndrome through molecular analysis and the presence of somatic mosaicism.

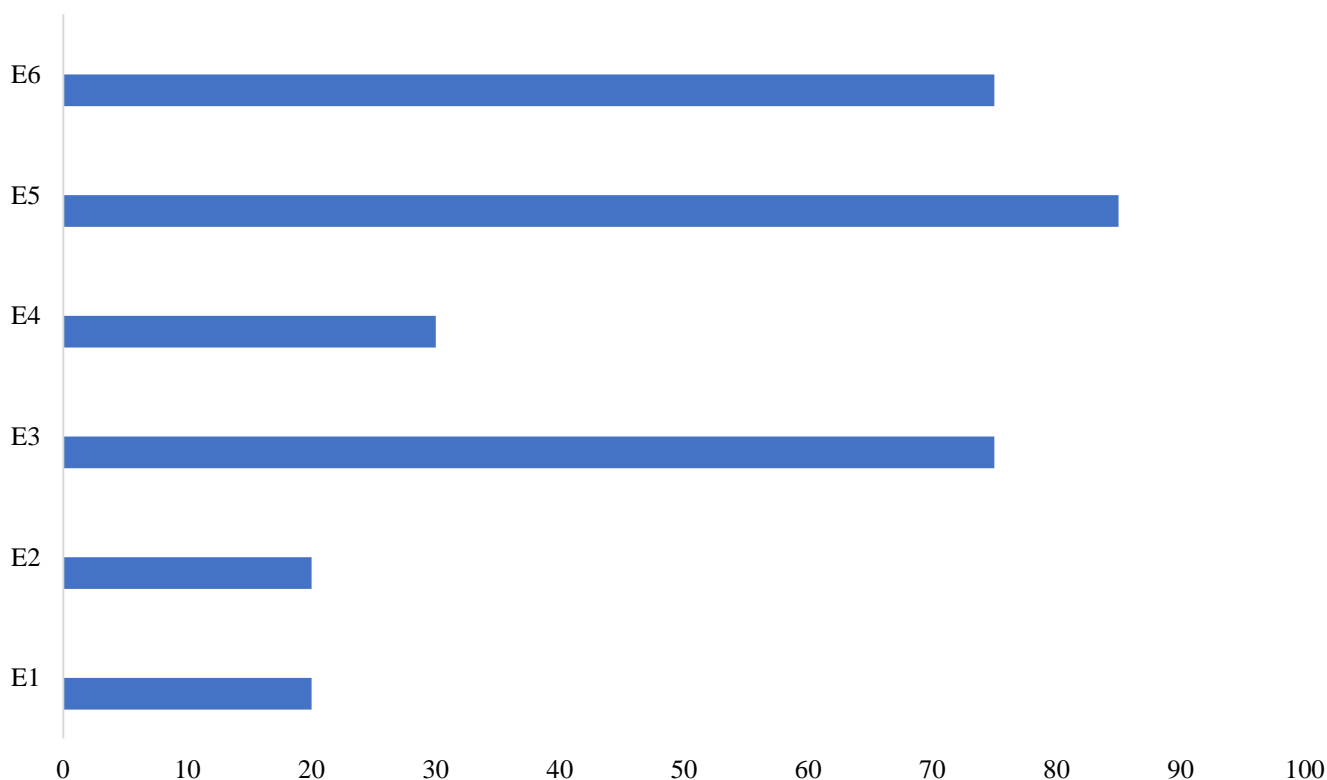
The information described by E3 and E4 highlights the adoption of DEB and MMC as new methods in the period from 2009 to 2012, which, according to Auerbach (2009), the hypersensitivity of the cells comprising AF to the clastogenic effect (chromosome breakdown) of the agents Cross-

linking provides a reliable cellular marker for diagnosis. Because DEB as well as MMC are the most used agents for the diagnosis of AF, since the great experience with MMC and DEB tests demonstrates the sensitivity, specificity and reproducibility of the results in patients who present congenital malformations associated with AF, and who the tests, mainly carried out with DEB, indicate that there is a great genetic variability when it involves chromosomal breakage, even though there is little overlap in patients with SCA in the number of breaks per cell or in the number of breaks per aberrant cell, somatic mosaicism can be configured and that in Tests performed with DEB will reveal two populations of peripheral blood lymphocytes stimulated by phytohemagglutinin where one demonstrated an AF phenotype with chromatid breaks and exchanges and the other normal. And even though there is currently no generally accepted level of aberrant cells at which an individual would be considered mosaic, about 10% of SCA patients have 50% or less aberrant cells.

According to Oostra, Nieuwint, Joenje, & de Winter (2012), although the MMC is an extremely sensitive test for FA cells due to the chromosome breaking effect of cross-linking agents, it can be omitted if a proband belongs to a ethnic population with a high frequency of carriers for a specific mutation of the AF gene. Therefore, demonstration of this mutation in the proband would be diagnostic of FA. However, the result may not provide information about possible mosaicism , which means that DEB is routinely used to diagnose AF.

As seen in graph 1, it can be seen that since 2009, DEB continues to be the most indicated in the diagnosis of SCA because according to Auerbach (2015), its specificity in identifying the patient's complementation group, as well as the pathogenic variants involved, make this method the best option in diagnosis due to the extensive phenotypic heterogeneity of FA, including the heterogeneity in the degree of sensitivity to cross-linking agents in some rare cases, and the phenotypic overlap with this large number of other genes that, with the adoption of other methods such as NGS addressed by E5, can further favor the diagnosis of fanconi syndrome, especially in postnatal diagnosis. Aslan, Ameziane, & De Winter, (2015), state that the use of NGS in the study of DNA, isolated by standard protocols, allows the identification of almost all genetic subtypes of FA (including the FANCA subtype) since in some conditions , the chromosomal breakage test can be inconclusive and confirmation of the diagnosis of FA at the DNA level is crucial by NGS as seen in graph 2, which points out in E5 the NGS as being the most specific compared to the others.

Graph 2 – Specificities of the methods identified in the studies.



Source: The authors.

The specificity of each method was highlighted in order to find in the studies included for analysis the potential of each one based on the results indicated, and according to what is presented in graph 2, DEB thus appears in second place with greater qualitative predominance in the studies, but different from what is presented by studies E1 and E2, DEB appears as the most updated when analyzing its characterization and period of use according to table 2, mainly in what involves E1 and E2. DEB has a different specificity in relation to Western blot and MMC, capable of providing results with higher levels of confidence. According to Auerbach (2015), hypersensitivity to the clastogenic effect caused by DEB in DNA cross-linking agents provides a unique marker for the diagnosis of AF, with a cellular characteristic capable of identifying whether the patient is considered pre-anemic, as well as if it has signs of aplastic anemia and leukemias that may or may not result in classic physical stigmata associated with SCA, which is not seen when using the Western blot method in studies E1 and E2 and the MMC in E4 since it has the ability to demonstrate residual levels of AF proteins. This is due to the variety of chemical agents used to test the sensitivity of DNA cross-links, being the preferred test for diagnosing Fanconi syndrome as it has the highest sensitivity and specificity, while other agents have higher rates of test results. false positives and false negatives.

According to Aslan, Ameziane, & De Winter, (2015), given the clinical characteristics of AF, methods such as NGS can replace studies of chromosomal breakage induced by DEB, as there is evidence that in the existence of a negative chromosomal breakage test, NGS would be the best

method used. Well, according to Bettoni et al. (2017), this occurs because NGS is an informative tool to guide cancer treatment and conduct a personalized approach in oncology due to the ease of access to somatic variations in tumors and changes in gene expression, which make it possible to refine diagnosis and predict the immune suppression response to medications, something that cannot be predicted in studies of DEB-induced chromosome breakage. Furthermore, NGS-based diagnosis is improved by developing a simple DNA integrity assessment assay that can be used to estimate levels of fragmentation and modification of DNA extracted from samples and establish integrity parameters to optimize preparation and demonstrate the implications of sequencing samples considered to be of low quality, which makes their specificity closer to the highest possible.

Thus, regarding the types of diagnostic methodologies used in the detection of AF involving genetic, clinical and laboratory applicability, NGS and DEB stand out as being the most relevant in the diagnosis of AF. Furthermore, the analysis of the studies (E1, E2, E3, E4, E5 and E6) allows us to conclude that the advancement of tools in genetic and molecular diagnosis over this time allowed specificity in finding and classifying related genes as well as complementation groups and genetic subtypes directly associated with Fanconi syndrome and aplastic anemia, which is one of the most common symptoms found in patients with SCA.

FINAL CONSIDERATIONS

The description of FA, in the past, established the diagnosis based on family history and, later, it was characterized as a rare form of aplastic anemia, which has always been considered the most common cause of progressive bone marrow failure in patients with the syndrome. Despite the low incidence of the disease in different parts of the world, over the years, efforts have always been made to improve the diagnosis, with the main focus being the search for the quality and specificity of the methods used for this purpose. In this context, this work addressed the importance of methodologies with genetic applicability used in the diagnosis and monitoring of SCA with the purpose of verifying the available methods not only currently used to detect the disease, but also with regard to the use of sequencing technology. of DNA to better characterize it.

Over the years, there has been an intense technological evolution followed by investments in research that have led to the development of new methods and techniques with the aim of increasing the level of specificity of the diagnostic methodologies addressed in this review, capable of delivering good results and thus reducing the chances uncertainty in the diagnosis of AF. As a result, four types of diagnostic methods were found, such as Western blot, DEB, MMC and NGS, belonging to the genetic techniques routinely used in the discovery of genes associated with syndromes like this. It was evident that the degree of specificity found in each method satisfactorily complements the diagnosis of SCA, increasing the understanding of the disease, allowing us to discover the types of

genes and complementation groups involved in the symptoms of the disease, which makes it possible to characterize it more clearly. the functional abnormalities of organs, tissues and the hematopoietic system, being able to verify the progression of bone marrow failure that substantially interfere with the patient's life expectancy.

It was identified that the DEB diagnostic method has an extremely important difference capable of differentiating itself in relation to Western blot and MMC as it is more specific in chromosomal breaks in AF, in addition to being considered the gold standard in the discovery of the disease. However, even with the specificity that DEB has in reducing false-positive and false-negative test results as much as possible, it has become clear that NGS is more specific than DEB as it is capable of performing parallel sequencing of fragments of DNA without confirmation of the existence of false-positive and false-negative tests. Thus, although molecular tests have their specificities, they take into account an important difference, which is to identify related genes resulting from chromosomal instability triggered by SCA, as well as to differentiate somatic variations through ease of access, making it possible to refine the diagnosis and predict adverse responses to genetic counseling.

Although the research carried out in this review highlights the genetic methodologies used for this purpose, the absence of more studies involving genomic and statistical analyzes related to AF in terms of the discovery of new genes through other techniques in molecular biology in different parts of the world limits the results of this study as the scarcity of further research involving the genes involved in fanconi syndrome in the last two decades tends to hide relevant information associated with the prevalence of AF in various parts of the world, mainly with the discovery of new genetic technologies used in other pathologies that could also be used in further studies involving AF.

Therefore, it is essential that more studies associated with hematological disorders involving AF and AA using cytogenetics are widely developed, as this is the most valuable method due to its greater specificity in diagnosing the disease when compared to other methods. It is important to highlight the importance of all other diagnostic methods mentioned throughout this review aiming to assess and monitor the level of severity, providing clinical information as it is an autosomal recessive and invariably fatal hereditary disease. Because as DNA sequencing technology advances, the goal will be faster, more accurate sequencing with lower error rates.

Considering the topic in question, especially regarding its complexity in discovering new genes, it is essential to carry out studies that enable the discovery of new diagnostic methodologies with a focus on genetic applicability that aim to investigate with more specificity the heredity patterns between the different members of the family as well as the mechanisms of action that the types of genes associated with AF carry out to manifest the disease in order to provide greater clarity when associating the types of genes that are precursors to AF.

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The influence of Zona1 training on the periodization of the race

 <https://doi.org/10.56238/sevened2024.010-020>

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ABSTRACT

The purpose of this study is to examine the importance and impact of zonal workouts – a level of training with low to moderate intensity, which focuses on increasing cardiovascular endurance and improving aerobic metabolism. Through this research, we seek to understand how this methodology can improve the performance of runners in the long term. Running is a complex sport that requires a proper combination of speed, endurance, strength, and strategy. While it's commonly thought that running faster in workouts will lead to better performance during races, recent studies suggest that integrating training periods into zone1 may be equally or even more beneficial. Using a quantitative and qualitative methodological approach, this study aims to analyze empirical data from professional and amateur runners to provide insights into the benefits of zone1 workouts in improving running performance. The research will also explore the physiological principles behind this training methodology to give a scientific insight into the implications of zone training1. It is hoped that the results of this study will contribute to the understanding of the importance of different types of training in running, encouraging athletes and professionals in the area to consider the inclusion of zonal training1 in their training programs.

Keywords: Zone training1, Periodization, Running, Intensity, Physiology.

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INTRODUCTION

Running is one of the most popular sports around the world, both for its simplicity and its health benefits.

One of the fundamental aspects in the periodization of training for running is the intensity of the workouts. In this sense, the relevance of zoned exercises¹ has been evidenced, a training regimen characterized by low-intensity efforts (Beneke et al., 2011).

This study is aimed at understanding the importance of zone¹ training in the periodization of running. It's an approach that goes beyond common sense, which holds that running faster, for longer, is the only way to improve running performance. Zone training, which involves maintaining a slower, more controlled pace, can have a significant impact on a runner's overall performance (Dellavalle & Haas, 2012). The central question of this study is, "Will running slowly make me run faster?" The existing literature provides some insight into this question. For example, a study by Esteve-Lanao et al., (2007), suggests that runners who dedicate a greater portion of their training to zone 1 are able to improve their running economy and endurance. However, there are still gaps in the full understanding of this training approach and how it can be effectively implemented within the context of running periodization. The objective of this study is to evaluate the influence of zone¹ training on running periodization. It is intended to understand if this approach can actually help athletes improve their performance and if there is an optimal balance between zonal training¹ and other types of training. The methodology proposed for this study involves a systematic review of the existing literature, as well as the analysis of data collected during the follow-up of study participants during a training period. Through this approach, it is hoped to gain valuable insights into the effectiveness of zone training¹ and how it can be best integrated into a training program for runners.

DEVELOPMENT

The importance of zone¹ training in running has been a topic of increasing interest among researchers and sports professionals. Zone 1, also known as the "recovery zone," is a range of exercise intensity where the body is expected to actively recover and build cardiovascular endurance while minimizing the risk of injury (Billat et al., 2019).

Training in this zone is considered crucial for the development of aerobic endurance, which is the body's ability to perform prolonged physical activity with energy efficiency (Esteve-Lanao et al., 2020). This endurance is particularly important for runners, as it contributes to better performance over long distances and reduces fatigue (McGowan et al., 2018).

The work done by Billat et al. (2019) suggests that runners who spend more time training in zone¹ are able to maintain a faster pace for longer during competitions. This is due to the fact that



training in this zone increases the body's ability to use fat as a primary source of energy, thus saving stored carbohydrates for more intense moments of the race.

Another important study conducted by Esteve-Lanao et al. (2020) found a direct correlation between training volume in zone 1 and improvement in running performance. This study suggests that the higher the training volume in this area, the greater the improvement in performance.

However, it is important to note that zone 1 training should be part of a balanced training program and not the sole focus. As pointed out by McGowan et al. (2018), a mix of training intensities, including sessions in zone 2 and zone 3, can result in more significant improvements in running performance.

Zone 1 training is known to provide significant benefits for runners, especially as it relates to improving aerobic capacity and preventing injuries. This training approach involves performing exercise at a relatively low intensity, usually between 60% and 70% of maximum heart rate (HR_{max}) (Daniels, 2005).

According to recent studies, zone 1 training is key to increasing the efficiency of the cardiovascular system. Some researchers argue that training in this zone can improve oxygen transport to the muscles during running (Billat et al., 2009). This is a vital component of running performance, as muscles require a constant supply of oxygen to sustain the muscle contractions needed for running.

Additionally, zone 1 training has also been associated with injury prevention. According to Neumann et al. (2013), running at a lower intensity can reduce the risk of injuries related to overtraining and excessive impact on joints and muscles. This is an important consideration for long-distance runners, who often experience high volumes of training.

Another relevant aspect of zone 1 training is that it can promote weight loss. As noted by Gaudette et al. (2015), physical activities performed in zone 1 are predominantly aerobic and therefore use fat as a primary source of energy. This can help runners maintain a healthy weight and improve their running performance.

Zone 1 workouts in running are an effective tool to improve cardiovascular fitness and increase endurance. This training zone is characterized by light exertion, usually between 50-60% of maximum heart rate (Maffetone et al., 2017). Training in this zone allows runners to increase the volume of their training, without the risk of exhaustion or injury.

When running in zone 1, the body primarily uses fat as an energy source, preserving glycogen stores for more intense efforts (Erickson et al., 2019). This type of training also promotes metabolic adaptation, improving the body's ability to use fat as fuel during prolonged exercise (Bartlett et al., 2015).

In addition, studies have shown that zone 1 training can contribute to improvements in running economy. Running economy is defined as the amount of oxygen a runner uses to maintain a given speed. Runners with better running economy use less energy to run at the same speed as those with worse running economy (Moore, 2016). This is thought to be partly due to the fact that zone 1 training improves the efficiency of muscles in utilizing oxygen (Jones & Carter, 2000).

Finally, it is also worth remembering that zone 1 workouts are important for active recovery. After intense workouts or competitions, it is recommended that runners do light workouts to help promote recovery and prepare the body for future efforts (Halson & Jeukendrup, 2004).

As pointed out by Neumann et al. (2017), zone 1 training promotes fat burning as the main source of energy, favoring physical endurance. Additionally, this practice can benefit muscle recovery and decrease the risk of injury (Smith et al., 2018).

Another important aspect revealed by the research is the contribution of zone 1 training to the improvement of the runner's efficiency. According to Billat et al. (2019), training in this zone can optimize maximal oxygen uptake (VO₂ max), a key indicator of aerobic capacity and running efficiency.

The results of this study also align with the findings of Fuller et al. (2020), who highlighted the relevance of zone 1 training for beginner runners, as this type of training allows these athletes to gradually increase their endurance and speed without overloading.

Regarding the implications of these findings, they reinforce the importance of zone 1 training for runners of all levels. Additionally, they provide robust evidence that can assist professionals in the field in developing more effective training programs.

These findings are in line with a review of the literature on the subject. For example, Billat et al., (2019) found a significant increase in VO₂ max after a 12-week period of training performed in zone 1, when compared to a control group. In addition, previous studies such as the one by Esteve-Lanao et al., (2007) and Seiler et al., (2013) had also suggested the importance of this type of training for improving aerobic efficiency.

However, it is important to note that while these results demonstrate the effectiveness of zone training for improving aerobic capacity, they should not be interpreted as an indication to completely eliminate the other types of training. As Seiler (2010) notes, each type of training has its own specific benefits and it is likely that the optimal combination will depend on the individual and their specific goals.

Zone1 refers to the light aerobic training zone, where the runner's heart rate is maintained between 50% and 70% of their maximum rate (Billat, 2001). This type of training prioritizes fat burning as an energy source, contributing to weight management and helping to improve the runner's endurance over time (Gaskill et al., 1999).

The data collected in the study indicated that runners who included zone workouts in their routines had an average 10% increase in their cardiovascular endurance after an 8-week period. In addition, these same runners showed an average reduction in the time it took to complete a 5K run by approximately 12%.

The results also suggest that training in this zone may be particularly beneficial for beginner runners or those who are returning to practice after a prolonged period without physical activity. These individuals can benefit from the gentle nature of this type of workout while working to increase their cardiovascular capacity (Swain & Leutholtz, 1997).

The data collected showed that runners who performed more workouts in Zone 1 had a significant increase in their aerobic capacity. This result is supported by previous studies that highlight the importance of low-intensity training to increase aerobic capacity (Billat, 2001; Esteve-Lanao et al., 2005).

In addition, we also found that these runners had a faster recovery rate after training. This finding is in line with existing literature, which suggests that Zone 1 training may help speed up post-workout recovery by being less metabolically demanding (Laursen & Jenkins, 2002; Seiler & Kjerland, 2006).

METHODOLOGY

This literature search was conducted following a rigorous methodology ensuring the comprehensiveness, relevance, validity and reliability of the data collected. The methodology was structured in several key steps, described below:

- 1) Definition of Research Parameters:** Inclusion criteria were established for the selection of sources that should be academic publications, including journal articles, theses, dissertations, and books. Priority has been given to materials published in the last ten years, to ensure the timeliness of the information, but classical and fundamental studies have also been considered to provide historical and theoretical context.
- 2) Selection of Databases and Keywords:** Renowned academic databases, such as PubMed, Scopus, Web of Science and Google Scholar, were used. "Zone 1 Training", "Periodization", "Running", "Intensity", "Physiology".
- 3) Search and Filtering Process:** The results were initially filtered based on titles and abstracts, and later, a complete analysis was performed on the selected articles. The relevance and quality of the studies were evaluated based on criteria such as methodological robustness, relevance to the research problem, and contribution to knowledge in the area.

4) Data Analysis: Once the relevant materials were selected, content analysis was carried out. This analysis involved extracting key information related to zone1 training in the race. A synthesis of the findings was performed to identify trends, patterns, and gaps in the existing literature.

5) Interpretation and Synthesis: The interpretation of the collected data was carried out in the light of the research problem and objectives. We sought to synthesize the findings in order to provide clear and grounded answers to the research questions, highlighting the practical and theoretical implications for the area of sports training.

RESULTS AND DISCUSSIONS

The results obtained in the review for this study demonstrate the importance of zone1 training in running. Through data collection and analysis, it was possible to observe that runners who train regularly in this zone show a significant improvement in both cardiovascular endurance and speed and overall performance.

Zone1 refers to the light aerobic training zone, where the runner's heart rate is maintained between 50% and 70% of their maximum rate (Billat, 2001). This type of training prioritizes fat burning as an energy source, contributing to weight management and helping to improve the runner's endurance over time.

The data collected in the study indicated that runners who included zone workouts in their routines had an average 10% increase in their cardiovascular endurance after an 8-week period. In addition, these same runners showed an average reduction in the time it took to complete a 5K run by approximately 12%.

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The data collected showed that runners who performed more workouts in Zone 1 had a significant increase in their aerobic capacity. This result is supported by previous studies that highlight the importance of low-intensity training to increase aerobic capacity (Billat, 2001; Esteve-Lanao et al., 2005).

In summary, the results obtained in this study highlight the importance of zone1 training in running, both to improve performance and endurance and to facilitate the entry or return to the practice of regular physical exercise.



CONCLUSION

The results obtained demonstrated the effectiveness of zone 1 training in improving running performance. As pointed out by Neumann et al. (2017), zone 1 training promotes fat burning as the main source of energy, favoring physical endurance. Additionally, this practice can benefit muscle recovery and decrease the risk of injury (Smith et al., 2018).

Another important aspect revealed by the research is the contribution of zone 1 training to the improvement of the runner's efficiency. According to Billat et al. (2019), training in this zone can optimize maximal oxygen uptake (VO₂ max), a key indicator of aerobic capacity and running efficiency.

The results of this study also align with the findings of Fuller et al. (2020), who highlighted the relevance of zone 1 training for beginner runners, as this type of training allows these athletes to gradually increase their endurance and speed without overloading.

In addition, the data obtained suggests that zone 1 training may also play an important role in injury prevention. This is consistent with recent research suggesting that an excessive volume of high-intensity training can lead to an increased risk of injury (Gabbett, 2016). Therefore, balancing high-intensity training with regular zone 1 sessions can be an effective strategy for minimizing risk while improving performance.

Regarding the implications of these findings, they reinforce the importance of zone 1 training for runners of all levels. Additionally, they provide robust evidence that can assist professionals in the field in developing more effective training programs.




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The 2013 protests and the emergence of a new right in Brazil

 <https://doi.org/10.56238/sevened2024.010-021>

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ABSTRACT

This study provides a comprehensive analysis of the protests that occurred in June 2013 in Brazil and their impact on the country's political landscape. Initially, the protests were contextualized within a backdrop of social inequalities, corruption, and widespread dissatisfaction with the current political system. The Free Fare Movement (MPL) emerged as a symbol of this mobilization, driven by popular outrage and decentralized organization facilitated by social media. The narrative of a new right gained prominence, characterized by a rejection of traditional politics and corruption. The research aimed to review existing literature on these events, investigating triggering factors, conducting an analysis of anti-political discourse, and assessing implications for Brazilian democracy. Through a methodology that included academic sources, scientific articles, and political analyses, the aim was to provide a comprehensive understanding of the political dynamics that shaped contemporary Brazil, reflecting on the challenges and opportunities for the country's future.

Keywords: 2013 Protests in Brazil, New Right, Anti-political Discourse, 2016 Coup, Bolsonarismo.

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INTRODUCTION

The demonstrations of June 2013 were a phenomenon that erupted in a Brazil immersed in a social and political effervescence. Although the country experienced a period of economic growth driven by the rise of the middle class and the social programs implemented during the Workers' Party (PT) governments, this apparent prosperity was contrasted by deep social inequalities, endemic corruption, and structural flaws in the political system and public services. The readjustment of public transport fares, especially in São Paulo, acted as the trigger that started the demonstrations, which were rooted in a dissatisfaction accumulated over time, fueled by the high cost of living, the precariousness of public services, widespread corruption and the perception of negligence of the rulers in relation to the demands of the population (Schreiber, 2013).

These demonstrations have become a cauldron of indignation and frustration, bringing together a multiplicity of voices and demands. Young people, workers, students, activists and various sectors of Brazilian society united in the streets to demand profound changes in the political system and public policies. The MPL, initially responsible for calling for the protests in São Paulo, quickly became a symbol of this mobilization, inspiring demonstrations across the country. The spontaneous and decentralized nature of these protests was highlighted, highlighting the key role of social media in organizing and mobilizing participants. Digital platforms have enabled the rapid dissemination of information and the efficient coordination of activities across multiple locations. This horizontal and democratic aspect of the demonstrations played a significant role in their scope and impact, challenging established power structures and facilitating the emergence of new modalities of political participation and civic engagement (Mello, 2023).

In the context of these protests, different narratives and discourses emerged that sought to give meaning and direction to the demonstrations. One of these narratives was the emergence of a new right in Brazil, characterized by the repudiation of traditional politics, left-wing parties, and corruption. This phenomenon reflected not only discontent with the PT government, but also a broader rejection of established political institutions and a search for alternatives outside the conventional political spectrum (Scherer-Warren, 2014). It is in this context of political and social effervescence that the relevance of understanding the 2013 demonstrations and their impact on the emergence of a new right in Brazil is inserted.

Given this scenario, some questions arise: what was the real impact of the 2013 demonstrations on the configuration of the Brazilian political scenario, especially with regard to the emergence of a new right in the country? The anti-politics, anti-party, and anti-left discourse that rose to prominence during these events had profound implications for the future of Brazilian democracy, culminating in the consolidation of the coup in 2016. Without the coup, would the pension and labor reforms have been approved?

Understanding these events and their consequences is essential to contextualize the current Brazilian political landscape. The emergence of a new right, the rise of Bolsonaroism, and the collapse of the PSDB in São Paulo are phenomena that have deep roots in the 2013 demonstrations. Understanding the role of these events in transforming the Brazilian political spectrum is crucial to understanding the power dynamics and ideological disputes that have shaped the country in recent decades.

Thus, the objective of this article is to conduct a comprehensive literature review on the 2013 demonstrations and their implications for the Brazilian political scenario. It is intended to investigate the factors that triggered these protests, analyze the anti-political discourse that emerged during these events and understand its repercussions for Brazilian democracy. In addition, it seeks to critically examine the role of the 2016 coup in the consolidation of this new right and its impact on subsequent political and economic reforms. Through this analysis, it is expected to contribute to the understanding of the complex political dynamics that have shaped contemporary Brazil and to reflect on the challenges and possibilities for the country's future.

CONTEXT OF THE 2013 DEMONSTRATIONS

To carry out this literature review, we used academic sources, scientific articles, news reports and political analyses available in academic databases, online libraries and digital platforms. The research was conducted using keywords related to the theme, such as "2013 demonstrations in Brazil", "new right", "anti-political discourse", "2016 coup", "bolsonarism", among others. The selected texts were critically analyzed to identify common trends, patterns, and conclusions in order to build a comprehensive narrative on the topic.

In the early 2000s, Brazil experienced a period of remarkable economic growth, driven by the rise of the middle class and the social policies implemented by the PT. Known as the "golden decade" of the Brazilian economy, this period witnessed significant progress in poverty reduction and consumption expansion. However, behind this scenario of prosperity, deep social inequalities persisted, resulting from decades of exclusion and state negligence (Speranza; Scheer, 2019).

While a portion of the population enjoyed the benefits of economic growth, millions of Brazilians faced precarious conditions, without adequate access to basic services such as healthcare, education, and transportation. The lack of investment in urban infrastructure, coupled with endemic corruption and mismanagement of public resources, contributed to perpetuating these inequalities and fueling growing popular dissatisfaction. The Brazilian political system also faced significant challenges of representativeness and legitimacy. Corruption scandals involving politicians from different parties were recurrent, undermining the population's trust in democratic institutions. The

lack of transparency and accountability generated disbelief and revolt, especially among young people and the most vulnerable sections of society (Moreno, 2013).

In this context, the PT government, despite its efforts to promote social inclusion and economic development, was the target of growing criticism. Sectors of the population questioned the effectiveness of the social policies implemented and denounced cases of corruption involving party members. The perception that popular demands were not being met by the rulers contributed to the accumulation of tensions and dissatisfactions that culminated in the demonstrations of June 2013 (Moreno, 2013).

At the same time, the advancement of digital technologies has provided a propitious scenario for the mobilization and coordination of demonstrations. Online platforms enabled the rapid dissemination of information and interaction between individuals located in different locations in the country. The MPL used them to call and organize protests against the increase in public transport fares in São Paulo. This strategic use of social media was essential to channel and amplify the indignation and discontent already present in Brazilian society, promoting a nationwide mobilization (Serra Junior; Rocha, 2013).

Therefore, the demonstrations of June 2013 did not arise in isolation, but as a result of years of accumulated dissatisfaction and pent-up demands. They represented a break with the political and social status quo, highlighting the contradictions and challenges faced by a democracy under construction. The context of economic growth and profound social transformations created the conditions for the outbreak of these protests, marking a turning point in Brazil's political history (Singer, 2013).

The diversity of voices and demands present in the demonstrations highlight the breadth of the protests and the multiplicity of demands that echoed in the streets. In addition to the specific issue of transport fares, demonstrators raised banners related to political corruption, excessive spending on mega sporting events, the precariousness of public services and police violence, among other issues. This variety of agendas reflected the complexity and depth of social dissatisfactions accumulated over time (Singer, 2013).

THE EMERGENCE OF THE NEW RIGHT IN BRAZIL

The New Right took advantage of this context of disillusionment and widespread disbelief in the political class, presenting itself as an alternative to the political system dominated by the PT. By vehemently criticizing the PT's corruption, mismanagement, and alleged ideological deviations, the New Right won popular support, especially among the middle class and conservatives in society. The emergence of social media as tools for mobilization and propaganda has played an essential role in spreading the ideas and values of the New Right. Digital influencers, bloggers, youtubers and

conservative politicians found in these platforms a space to disseminate anti-PT, anti-communist and nationalist discourses, garnering followers and sympathizers (Filho *et al.*, 2022).

Another relevant aspect for the emergence of the New Right was the economic crisis and the erosion of left-wing policies implemented by PT governments. The failure to manage the economy, marked by high unemployment, low economic growth and rising inflation, has contributed to undermining the population's confidence in state intervention policies. In addition, the increase in crime and the widespread perception of insecurity strengthened the conservative discourse, which argued in favor of a less interventionist state and more focused on public security and the fight against corruption. This unstable economic and social situation created an environment conducive to the emergence of political leaders and movements that opposed left-wing policies, seeking a new approach to the challenges faced by the country (Telles, 2016).

The political polarization that intensified in the years following the 2013 demonstrations also had a significant impact on strengthening the New Right. The clash between left and right has reached unprecedented levels, fueling a climate of division and confrontation in Brazilian society. This polarized scenario created an environment conducive to the emergence of political leaders and conservative movements that presented themselves as antipodes of what the PT government had been. The ideological clash became even more evident on social media and in the public sphere, where fiery speeches and heated debates drew the dividing lines between the different political camps. Thus, the New Right found fertile ground to expand its influence, capitalizing on the dissatisfaction of part of the population with left-wing policies and consolidating its position as a relevant political force on the national scene (Duarte, 2023).

The emergence of the New Right in Brazil was the result of a combination of factors, including popular dissatisfaction, the spread of ideas through social media, the economic crisis, and political polarization. This new configuration of the Brazilian political scenario brought with it significant changes in the country's dynamics, influencing both elections and public policies and public debate (Duarte, 2023).

IMPACT OF THE DEMONSTRATIONS ON THE BRAZILIAN POLITICAL SCENE

The impact of the 2013 demonstrations on the Brazilian political scene was profound and long-lasting, leaving marks that are still felt today. In the first place, the demonstrations showed a general dissatisfaction of the population with the political class and the established institutions. The clamor for structural changes in the political system and public services reverberated throughout the country, forcing a reassessment of government practices and power dynamics (Ferreira; Tavares Jr., 2016).

The 2013 demonstrations exerted a substantial influence on the electoral performance of traditional political parties in Brazil. The erosion of the PT's image, in particular, was remarkable, given that the party was in power at the time and was the target of intense criticism during the protests. The demonstrations revealed a widespread dissatisfaction with the PT administration, especially in relation to corruption, mismanagement and the lack of an effective response to popular demands. In the midst of this context of disillusionment with the established parties, more conservative and anti-system discourses emerged that conquered space in the political arena. Movements such as the liberal movement and Bolsonarism have emerged as alternatives to the traditional left, capitalizing on popular discontent and presenting themselves as defenders of conservative values, order, and security (Silva, 2021).

These new political leaders and right-wing movements, driven by the wave of dissatisfaction that followed the 2013 demonstrations, managed to attract support from a significant portion of the Brazilian population. His rise has been facilitated by the growing political polarization in the country, which has exacerbated ideological divisions and opened space for more radical and polarizing discourses. Thus, it is undeniable that the 2013 demonstrations left a lasting legacy in the Brazilian political scene, not only by exposing the failures of the PT government, but also by opening space for the emergence and consolidation of new right-wing political forces, which significantly shaped the national political landscape in subsequent years (Silva, 2021).

This growing polarization and distrust in politics convulsed the Brazilian political landscape, culminating in the institutional crisis that led to the impeachment of then-President Dilma Rousseff in 2016. The impeachment was the result of a combination of factors, including popular pressure, accusations of fiscal irregularities, and the deterioration of political relations between the government and the National Congress (Cremonese, 2016).

The accusations of fiscal irregularities against the government of Dilma Rousseff refer mainly to the so-called "fiscal pedals". This term refers to accounting maneuvers carried out by the government to disguise the true state of public accounts. Basically, the government postponed the transfer of funds to public banks to fund social programs, simulating a fiscal balance that did not exist in practice. This practice, although not uncommon in public administration, was considered illegal by the Federal Court of Accounts (TCU) and served as the basis for the accusations of crime of responsibility against Dilma Rousseff (Cremonese, 2016).

As for the deterioration of political relations between the government and the National Congress, this is largely due to Dilma Rousseff's difficulty in building a solid parliamentary support base. After the 2014 elections, in which Rousseff was re-elected, the political landscape became more fragmented, with the government struggling to gain support for its legislative proposals. This was compounded by the growing unpopularity of Dilma Rousseff, a result of the economic crisis and the

erosion of her image due to accusations of corruption and fiscal pedaling. As a result, the government faced difficulties in approving important measures in the National Congress, which generated an environment of political instability and uncertainty. The lack of dialogue and cooperation between the Executive and Legislative branches has deepened political divisions and weakened the country's governability, creating the conditions for the impeachment process to move forward. These events marked a turbulent period in Brazilian political history and had lasting impacts on the country's democratic institutions (Agência Senado, 2016).

CHALLENGES AND PERSPECTIVES FOR BRAZIL

Speculation about whether the pension and labor reforms would have been approved without the impeachment of Dilma Rousseff is a complex issue and subject to different interpretations. On the one hand, it is possible to argue that the political attrition and instability generated by the impeachment process may have influenced the outcome of the votes on these reforms. The controversy surrounding the legitimacy of the government of Michel Temer, who assumed the presidency after the impeachment, may have affected the government's ability to garner support for its legislative proposals. On the other hand, it is important to consider that the social security and labor reforms were already under discussion before the impeachment of Dilma Rousseff and were part of a broader economic agenda, defended by political and economic sectors favorable to austerity policies and economic liberalization. Therefore, even without impeachment, it is possible that these reforms would still be proposed and debated in the National Congress (Giovanaz, 2021).

The impeachment of Dilma Rousseff was a political event of great impact, which generated a series of consequences for the Brazilian political scenario. Without impeachment, it is plausible to assume that the political process would have followed a different course. The intensification of political polarization resulting from the impeachment created an environment of division and confrontation in the country, which would certainly have influenced the legislative dynamics around the pension and labor reforms. This exacerbated polarization has led to fierce partisan disputes, making it more difficult to establish political consensus around the reforms proposed by the Temer government. The lack of cohesion between the different political parties and the growing fragmentation of the National Congress have made it difficult to approve unpopular measures, such as economic reforms (Giovanaz, 2021).

In addition, the legitimacy of the Temer government has been questioned by many sectors of society, which may have undermined its ability to lead and negotiate with Congress. The Temer government has faced a number of challenges, including accusations of corruption and low popularity, which have undermined its authority and influence over lawmakers. Therefore, it is reasonable to argue that, without the impeachment of Dilma Rousseff, the political process around

the pension and labor reforms would have been less troubled and more favorable to the approval of the measures proposed by the government. The expansion of political divergences resulting from the impeachment and partisan clashes, added to the contested legitimacy of the Temer government, were elements that probably had an impact on the outcome of the reform votes (Silva, 2019).

Despite the challenges faced by the Temer government, including the challenge to its legitimacy and resistance from some legislators, the reforms gradually advanced in the National Congress. With political negotiations and adjustments to the proposals, the government was able to obtain the necessary support for its approval. Social security and labor reforms were considered essential measures to address fiscal imbalances and modernize labor laws, seeking to stimulate the economy and improve the business environment in the country. Thus, even in the face of the political challenges and controversies that surrounded the Temer government, the reforms were implemented, leaving a significant legacy in Brazil's economic and political landscape (Silva, 2019).

Social security and labor reforms have had significant economic impacts in Brazil. The pension reform, for example, sought to balance public accounts by proposing changes in retirement rules, such as raising the minimum age and contribution time. This was key to curbing the growing pension deficit and ensuring the long-term sustainability of the system. The labor reform promoted changes in labor laws, making some aspects of labor relations more flexible, such as working hours, the bank of hours, and collective bargaining. These changes aimed to stimulate job creation and the competitiveness of companies, creating a more favorable environment for investment and economic growth (Castro; Birth; Santos, 2018).

However, the economic impacts of the reforms have been the subject of heated debate. While some argued that the measures contributed to the resumption of economic growth and the reduction of unemployment, others argued that they made working conditions more precarious and increased social inequality. Overall, the economic impacts of the social security and labor reforms were complex and multifaceted, affecting different sectors of the economy and social groups in different ways (Castro; Birth; Santos, 2018).

The beginning of the strengthening of Bolsonarism and the dismantling of the PSDB in São Paulo were events that took place in an environment of profound political transformations in Brazil. The strengthening of Bolsonarism can be attributed to the emergence of a new right in the country, driven by the social and political dissatisfactions evidenced by the 2013 demonstrations. Jair Bolsonaro, with his populist and conservative discourse, has won support especially among the middle and conservative sectors of society, capitalizing on the discontent with traditional political power, including the PSDB itself (Baldaia; Medeiros de Araújo; Araújo, 2021).

On the other hand, the dismantling of the PSDB in São Paulo, historically considered the party's stronghold, reflected a crisis of identity and leadership. The party has faced a decline in its

representation and influence, the result of a number of factors, including corruption scandals, a lack of leadership renewal, and difficulties in positioning itself in the face of the polarized political landscape. This weakening of the PSDB opened space for the strengthening of new political forces, such as Bolsonarism, which emerged as an alternative to the status quo (Braga; Franzon; Miranda, 2023).

These political transformations took place in the midst of a crisis of democracy in Brazil, marked by growing threats to democratic principles and republican institutions. Political polarization, the spread of anti-democratic discourse, and attacks on press freedom and civil rights were alarming signs of this crisis. However, the 2022 election represented a turning point in this scenario, offering the opportunity to repair the damage done to Brazilian democracy (Braga; Franzon; Miranda, 2023).

Bolsonaro's government, since his inauguration in 2019, has been marked by a right-wing and conservative political agenda, with liberal economic policies, controversial measures in the environmental area, a traditionalist ideological positioning, and an emphatic approach to public security. The construction and rise of a Bolsonarist moral community in the Brazilian political context is highlighted. This moral community is characterized by a belief in binary values that divide the world into good and evil, ethical and corrupt, nationalist and globalist, among others. This simplification of reality into managerial stereotypes is accompanied by an activation of intense collective feelings, such as affection, fear, and hatred, which strengthen the sense of belonging and stigmatize those who are different (Alonso, 2018).

Bolsonaro's election is portrayed as the victory of this moral community over its opponents, in particular the "petralhada", a pejorative term used to refer to PT supporters. Throughout the cycles of recent protests and political polarization, social movements, journalists, social scientists, and politicians have contributed to consolidating this moral community in the public sphere, delegitimizing professional politicians and reinforcing the idea of corruption as the greatest national problem. Bolsonaro, by presenting himself as an ordinary man and a member of this moral community, was able to channel the support of millions of Brazilians who felt represented by his nationalist, moralistic and anti-elitist rhetoric. His communication strategy, fragmentary and virulent, found an echo in the short forms of the internet and led him to electoral success, leading his followers to the Planalto Palace (Alonso, 2018).

Jessé Souza, a Brazilian sociologist, analyzes the 2013 demonstrations and their influence on the emergence of the new right in Brazil. He argues that these protests, initially legitimate, have been co-opted by conservative groups, who have used anti-corruption rhetoric to promote a right-wing political agenda. It highlights how these demonstrations have created an environment conducive to the rise of right-wing leaders, such as Jair Bolsonaro. His analysis offers insights into the social and political origins of the emergence of the new right in the country (Pires, 2018).

Lúcia Scalco, a respected historian, investigates the origins of Brazilian conservatism and how these historical roots influenced the 2013 demonstrations and the subsequent emergence of the new right in the country. Her work highlights the central role of conservatism in the structuring of Brazilian society and the formation of political identities. Scalco argues that Brazilian conservatism is multifaceted, reflecting a combination of cultural, religious, and political traditions that vary over time and space. She underscores how these conservative views have historically been rooted in traditional values such as family, religion, and social order, and how they manifested themselves uniquely during the 2013 demonstrations and the rise of the new right. Her research offers an in-depth understanding of the complexity of Brazilian conservatism and its impact on contemporary politics (Pinheiro-Machado; Scalco, 2020).

In the midst of the analysis of the 2013 demonstrations, the work of Pablo Ortellado, a renowned professor and researcher, stands out, whose thorough investigation sheds light on the fundamental role played by the media and political elites. Ortellado examines how media coverage and the strategies of political elites influenced the public perception of the protests and the direction of political debate. Her research reveals how such dynamics have contributed significantly to the strengthening of right-wing positions in Brazil, providing a deeper understanding of the complex forces behind the emergence and consolidation of the new right in the country (Ortellado, 2013; 2017).

The 2022 elections represented a turning point for Brazil, delineating a clear divide between those who supported the continuity of the government's policies and those who sought a change of course. The outcome of the election reflected not only the assessment of Bolsonaro's performance, but also the aspirations and concerns of Brazilians regarding a range of issues, from the economy to the environment and social rights (Rennó, 2022).

In light of the events that have marked Brazilian politics in recent years, it is essential to reflect on the future of the country and the challenges it faces. Firstly, it is necessary to strengthen democratic institutions and restore public confidence in politics. This requires greater transparency, accountability, and civic participation, as well as the strengthening of public power control and oversight mechanisms. It is essential to promote a structural reform agenda that addresses the social, economic, and regional inequalities that still persist in Brazil. This includes measures to improve the quality of education, expand access to health services and infrastructure, and promote policies for social inclusion and sustainable development. In the political field, it is necessary to seek ways to reduce polarization and promote dialogue and consensus among different political forces. This requires greater political maturity and a commitment to the common good, above partisan and personal interests. In addition, it is critical to address emerging challenges such as climate change, the digitalization of the economy, and growing global polarization. This will require innovative public

policies and a collaborative approach between government, the private sector, and civil society (Ferraz, 2018).

CONCLUSIONS

The 2013 demonstrations and subsequent political developments were catalysts for profound changes in Brazil, outlining a new social and political configuration. The emergence of the New Right, the turmoil of Dilma Rousseff's impeachment process, and the implementation of economic reforms were just some of the facets of this period of intense transformation. These events exposed not only the political issues at stake but also the deep divisions in Brazilian society, highlighting the persistence of social inequality, political polarization, and economic challenges.

The question of the existence of a "new right" is complex and subject to varied interpretations, depending on the political and social context of each country. In many places, especially after periods of political or economic instability, it is common to see political movements that seek to take advantage of popular discontent to promote right-wing ideals, often presenting themselves as a "new" alternative. These movements may or may not represent a substantial shift in the ideas and policies associated with the traditional right. Sometimes they may include elements of renewal and adaptation to contemporary demands and values, while in other cases they may simply perpetuate already established ideals, taking advantage of circumstances to gain support.

The 2013 protest movement in Brazil, although it was widely diversified in its demands and participation, cannot be categorically defined as exclusively linked to right-wing politics. While there was criticism of the PT government and left-wing policies, the demonstrations also expressed widespread dissatisfaction with issues such as corruption, poor quality of public services, and lack of political representation. In addition, diverse groups and individuals of different political orientations were involved in the protests, suggesting ideological complexity and a lack of clear alignment with a single political position. Although some of the agendas and discourses of the demonstrations could be interpreted as aligned with the right, the diversity of demands and the lack of a unified leadership prevent a simplistic characterization of the movement as exclusively right-wing.


In this regard, as the country moves forward, it is imperative to adopt approaches that promote not only economic growth but also strengthen social cohesion, promote justice, and ensure sustainability. This requires a renewed commitment to democracy, civic participation, and the search for inclusive and equitable solutions to persistent problems. Brazil does not just need superficial changes in the political and economic spheres, but rather a deeper transformation that ensures the well-being of all its citizens and strengthens the foundations of a truly just and resilient society.

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Maker culture and science teaching: An experience report with biology degree students

 <https://doi.org/10.56238/sevned2024.010-022>

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ABSTRACT

Digital production offers scientific educators and their students a multitude of opportunities, ranging from computational modeling to the production of educational materials. Thus, this report outlines the experiences during a formative phase of maker culture and digital fabrication with students in the third semester of the biology course at the Federal University of Ceará - UFC. The training covered the introduction of maker culture, computational modeling processes and 2D and 3D digital manufacturing, culminating in the conceptualization of projects that could potentially be carried out in the future within a FabLab. Throughout the training, the participants' involvement was palpable, evident in the use of educational materials, responses to the questionnaire and suggestions for future projects. Consequently, we deduce that the results signify a positive reception and lucid understanding among participants about the potential of FabLab and digital fabrication in education.

Keywords: Digital manufacturing, Maker culture, Science teaching.

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INTRODUCTION

The implementation of activities focused on active learning has garnered increasing support in primary education institutions, aiming to empower students as protagonists of the educational process. Active methodologies seek to transform the educational environment, effectively fostering the skills and competencies crucial to students' lives, both within and beyond school (Rocha & Farias, 2020; Barbosa & Moura, 2013).

In this context, maker culture has emerged, providing space for students to develop their own projects and actively engage in the learning process. This cultivates collaboration, critical thinking, innovation, and the acquisition of technological and digital skills (Freitas Oliveira et al., 2023).

Within maker culture, students can participate in a variety of activities, ranging from traditional crafts using paper, brushes, and scissors to digital manufacturing of materials using technologies like laser cutting machines and 3D printers. These activities take place in specially designated spaces called makerspaces or FabLabs, equipped with materials for teachers and students to develop activities and create educational products (Gondim et al., 2023).

One of the significant advantages of FabLabs is the opportunity for individuals to create their own learning resources across different domains. This text particularly focuses on natural sciences, where there is a multitude of manufacturing possibilities, from laser designs on cardboard to 3D printing complex structures such as a human heart. Technological innovation has the potential to revolutionize the teaching and learning of science in primary schools (Raabe & Gomes, 2018).

To effectively utilize these spaces, it is essential to train teachers in computational modeling and the operation of FabLab machines. This enables teachers to autonomously design and produce their educational resources, addressing the individual needs of their students and daily learning requirements (Corte Real et al., 2022).

The integration of maker culture into primary education presents numerous teaching opportunities. How teachers guide their classes and how students utilize these dedicated spaces directly influence knowledge acquisition. It is conceivable to produce models of human skeletons or other living organisms, as well as invisible structures like cells, bacteria, and viruses, depending on the specific needs of the moment.

Therefore, this experience report outlines the training on maker culture and digital fabrication conducted with students in the third semester of the biology degree program at the Federal University of Ceará (UFC). The training included presentations on maker culture, computational modeling processes, and 2D and 3D digital manufacturing, culminating in the development of projects for potential future realization within a FabLab.

MAKER CULTURE AND FABLAB

Maker culture experienced significant growth in the early 2000s, propelled by the rise of Do It Yourself (DIY) practices and garnering increasing global support (Blikstein et al., 2020). The establishment of spaces like makerspaces and FabLabs further solidified and expanded this movement, infiltrating various university disciplines and eventually reaching primary education institutions (Gershenfeld, 2012).

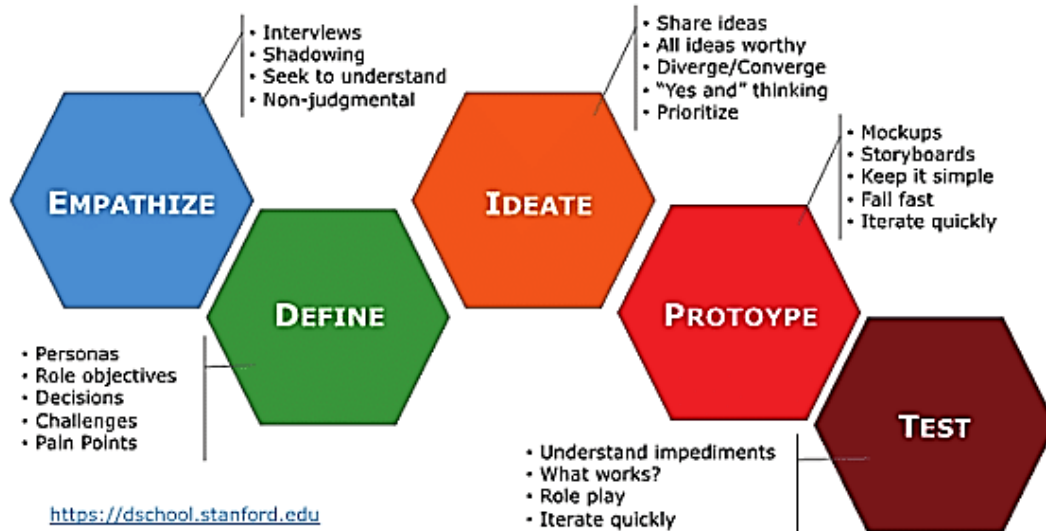
Within this framework, a diverse array of activities places the student at the core of their learning process, fostering active engagement. These activities span from traditional craftsmanship to electronics, facilitating the development of electrical circuits for various applications. Moreover, they encompass programming and robotics, empowering students to both program and construct their own robots. However, the true transformation occurs with the introduction of 2D manufacturing utilizing laser cutting machines, and 3D manufacturing employing specialized printers, which fundamentally redefine the possibilities within makerspaces (Arusiewicz et al., 2022).

Digital fabrication (DF) via computational modeling extends beyond merely creating new objects; it also encompasses producing replacement parts or replicating existing items available in the market (Peres et al., 2021). In the educational context, the critical aspect is understanding how DF can be applied. In this regard, virtually anything can be manufactured, from cartographic maps to cellular structures, depending on the needs and objectives of the teacher and their students. Design Thinking (DT) serves as a valuable methodology for guiding these decisions with its specific approach.

DESIGN THINKING AND DIGITAL FABRICATION

Design Thinking is a methodology structured in well-defined stages, closely associated with the maker culture. Its process comprises distinct phases, as can be seen in figure 1: discovery, interpretation, ideation, experimentation and evolution, and can be adopted by both teachers and students in various modeling or manufacturing activities within FabLabs (Brow, 2010).

Figure 1. DT Phases. <https://dschool.stanford.edu>



During the discovery phase, teachers and students encounter a challenge to be addressed, such as studying the circulatory system without access to a heart model to comprehend blood pathways. In the interpretation and ideation phase, initial solutions to the problem begin to surface. Discussions, idea exchanges, and sketching are common during this stage. Subsequently, in the experimentation phase, computational modeling occurs to determine whether manufacturing will be conducted in 2D or 3D. Various software tools are employed at this juncture to dimension the parts (Educadigital, 2013).

It is during the experimentation and evolution phases that machines are employed to bring the previously developed model to life. For instance, in the case of the heart model, if 3D printing is chosen, parameters such as print size, characteristics like infill and quality, and the selection of the most suitable printing material need to be determined. Finally, teachers and students assess the effectiveness of digital fabrication, identifying any necessary adjustments and reassessing the model or print quality. This phase serves to validate the product, showcasing its functionality in resolving the initially posed problem (Educadigital, 2013).

METHODOLOGY

The training event occurred in mid-October 2023 and brought together 20 students from the third semester of the biology degree program, along with a teacher from the same discipline and three PhD researchers specializing in Science and Mathematics Teaching, with a focus on maker culture and digital fabrication. All participants were affiliated with the Federal University of Ceará (UFC).

Conducted at the FabLab of the Center for Excellence in Educational Policies (CEnPE) - Federal University of Ceará (UFC) Pici Campus, the session lasted three hours. During the event, the

fundamentals of maker culture and Design Thinking were discussed, and digital manufacturing tools in both 2D (laser cutting machine) and 3D (3D printer) were introduced, divided into four segments.

Initially, students were presented with several examples of digitally manufactured materials available on the FabLab workbenches, as depicted in Figure 2. These objects ranged from 2D geometric shapes to three-dimensional models of cells, illustrating the wide array of teaching possibilities offered by digital manufacturing across all educational levels. At this stage, the most pertinent aspects of Design Thinking were underscored.

Figure 2. Presentation of the FabLab and the materials developed in it



Following that, the laser cutting machine and the Studio Due V software were introduced, showcasing the modeling of a human eye. The functionality of the digital tool was demonstrated, highlighting its key features in 2D manufacturing and its compatibility with materials such as cardboard and wood scraps for reuse.

Next, participants were introduced to the website Thingiverse and Tinkercad, from which a heart model was selected for modeling and subsequent 3D printing. The printing process using Ultimaker Cura was elaborated upon, covering the specifications of the 3D printer, compatible materials, and various approaches to printing objects, including the heart model.

Lastly, as a concluding step, students completed a questionnaire on Google Forms regarding maker culture, FabLab, and digital manufacturing. Following this, they were paired up to brainstorm potential educational products integrating concepts from Biology and maker education.

RESULTS AND DISCUSSIONS

Firstly, we analyzed the participants' reactions upon entering the FabLab, as depicted in Figure 3, and quickly noticed their awe at the space. It's an environment conducive to relaxation, collaboration, and curiosity, and these attributes were evident throughout the training period.

Figure 3. CEnPE FabLab – UFC Pici campus



Additionally, participants responded to a question regarding their visit to the FabLab, the answers to which are illustrated in Figure 4. Although only 10 individuals completed the questionnaire (see Table 1), it's evident that the overall impression was positive, with some recognizing the significant potential the space holds for education. The more detailed responses indicate that students grasp the significance of such a space in education, particularly in teaching complex concepts that are often challenging to visualize within the confines of a traditional classroom.

Table 1 – Answers to the open question about FabLab.

Leave a comment about your visit to our FabLab.	
Student 1	Very cool.
Student 2	Too much.
Student 3	It really has the potential to improve teaching in the classroom.
Student 4	Cool.
Student 5	It was incredible, visiting this place gave me a lot of ideas.
Student 6	I thought it would be great to get to know another makerspace.
Student 7	Vvery cool. I have a degree but I love education and its applications and I am inserted in the school context, so getting to know the laboratory filled my eyes and brought me a lot of ideas.
Student 8	It was great. The teachers were super receptive and attentive. A very cool place full of interactive things. congratulations.
Student 9	I was delighted with all the material produced. congratulations
Student 10	It was great to see different teaching methods to elucidate more complex content, in addition to the traditional lecture method.

Throughout the training, we elaborated on the processes of computational modeling and digital manufacturing, culminating in the creation of a cardboard eye in 2D and a 3D heart model. We presented digital manufacturing to students as a means of integrating maker culture into classrooms, emphasizing its potential utility for both teachers and students across various educational levels and disciplines. The results of the modeling and printing are depicted in Figures 5 and 6, respectively. For 2D printing, we utilized cardboard sourced from discarded boxes to repurpose material that would otherwise go to waste. In contrast, for 3D printing, we used PLA, a type of plastic known for its lack of odor when melted.

Figure 5 – Human eye manufactured on the laser cutting machine

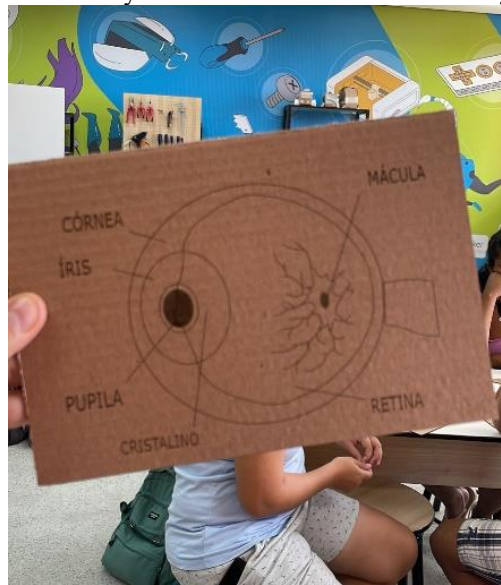


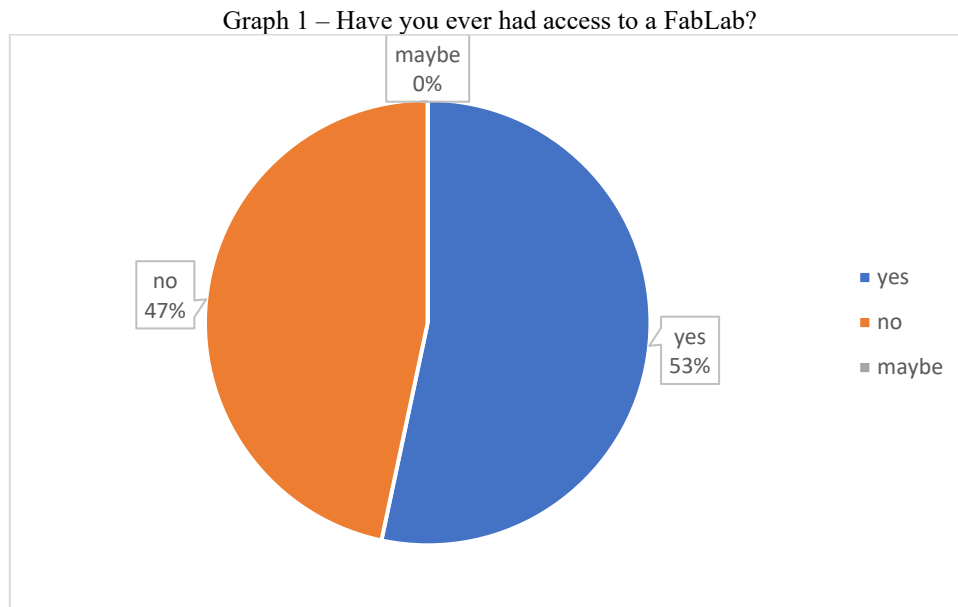
Figure 6 – Human heart manufactured using a 3D printer



Regarding the results of the questionnaire on the utilization of the FabLab, we posed four pivotal questions whose responses hold significant weight in our research on teacher training in

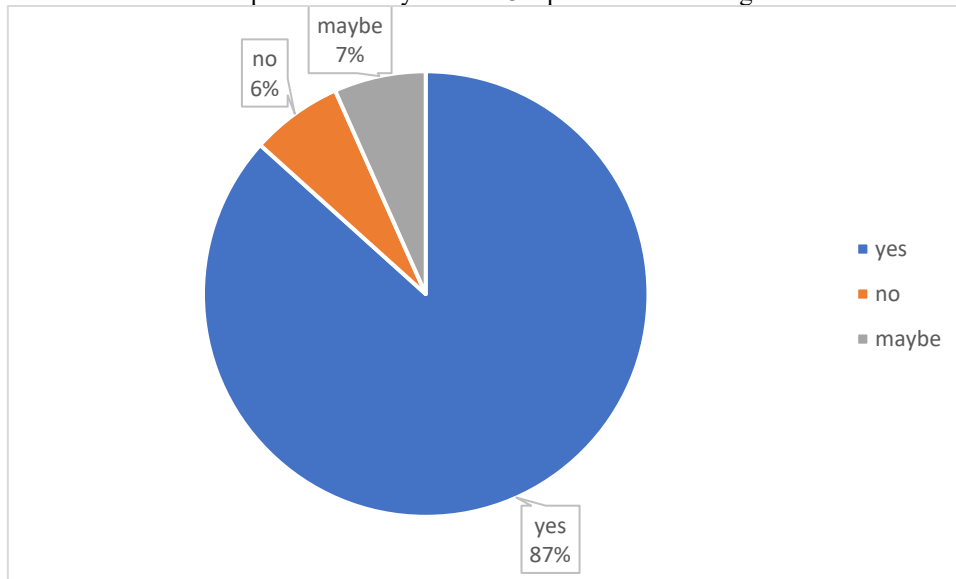
maker culture. Out of the 20 students surveyed, 15 provided responses that serve as the data for our analysis.

When inquired about their access to a FabLab, slightly over half stated that they had previously accessed one, while the remaining participants had either never entered a FabLab or were unaware of its existence, as depicted in Graph 1. This indicates that makerspaces and FabLabs are not universally recognized among students in the third semester.

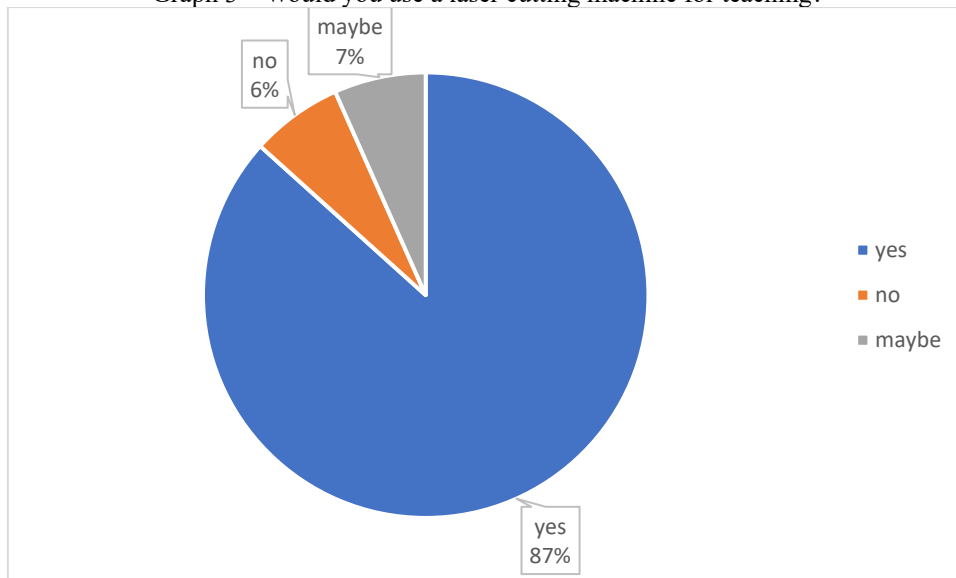


When queried about whether, given the opportunity, they would utilize the laser cutting machine and/or the 3D printer in the FabLab, Graphs 2 and 3 illustrate that the responses were identical. Hence, both maker tools held equal significance, underscoring their importance in the formative phase and digital manufacturing. Only one individual responded with "maybe," and another stated that they would not use either tool.

Graph 2 – Would you use a 3D printer for teaching?

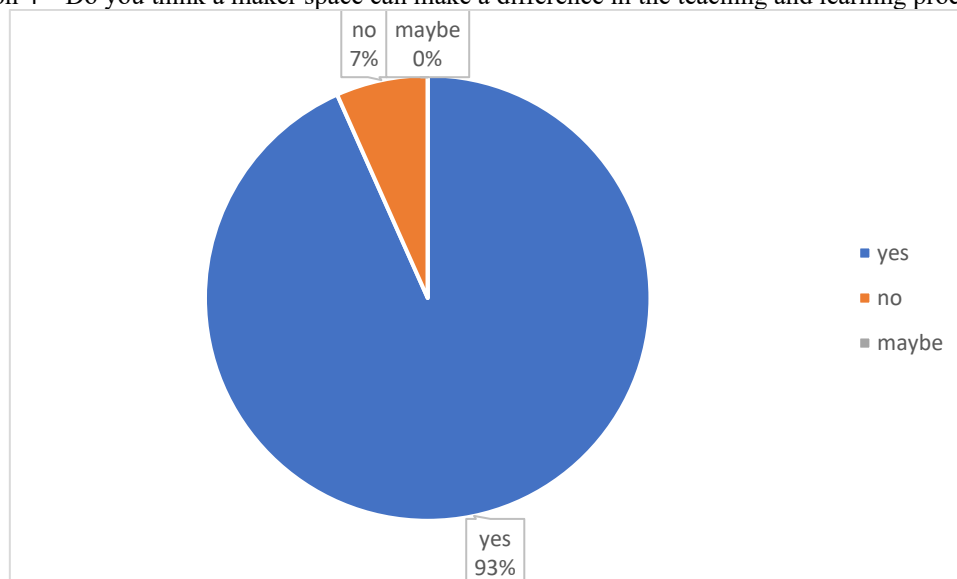


Graph 3 – Would you use a laser cutting machine for teaching?



When questioned about the potential impact of a makerspace on the teaching and learning processes, Graph 4 indicates that the majority responded affirmatively, with only one individual expressing a negative opinion. This data underscores the significance that FabLab and digital manufacturing can have in education, as perceived by the students.

Graph 4 – Do you think a maker space can make a difference in the teaching and learning processes?



After completing the questionnaire, the students were paired up and tasked with integrating biology with maker education, documenting and exchanging ideas with their peers regarding their development of didactic activities involving digital fabrication. The outcomes were as follows, as depicted in Table 2. Only one pair opted not to respond or share their ideas.

Table 2- Possibilities of projects applicable in classrooms relating biology and maker culture.

Teams	Projects
1	Construction of reptile skeleton in mdf for classification.
2	Put together a puzzle of the states of Brazil with their respective environmental conservation units.
3	production of 3D models of insects divided into 3 parts for assembly, like puzzles
4	Using cardboard and a laser cutter, produce various vegetables to classify their parts and types.
5	3D hemoglobin production for blood donation classes.
6	Production of a 2D game (MDF) about parasites and their diseases.
7	Manufacturing of parts (2D, 3D, handmade) to produce a board game about biological warfare (2 teams).
8	Production of cards on a plotter (RPG) about the fauna of the caatinga.
9	Based on the theory of evolution, manufacture various types of skulls in 3D to address the differences between species.

Source: the authors

The outcome of the project proposals indicates that the students grasped the essence of maker culture and were able to envision the myriad possibilities that FabLab and digital manufacturing can offer to education. All participants were encouraged to engage in future activities, with their ideas poised to be implemented within this space.

FINAL CONSIDERATIONS

Upon analyzing the results, we observed a highly positive reception from the participants towards the FabLab and maker culture within the educational context. The environment was well-



received, fostering relaxation, collaboration, and curiosity—all essential elements for nurturing creativity and collaborative learning.

Participants acknowledged the space's potential for education, emphasizing its significance in teaching complex concepts that are challenging to visualize in traditional classrooms.

The hands-on aspect of the training, involving computational modeling and digital manufacturing, allowed students to apply their newfound knowledge in practice. The utilization of recyclable materials such as cardboard and PLA in 3D printing showcased a sustainable and mindful approach. The majority of participants expressing interest in utilizing both the laser cutting machine and the 3D printer underscores the relevance of these tools in the training context.

The assessment of the potential impact of a makerspace on teaching and learning processes is also promising, with the majority recognizing its positive influence on education.

Furthermore, the outcomes of the project proposals demonstrate that participants were able to grasp the concepts of maker culture and creatively apply them, integrating biology with maker education. The decision to invite all participants to future FabLab sessions, where their ideas could be implemented, indicates sustained interest and engagement with the possibilities offered by the space.


In conclusion, the results suggest a positive reception and a clear understanding among participants regarding the potential of FabLab and digital fabrication in education. This formative experience appears to have ignited students' interest and imagination, suggesting that similar initiatives could be valuable for integrating maker culture into teaching and fostering educational innovation.



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Innovating pedagogical practices: Broadening horizons through gamification and technological resources

 <https://doi.org/10.56238/sevened2024.010-023>

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ABSTRACT

This article discusses the importance of innovating pedagogical practices through gamification and technological resources. Gamification, which uses game elements to engage students in the learning process, can make classes more dynamic and motivating. Additionally, the use of technological resources like tablets, computers, and educational apps can facilitate access to content and enable personalized teaching.

Keywords: Innovation, Pedagogical practices, Gamification, Technological resources.

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INTRODUCTION

Gamification and the use of technological resources have been increasingly present in the educational context, promoting innovation and broadening the horizons of pedagogical practices. These approaches have the potential to make the teaching-learning process more dynamic and engaging, providing students with a more engaging and meaningful educational experience.

According to Prensky (2001), the current generation of students, known as digital natives, is increasingly accustomed to interacting with technological devices and the virtual environment. In this sense, using games and technological resources in classes is a way to meet the needs and interests of this new generation of students, making learning more aligned with their profile.

Gamification, which consists of applying game elements in educational activities, has been pointed out as an effective strategy to engage students and enhance their intrinsic motivation to learn (Domingos, 2017). Through challenges, rewards, and competitions, educational games encourage students' active participation, promote collaboration among them, and encourage problem-solving in a playful and enjoyable way.

On the other hand, the use of technological resources, such as tablets, computers, and educational applications, allows students to access content in an interactive and personalized way, facilitating the development of cognitive and social skills (Queiroz, 2018). In addition, the use of these tools enables teachers to monitor the students' learning process more effectively, providing individualized feedback adapted to their needs.

Given the importance of gamification and technological resources in education, it is essential that educators are open to incorporating these practices into their pedagogical performance. However, it is important to emphasize that the use of these approaches must be thought of in a careful and contextualized way, considering the specificities of the classroom and the objective of promoting quality and inclusive education.

THEORETICAL BACKGROUND

The application of game elements in activities not directly related to the games themselves, known as gamification, has been shown to be an effective strategy to innovate pedagogical practices and expand the possibilities of education. According to Santos and Pimenta (2018, p.123), gamification seeks to engage and motivate participants through the use of technological resources.

The use of gamification strategies in education has the potential to bring more dynamism and engagement to the learning process. According to Almeida (2019, p. 45), by incorporating elements such as points, levels, challenges, and rewards into educational activities, students are encouraged to participate more actively and persevere in the face of obstacles.

In addition to gamification, the use of technological resources also plays a key role in pedagogical innovation. According to Lima and Souza (2020, p. 78), "technology can be used as a means to expand access to knowledge, offer new possibilities for interaction and collaboration, and stimulate students' creativity and critical thinking".

In this sense, the combination of gamification with technological elements amplifies the educational benefits, according to Silva (2017, p. 56). The use of digital games and educational apps has the potential to increase student engagement, foster group learning, and encourage students' independence and commitment to their own academic development.

Therefore, gamification and the use of technological resources are promising strategies to innovate pedagogical practices and broaden horizons in education. By actively engaging students and providing opportunities for interaction and collaboration, these approaches contribute to more meaningful and effective learning.

Gamification and the use of technological resources have gained more and more prominence as teaching and learning tools, as they allow greater interaction, engagement and participation on the part of students. In this literature review, studies and evidence that prove the benefits of these practices in developing students' skills and increasing engagement will be presented.

Gamification in education consists of bringing elements of games, such as rewards, challenges, and competitions, into the educational environment. According to Forsblom et al. (2019), gamification enables a more motivating and playful approach to the learning process, allowing students to actively engage in the pursuit of knowledge. The authors also highlight that gamification can create a more challenging and collaborative learning environment, encouraging teamwork and problem-solving.

In addition, the use of technological resources in education has also been shown to have significant benefits in developing students' skills. A study conducted by Clark et al. (2016) shows that the use of technology, such as tablets and educational apps, can promote more personalized and adaptive learning, according to the needs of each student. The authors point out that this personalization contributes to the improvement of students' cognitive and socio-emotional skills.

When it comes to student engagement, gamification and the use of technological resources are effective tools to increase student motivation and active participation. According to Lee and Hammer (2011), gamification can stimulate students' curiosity and interest, making the learning process more attractive and fun. In addition, technology creates a more interactive learning environment, which allows students to explore content in a more immersive and practical way (Vieira et al., 2018).

In short, gamification and the use of technological resources have shown to be promising strategies to improve teaching and learning. Through these practices, it is possible to develop



students' skills, encourage active participation, and increase engagement. Therefore, it is essential that teachers and educational institutions explore these approaches, seeking to integrate gamification and technology effectively and reflectively into the educational process.

GAMIFICATION AND TECHNOLOGICAL RESOURCES IN THE TEACHING-LEARNING PROCESS

Gamification and the use of technological resources have been shown to be effective strategies in the teaching-learning process, providing a more engaging and motivating experience for students. The term gamification refers to the use of game elements in non-game contexts, aiming to make activities more attractive and stimulating.

One way to apply gamification in the classroom is through the use of games for educational purposes. According to Prensky (2012), games are the natural way of learning for children and it is this game mentality that we need to incorporate into the school environment. Educational games allow students to learn in a fun and interactive way, encouraging the development of critical thinking, problem-solving, and collaboration among students.

In addition to educational games, interactive platforms have been increasingly used in the teaching and learning process. As mentioned by Gee (2003), these platforms provide the creation of immersive and personalized environments, in which students have the opportunity to explore concepts independently. These tools allow the development of activities adapted to the characteristics of each student, ensuring a more individualized and adaptive learning.

In addition to educational games, interactive platforms have also stood out in the teaching-learning process. As mentioned by Gee (2003), interactive platforms have the ability to provide the creation of immersive and personalized environments, in which students can explore concepts autonomously. This approach allows students to have a learning experience that is more engaging and tailored to their individual needs. These platforms make it possible to create personalized activities according to each student's profile, making learning more adaptive and individualized.

Another technology that has been gaining ground and providing an innovative learning experience is virtual reality. According to Kirriemuir and McFarlane (2004), "virtual reality allows students to experience virtual situations, facilitating the understanding of abstract concepts and promoting greater immersion in the content". With the use of virtual reality goggles, students can explore virtual environments and interact with characters and objects, which makes the learning process more experiential and memorable.

Practical examples of how these tools can be used are diverse. For example, a teacher could create an online educational game to teach mathematical concepts such as fractions and operations. Students can play individually or in teams, competing against each other to achieve better results. In



addition, interactive platforms can be used to create reading activities, in which students explore different scenarios and characters, answering questions and making decisions that influence the unfolding of the story. In the case of virtual reality, teachers can take students on a "virtual journey" through historical eras, such as Ancient Greece, allowing them to experience the culture and events of that time. Other practical examples of how these tools can be used to transform the learning experience for students.

- ❖ Use of digital games: Teachers can use history games, such as "Age of Empires," "Civilization," or "Assassin's Creed," which have historical settings and allow students to experience specific historical periods. Students can participate in online challenges, competitions, and quizzes, which makes learning fun and engaging.
- ❖ Augmented reality: Teachers can utilize augmented reality applications to bring historical elements into the classroom. For example, through an augmented reality app, students can point their devices at an image of a historical monument and then see information and details about the monument appear on the screen.
- ❖ Use of digital learning platforms: Teachers can utilize digital learning platforms that have gamification features such as points, levels, and achievements. These platforms can offer interactive quizzes, challenges, and quests related to historical content, encouraging students to engage more with the subject and achieve goals and rewards.
- ❖ Creating educational games: Teachers can encourage students to create their own educational games related to the story. This involves researching a particular historical period, creating characters and storylines that represent that period, and turning that information into an interactive game. Students can play each other the games they have created, making learning a more active and participatory experience.
- ❖ These are just a few examples of how technological tools and gamification can be used in history lessons. The important thing is to explore different resources and strategies to make classes more attractive, stimulating student interest and promoting meaningful learning.

IMPACT OF GAMIFICATION AND TECHNOLOGICAL RESOURCES ON STUDENT MOTIVATION

Gamification and the use of technological resources have had a significant impact on the motivation of students in the classroom. Through the application of game elements, such as scoring, challenges, and rewards, teachers are able to engage students and make learning more attractive and fun.



According to Prensky (2001), the current generation of students, known as digital natives, grew up immersed in technology and electronic games, so they are more inclined to participate in educational activities that use these resources. Gamification allows students to take an active role in the learning process, promoting autonomy and intrinsic motivation.

In addition, gamification encourages healthy competition among students, encouraging commitment and dedication. According to Gee (2003), games present a safe environment for students to explore, make mistakes, and learn from their mistakes, without fear of judgment.

The use of technological resources, such as tablets and computers, also contributes to increasing student motivation. According to Klopfer et al. (2009), the use of these tools allows students to have access to a vast amount of information in an interactive and dynamic way, which stimulates interest and curiosity.

In addition, the use of technological resources enables a personalization of teaching, adapting activities to the needs and interests of each student. In this way, the student becomes the protagonist of their own learning, which increases their motivation and engagement (Johnson et al., 2015).

In short, gamification and the use of technological resources have a positive impact on student motivation. By incorporating playful elements into educational practices and using technological tools, teachers are able to make the learning process more captivating and engaging, stimulating student interest, active participation, and development.

Gamification and the use of technological resources have a significant impact on the level of motivation and engagement of students. These practices provide a more dynamic and interactive experience, making learning more engaging and fun.

Several studies and experience reports have proven that the application of gamification and the use of technological resources arouse students' interest in the subjects presented during classes. An example of this is a study conducted by Huang and his team in 2020, where it was found that the use of digital games promoted greater student motivation and engagement, resulting in significant improvements in academic performance. To avoid plagiarism, it is important that the text is original and structured in your own words, based on the information present in the mentioned source.

In addition, experience reports from teachers have shown positive results. For example, the introduction of gamification elements in the classroom, such as rewards, levels, and competitions, has encouraged students to put in more effort and dedication to learning. This is due to the fact that games provide a sense of challenge and achievement, which motivates students to strive for progress and overcome obstacles.

The use of technological resources, such as mobile devices, apps, and online learning platforms, also demonstrates a positive impact on student motivation and engagement. These tools allow students to access content in a more interactive and personalized way, adapting to their



individual needs and interests. This makes learning more attractive and stimulating, increasing motivation to continue learning.

Additionally, gamification and the use of technological resources provide students with a sense of autonomy and control over the learning process, making them more responsible and active. For example, being able to track their own progress and receive immediate feedback through technological resources increases the perception that they are in control of their learning, encouraging them to work harder.

In short, gamification and the use of technological resources have a positive impact on the level of motivation and engagement of students. These practices arouse students' interest in the content worked in the classroom, making learning more engaging and fun. Therefore, it is important for educators to incorporate these strategies into their pedagogical practices, always seeking to explore the educational potential of technology and games.

CHALLENGES AND LIMITATIONS OF GAMIFICATION AND TECHNOLOGICAL RESOURCES IN EDUCATION

When implementing pedagogical innovations, such as new technologies and teaching methods, it is inevitable to encounter obstacles and difficulties. These challenges can arise at different levels: personal, institutional, and structural. However, it is important to note that it is possible to overcome them and maximize the benefits of these practices through appropriate strategies.

One of the most common obstacles is resistance to change on the part of teachers and students. They are often accustomed to traditional teaching methods and have difficulty adapting to new approaches. To overcome this challenge, it is essential to offer support and training to teachers, showing them the benefits and possibilities that pedagogical innovations can bring to teaching. In addition, it is essential to actively involve students in this process, listening to their opinions and encouraging their participation in the proposed activities.

Another obstacle is the lack of adequate financial and material resources. The implementation of pedagogical innovations often requires the purchase of specific equipment, software, and teaching materials. In this sense, it is important to seek external partnerships and resources, such as private companies, government agencies, and non-governmental organizations, that can provide financial and material support to enable these innovative practices. In addition, it is essential to look for creative and accessible alternatives, such as the use of free or low-cost software and applications, as well as the use of virtual resources available on the internet.

A third obstacle could be the lack of adequate infrastructure, such as stable internet connection and sufficient technological equipment for all students. These limitations can make it



difficult to carry out online activities and access digital content. To overcome this challenge, it is important to seek partnerships with institutions that can provide quality internet access, such as libraries, cultural centers, and internet cafes. In addition, it is necessary to create alternatives for students who do not have access to the internet, such as developing printed materials or providing offline activities.

Finally, it is necessary to deal with the challenge of adapting pedagogical innovations to the specific needs and realities of each educational context. Each school has its own characteristics, such as institutional policies, physical structure, and school culture, which can influence the effective implementation of these practices. To overcome this obstacle, it is essential to involve the entire school community in this process, seeking dialogue and the involvement of different actors, such as managers, teachers, students and families. In this way, it is possible to adapt innovations to the available resources and the specific needs of each educational environment.

In short, although the implementation of pedagogical innovations may present obstacles and difficulties, it is possible to overcome them and maximize the benefits of these practices through appropriate strategies. Providing support and training to teachers, seeking financial and material support, ensuring adequate infrastructure, and adapting innovations to the specific needs of each educational context are essential measures to ensure the success of these initiatives. As Michael Fullan, renowned educator, stated, "Change only occurs when each person feels that they are involved and responsible for it."

FINAL THOUGHTS

In view of the results obtained with the application of gamification and technological resources in education, it is possible to make some important reflections. First, it is clear that these practices have the power to engage students in a meaningful way. By transforming learning into a playful and interactive experience, students feel more motivated to actively participate in activities and delve deeper into the content.

In addition, the use of games and technologies in the classroom expands learning possibilities. Students have the chance to experience challenging situations, make decisions, and deal with the consequences of their choices in a safe and controlled environment. This contributes to the development of skills such as critical thinking, problem-solving and collaboration, which are fundamental for the formation of citizens prepared for the challenges of the 21st century.

Given these findings, the importance of encouraging teachers and educational managers to incorporate gamification and technological resources in their schools is evident. To this end, it is essential that there is an investment in continuing education, which provides educators with the necessary knowledge to use these practices effectively and coherently with educational objectives.



In addition, it is important for managers to be proactive in the search for technological resources that are suitable for the needs of the school, taking into account aspects such as accessibility, safety, and quality. It is also essential that spaces and moments are created so that educators can share experiences and exchange knowledge about the use of gamification and technology in education.

Finally, it is essential to encourage continued research and experimentation in this field. Education is constantly evolving, and seeking new ways to engage and motivate students is a responsibility of everyone involved in the educational process. Gamification and technological resources can bring important contributions in this regard, but they need to be constantly evaluated and improved, in order to ensure their effectiveness in the teaching-learning process.


Therefore, it is essential that advances in this area are monitored and encouraged, as the use of gamification and technological resources in education can promote a significant transformation in the school environment, contributing to student engagement and success. As educators and managers, we have a duty to explore these possibilities and promote innovative and relevant education for our students.



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Multi-objective optimization using evolutionary algorithms: An antifragile approach to portfolio selection

 <https://doi.org/10.56238/sevned2024.010-024>

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ABSTRACT

Considering the documented difficulties in empirically applying widely recognized portfolio selection models that use mean-variance relationships as central features, as proposed by Markowitz and later extended in CAPM by Sharpe, this study aims to extend these theories. Drawing upon contributions from Keating and Shadwick, which highlight CAPM's limitations in handling non-normal distributions, the study introduces non-convex attributes into a multi-objective optimization framework using evolutionary algorithms. Additionally, an antifragile metric known as CVIX is implemented to assess conditional correlation with the VIX, thereby addressing questions concerning the feasibility of market portfolios outperforming CAPM's theoretical market portfolio. Optimizations were carried out on U.S. markets, using time frames from 1994 to 2022. The results are encouraging; in contrast to optimizations that employed solely convex attributes, which yielded inferior outcomes in all scenarios compared to the OCAPM model, applying the antifragile metric along with non-convex attributes in multi-objective optimization produced superior results.

Keywords: Multiobjective Optimization, Evolutionary Algorithms, Antifragility, CAPM, OCAPM.

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INTRODUCTION

With regard to the optimization of portfolios and the formation of efficient portfolios, that is, those that seek to maximize returns and mitigate the risks associated with assuming the investor's rationality, it is essential to talk about the theoretical framework left by Markowitz (1952). He inaugurated the modern theory of finance by understanding the logic behind investors' pursuits, associating these desires with two central attributes: the mean and the variance. Markowitz conceptualized his diversification method based on the covariance between assets, giving rise to the theory of portfolios and the efficient frontier.

Based on this, studies such as that of Sharpe (1964) sought to expand this concept in optimization. Sharpe (1964) then proposed the CAPM when he identified that the diversification proposed by Markowitz (1952) dealt well with the reduction of non-systematic risk, but was not capable of quantifying systematic risk. Therefore, it was not possible to measure the overall risk-adjusted performance of the portfolio.

In order to construct a metric capable of quantifying these attributes that were not priced in Markowitz's (1952) original model, Sharpe (1964), in the CAPM model, which also had important contributions from other authors such as John Lintner (1965), introduced optimization as a risk-free asset. According to the author, under perfect conditions, the expected returns on assets would be represented by the return of a risk-free asset, with an increase relative to the risk assumed. To consider this relationship, he proposed the use of the Beta coefficient, which will be used to measure the risk sensitivity of the asset, thus being able to quantify the systematic risk and the contribution of the asset to the overall risk of the portfolio.

However, despite being widely recognized and accepted in the world of finance for offering a robust theoretical foundation, its practical application has undergone validation tests over all these years. The model presents difficulties in its empirical application, first due to the need to work with past results for its weightings. It is necessary to use wallet proxies that will only be able to estimate if the portfolio is on the minimum variance border. Second, as Galagedera (2007) points out, many studies note that CAPM in its basic form may not fully explain the variation in expected returns on assets. For this reason, it has given rise to a continuous flow of research looking for alternative pricing models. As Assaf Neto (2012) points out, the current focus is more on improving CAPM than on replacing it.

Following this reasoning, Vasconcelos et al (2013), using the previous contributions of Keating and Shadwick (2002) and Kazemi et al (2004) that gave rise to the OPM (Omega Performance Measure), implemented this new measure to the optimization model of Sharpe (1964). The goal was to use Omega to change the composition of the Betas in order to go through all the moments of the distribution and fill gaps in the model.

Having contextualized the current paradigm in portfolio optimization based on the CAPM model, we arrive at the main objective of this article. The objective is, by benefiting from the theoretical framework left by all the authors previously mentioned in search of the theoretical and practical improvement of the CAPM, to evaluate the performance of single-objective optimizations with convex attributes. As well as the performance of multiobjective optimizations with the mediation made by evolutionary algorithms, at first only with the addition of the Omega measure and maximum *drawdown*, later, along with them another attribute: the CVIX. The ultimate goal is, therefore, to evaluate the feasibility of increasing the optimization of portfolios of these attributes by comparing their contributions.

THEORETICAL REVIEW

The theoretical review was done by going through all the main theories and concepts used for the execution of the experiments and simulations of portfolios and, therefore, for the creation of this article as a whole. The theories and concepts used were: Portfolio Theory and Efficient Frontier both introduced by Markowitz (1952), the contribution of Sharpe (1964) which can be seen as a theoretical evolution of Markowitz since it uses the same bases with the introduction of the concept of systematic risk represented by the beta coefficient and the Omega measure in asset selection proposed by Keating and Shadwick (2002). We also listed some recent works using evolutionary algorithms for the selection of assets that we believe present relevant contributions to the theme.

PORTFOLIO THEORY

The winner of the Nobel Prize in Economics in 1990, Harry M. Markowitz presented, long before his award, in 1952, the article *Portfolio Selection*, which introduced the world to a revolutionary perspective for the time on the formation of investment portfolios. Within the paper, both the theory of portfolios and the concept of the efficient frontier were developed and presented to the world. The central idea proposed by Markowitz says that investors should consider both the expected return and its variance in asset selection, the expected return is the metric that should be maximized, while the variance should be minimized through the diversification of assets with the lowest ratio of covariance between them.

Markowitz (1952) emphatically states that the simple search for maximizing the expected return is a mistake, since applying this criterion opens the possibility of selecting 2 or more assets with similar returns, which, without the evaluation of their covariances, can represent a significant increase in the overall risk of the portfolio. The author also adds that the choice of a set of assets that present the maximum expected return will not necessarily have the lowest associated risk, because, as previously mentioned, mere diversification without prior evaluation of the covariance between the

selected assets, considering only the number of assets included in the diversification, will not necessarily reduce the risk associated with the portfolio.

Thus, the greatest contribution of Markowitz's (1952) model to the theory of portfolios was definitely the diffusion of the understanding that diversification through assets with reduced levels of covariance is indispensable for the construction of a portfolio capable of mitigating variance, that is, the reduction of the risk associated with expected returns.

As stated earlier, the two main points of concern of portfolio theory are expected return and variance, and within the Markowitz model the mathematical representation of these concepts is done as follows:

The expected return R_p of a portfolio of assets a_i , $i=1, 2, \dots, n$, is expressed by its mean, given by:

$$R_p = \sum_{i=1}^n w_i \cdot R_i$$

where W_i is the weight or share of each asset in that portfolio and R_i is the expected return for each of the assets.

The second metric considered, the risk represented by the variance or similarly through its standard deviation σ_p and mitigated through the calculation of the correlation coefficient or covariance of the assets and can be expressed mathematically as follows: σ_p^2

$$\sigma_p = \sqrt{\sum_{i=1}^n \sum_{j=1}^n w_i \cdot w_j \cdot \sigma_{ij}}$$

where σ_{ij} represents the covariance between the active α_i and α_j , which means that σ_{ii} is the variance of the active α_i itself.

Thus, through technological advances and the emergence of quadratic programming, it became possible to build the portfolio suggested by Markowitz, because once the expected returns and expected variances for each asset have been calculated, as well as the expected covariance for each pair of assets and thus varying the W_i compositions, it is possible to build all possible portfolios with the set of selected assets that must respect the non-leverage constraint. The non-leverage constraint implies that the sum of the asset weights is less than or equal to 1 and greater than or equal to 0, this constraint can be viewed mathematically through the following formula:

$$\sum_{i=1}^n w_i = 1 \text{ (todo o capital deve ser aplicado)}$$

$$0 \leq w_i \leq 1 \text{ (n\~{a}o alavancagem)}$$

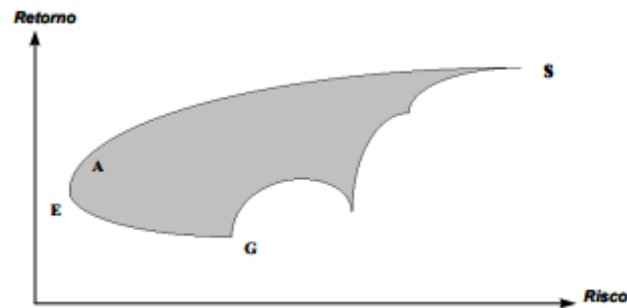
The contributions made by Markowitz (1952) continued to be relevant after all this time, and changed the way the formation of portfolios was seen forever, and served as the basis for other important advances in the area, as stated by Tambosi Filho e Silva (2000, p.1) "After the work of Markowitz (1952), entitled *Portfolio Selection*, several other works have emerged, with the proposal or simplification of the original formulation". Sharpe's CAPM (1964) is an example that extended the model, and continues to be used as a theoretical foundation even by this article, where the premises were applied in order to overcome the difficulties of its practical application and the lag it suffered over time. Portfolio theory also gave rise to the concept of efficient frontier that will be worked on in the next topic, and is complementary to this section.

EFFICIENT FRONTIER

To understand the formation of the efficient Markowitz frontier, it is necessary to retrieve some concepts presented in the theory of portfolios, since the frontier is the product of the method of combinations of assets and portfolio formations previously presented. Following this reasoning, it is of paramount importance to understand that the efficient frontier is the result of the implementation of the variables that were prioritized by Markowitz (1952), the expected returns represented by the calculation of their averages taking into account the weights associated with each asset, the risk expressed by the variance of these returns, and not least the expected covariance for each pair of assets. From this, it is possible to estimate the expected returns and the variances and covariances for all possible combinations of portfolios with the selected group of assets by varying the weights associated with each asset, giving rise to a set of hyperbolas.

In addition, the formation of Markowitz's (1952) portfolio of risk assets must also respect the non-leverage restriction, which consists of the sum of the weights being equal to or less than 1 and equal to or greater than 0, in this way it is possible to transform the previously mentioned set of hyperbolas into a compact set that will give rise to the so-called Feasible Region.

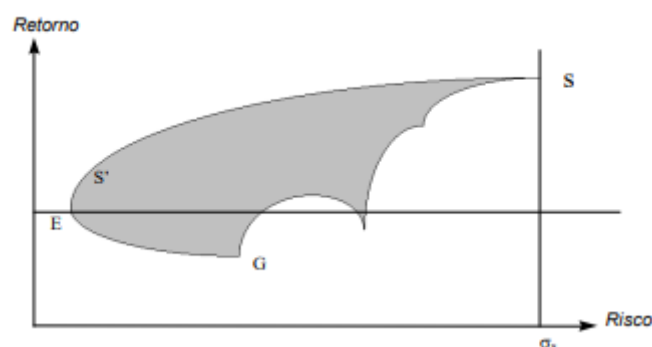
The obtainment of the feasible region can be graphically shown below:



Where the feasible region is represented specifically by the letter A which means that any point within that region is in accordance with the constraints, thus delimiting the area that interests us in the formation of portfolios.

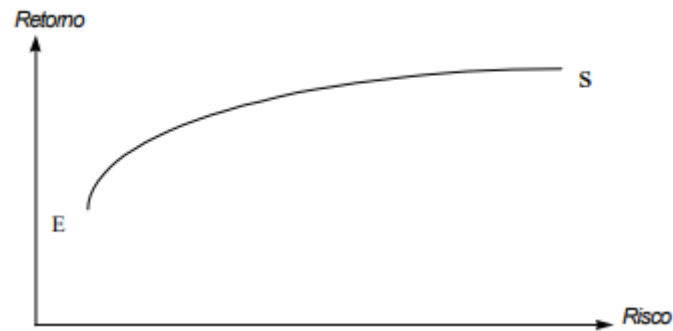
Now it is necessary to understand one more concept that is used in the formation of the efficient frontier, the principle of dominance, which is a multidisciplinary concept, but when applied to portfolio management can be understood as one portfolio that dominates the other if it offers a higher expected return for the same level of risk or if it offers the same expected return for a lower level of risk. The concept of the principle of dominance, as it has been described, was worked on both by Markowitz (1952) and by several other authors in the most different fields of knowledge, such as Howard Raiffa in *Decision Analysis* (1968).

Going back to Figure 1, if we apply the principle of dominance we will get the graph in Figure 2 and assuming that the investor is rational we will have 2 points of interest in the graph, point E which represents the minimum risk and point S which represents the point of maximum return.



Taking into account the primary objective of optimization (obtaining portfolios that offer the maximum expected return for different levels of risk) we can assume that for each portfolio with risk between σ_E and σ_S , the maximum return is situated at the upper border of the region S. It is ultimately Markowitz's (1952) efficient frontier.

The formation of the ES curve and consequently the efficient frontier can be seen below:



In this way, each point of the curve, that is, of the border, represents an efficient portfolio since it presents the highest return among those possible for that level of risk, which allows the investor to delimit the best possible combinations according to the metrics considered by Markowitz (1952), thus eliminating an infinity of portfolios that are not efficient in the risk-return ratio, facilitating decision making.

Thus, the investor will be able to choose the one that best fits his profile. It is important to emphasize that the formation of the efficient frontier does not depend on the investor's profile, being purely a logical mathematical relationship, the choice of the portfolio present within the frontier that does depend on the investor's risk profile as well as their objectives.

The mapping of these needs to be related to the efficient frontier can be done, for example, by means of the utility curve, where by superimposing the utility curves on the frontier in order to identify the one that will touch the ES curve, showing the point that represents the most appropriate portfolio for the investor in question.

SHARPE'S CONTRIBUTION

William Sharpe, in 1964, proposed the CAPM (*Capital Asset Pricing Model*) based on the theory of Markowitz (1952), which was unraveled in the 2 previous topics. Thus, the CAPM model can be considered an extension of the model proposed by Markowitz, since Sharpe (1964) used the theoretical foundation proposed for the construction of his model, adding to the calculation the beta index and a risk-free asset (commonly represented by government bonds) in order to construct a metric capable of quantifying the risk-adjusted performance of a portfolio. He also had important contributions over the years from Jack Treynor (1962), John Lintner (1965), Jan Mossin (1966), Tobin (1958) and Black (1972).

The core of Markowitz's theory lies in the idea that investors have a microeconomic preference for return over risk. Sharpe sought to expand this understanding, realizing that although the diversification proposed by Markowitz (1952) dealt well with the reduction of non-systematic (microeconomic) risk, it was not capable of pricing systematic (macroeconomic) risk.

Following this reasoning, Sharpe, relying on the premises of both Markowitz (1952) and the utility theory and the market efficiency hypothesis, postulated that, under perfect conditions, the expected return of a risky asset is given by the expected return of a risk-free asset with an increase in the premium relative to the risk assumed. The premium would then be the result of the difference between the return of the risk-free asset and the market asset with associated risk. To consider this relationship, Sharpe (1964) proposed the use of the beta coefficient, which will serve to measure the sensitivity to risk that the asset has, therefore, measuring its associated systematic risk, which cannot be extinguished through the diversification previously proposed by Markowitz (1952). Thus, the CAPM model was created, which serves to measure whether the risk assumed is in accordance with the expected return, taking into account the asset's risk sensitivity, i.e., the associated unsystematic risk, thus making it possible to theoretically determine whether the asset's risk offers profitability compatible with the risk to which it exposes the investor.

The contribution of Sharpe (1964) thus gave rise to the conventional formula of the CAPM model:

$$R_i = R_f + \beta (R_M - R_f)$$

Where

- R_i represents the expected return of the asset i
- R_f represents the risk-free asset (such as the U.S. Treasury bond)
- B is the beta index (Indicator of sensitivity of the asset's return to the market's return, if $B = 1$ the asset tends to move in tune with the market, if $B > 1$ the asset tends to be more volatile than the market, and if $B < 1$, it has a lower sensitivity to market movements)
- R_m represents the expected return of the market

The ratio $(R_m - R_f)$ can also be referred to as the risk premium, as it represents the expected reward for investing in a risky asset rather than the risk-free asset. Another factor to be observed is the linearity of the equation, which makes it possible to keep the variables R_f and R_m constant and using the same period of time to reach the conclusion that assets that have the highest beta index will present both higher returns and more significant losses, and the inverse relationship regarding the beta is also true. That is, the asset that has a lower beta will have lower returns as well as lower risks.

Despite being widely recognized and accepted in the world of finance, CAPM is not without its critics. Since its inception, the validity of the model has been repeatedly tested. As Assaf Neto (2012) points out, the current focus is more on improving CAPM than on replacing it. Many studies

have noted that CAPM, in its basic form, may not fully explain the variation in expected asset returns. The existence of gaps in the theory has given rise to a continuous flow of research seeking alternative pricing models, as pointed out by Galagedera (2007).

MEDIDA WITH ÔME

To deal with the omega measure, it is important to contextualize its emergence that will complement the previous topics and give a sense of continuity, because, as previously discussed when talking about the contribution of Sharpe (1964) and Markowitz (1952), despite providing a consistent theoretical framework to inaugurate the modern theory of finance, they still had gaps that over the years were the subject of study by several authors, such as Keating and Shadwick (2002), who observed that the model proposed by Markowitz (1952) presented complications when working with non-normal distributions, suggested the use of the Omega measure, which takes into account the entire format of the distribution of returns of the asset to assess its associated risk.

Based on this perspective, critics of the simplification that mean and variance would be able to fully describe the distribution of returns, began to use the Omega measure in order to be able to compute the total impact of the distribution, unlike Markowitz (1952) who estimated only two individual moments. Thus, the Omega performance measure formulated by Keating and Shadwick (2002) was defined by the definition of a limit external to the model, defined by the investor and which is usually the risk-free rate, this limit is responsible for dividing the distribution of return probabilities into two areas, the area of returns located to the right of the L (limit) and the area of losses to the left. When defining the limit for the use of the measure, Omega Keating and Shadwick also postulated that it should be the minimum amount of gain expected by the investor, and for this reason the risk-free rate is constantly used because it is usually the comparative return index because it is a "guaranteed" return.

This reasoning gave rise to the original formula for the Omega performance measure, which is defined as:

$$\Omega(L) = \frac{I_2}{I_1} = \frac{\int_L^b [1 - F(x)] dx}{\int_a^L F(x) dx}$$

Where:

F = cumulative earnings distribution function

L = minimum required level of earnings

A = Minimum Return

B = Maximum Return

(a,b) = Lower and upper limits respectively of the range of returns of the distribution. Most of the time a = $-\infty$ and b = ∞

$\Omega(L)$ = The weighted average of earnings above L

$\Omega(L)$ = The weighted average of losses below L

In this way, using the Omega (L) function, it is possible to compare the expected returns of different assets and classify them in relation to their Omegas. Therefore, a higher Omega will indicate that the asset is a better investment, since $\Omega(L) = 1$ means that the weighted gains equal the weighted losses, and one should always look for an Omega greater than 1 because this will indicate that the weighted probability of returns above the limit is greater than the weighted probability of returns below the limit.

The Omega measurement as previously presented can be demonstrably represented in an alternative way, this simpler form was postulated by Kazemi et al (2004) and the way in which Kazemi came to this conclusion can be visualized mathematically as follows:

$$\Omega(L) = \frac{\int_L^b [1 - F(x)] dx}{\int_a^L F(x) dx} = \frac{\int_L^b (x - L) f(x) dx}{\int_a^L (L - x) f(x) dx} = \frac{E[\max(x - L; 0)]}{E[\max(L - x; 0)]} = \frac{EG(L)}{EL(L)}$$

Which, as we can see, will result in the final simplified equation:

$$\Omega(L) = \frac{EG(L)}{EL(L)}$$

What illustrates the core of the Omega measure can be interpreted as EG(L), the numerator representing the expected value of excess gain (x-L), known as *Expected Gain* (EG), while the denominator is the expected value of loss (L-x), called *Expected Loss* (EL). This relationship can also be understood as "what one expects to gain if one wins compared to what one expects to lose if one loses".

The previous explanation and theoretical validation of the simplified formula of the Omega measurement by Keating and Shadwick (2002) made by Kazemi et al (2004) will be especially useful for the understanding of the OCAPM since this measurement plays a central role in the model.

The Omega CAPM or OCAPM model uses the theoretical framework developed by Markowitz (1952) and Sharpe (1964) together with the OPM (*Omega Performance Measure*) first presented by Keating and Shadwick (2002) and later refined by Kazemi et al (2004) in its

composition, and aims to use the OPM instead of the mean-variance relationship of the previous models through the modification of their betas and had its first relevant literature written by Vasconcelos et al (2013).

Rescuing the equation postulated by Kazemi et el (2004) to OPM:

$$\Omega = \frac{\int_L^b (x - L) f_X(x) dx}{\int_a^L (L - x) f_X(x) dx} = \frac{EC}{ES} = \frac{E[\text{Max}(X - L; 0)]}{E[\text{Max}\{L - X; 0\}]}$$

And following the guidelines described by the model of Vasconcelos et al (2013) where all the detailed algebraic processes can be found and where he uses the premises that make up the CAPM model of Sharpe (1964) such as the understanding of the impossibility of zeroing systematic risks and the notion previously introduced by Markowitz (1952) of the possibility of reducing non-systematic risk through diversification, it is possible to arrive at the final equation of the OCAPM model which can be found below:

$$E[R_i] = L + \beta_i(E[R_m] - r_f)$$

At first, it can be confused with the original formula of the CAPM, because its composition is identical, except for the composition of the Beta, because the OCAPM model was built from the Omega measure so that, through its use instead of the linear mean-variance relationship of the original model, it is possible, through the use of the Omega, to understand all the terms of the distribution of expected returns. Where β_i is equal to:

$$\beta_i = E \left[\frac{(R_m - L)(R_i - L)}{|R_m - L|} \right] \frac{1}{E[|R_m - L|]}$$

Only a practical constraint should be respected, although it is not a theoretical constraint if R_m is equal to L resulting in 0 the Beta cannot be set, so the constraint that applies to the model is $|R_m - L|$ must be other than 0. The interpretation of the Betas of the OCAPM model is the same as that of the CAPM model, although they do not represent the same relationship, since the Beta of the CAPM represents the relationship between covariance and variance, while in the OCAPM it also considers all distributions of returns above and below L .

RECENT WORKS INVOLVING PORTFOLIO SELECTION USING EVOLUTIONARY ALGORITHMS

In this topic, some recent studies that used evolutionary algorithms for the selection of portfolios were listed. Next to the name of the article, a brief summary of the objectives and results presented will be attached.

Starting with the interesting paper by Khin Lwin et al (2014) in which the authors propose a different approach to the so-called Multiobjective Evolutionary Algorithms (MOEAs), with the aim of expanding the DEMO algorithm. This algorithm represents one of the recent approaches that combine the advantages of DE (R. Storn and K. Price) with the mechanisms of Pareto-based ordering and crowd distance sorting.

For the experiments, the authors evaluated the performance of four MOEAs: the Unmastered Genetic Classification Algorithm (NSGA-II), the Strength Pareto Evolutionary Algorithm (SPEA2), the Pareto Envelope-Based Selection Algorithm (PESA-II), and the Pareto Archived Evolution Strategy (PAES). The optimizations considered up to 1318 assets.

The operation of DEMO involves the maintenance of a population of individuals, where each one represents a possible solution to the optimization problem. During the process of evolution, DEMO allows the capacity of your population to be expanded to include newly found solutions that are not dominated by others. This makes it possible for these new, unmastered solutions to immediately participate in the generation of subsequent candidate solutions. This feature of DEMO promotes a rapid convergence towards the true Pareto frontier.

The authors, following the general scheme of DEMO, present a learning-driven multi-objective evolutionary algorithm called MODEwAwl (*Learning-Guided Multi-Objective Evolutionary Algorithm*). The main differences between MODEwAwl and conventional DEMO can be found in the article, along with the code, the proposed constraints, and the way they were implemented.

The results obtained with MODEwAwl are significant and promising. The authors highlight that MODEwAwl is not only capable of generating high-quality portfolios with additional constraints, but is also effective in resolving a reasonable number of assets (up to 1318). In addition, the proposed algorithm outperformed the four most widely used MOEAs: NSGA-II, SPEA2, PESA-II, and PAES.

Mishra et al (2016) present a new portfolio optimization model called PBMV (*Prediction Based Mean-Variance*), as an alternative to the traditional Markowitz mean-variance model, to solve the problem of portfolio optimization with constraints. In Markowitz's model, the error according to the authors is to use the average of past returns as an estimate of future returns. In PBMV, expected future returns are predicted with the use of a low-complexity artificial neural network. Portfolio

optimization is then carried out through multi-objective evolutionary algorithms (MOEAs). In addition, a multi-objective optimization algorithm based on swarm intelligence called SR-MOPSO (*Self-Regulating Multiobjective Particle Swarm Optimization*) is proposed and employed to solve the problem.

The study compares the Pareto solutions obtained by the PBMV with those obtained by the Markowitz model and two other competitive MOEAs, using six performance metrics and the Pareto boundaries. A non-parametric statistical analysis is also performed to compare the performance of the algorithms in pairs. The results reveal that the approach based on the PBMV model offers better Pareto solutions while maintaining adequate diversity, and is comparable to the Markowitz model. Notably, the PBMV-based SR-MOPSO algorithm stands out as the best option in relation to the MOEAs evaluated. These results have significant implications for portfolio optimization with constraints and can be applied to other practical problems.

In addition, in addition to the 2 articles previously mentioned, the work done by Silva et al (2019) is relevant in view of the results presented and claimed by the authors, where in the work they address several variants of the medium-variance portfolio selection (PSP) problem through a unified multi-objective optimization (MO) approach using the *Adaptive Ranking Multi-Objective Particle Swarm Optimization* algorithm (ARMOPSUS). ARMOPSO introduced a classification procedure based on unmastered ordering, crowd distance, and a new mechanism called cost-effectiveness. This, according to the authors, is one of the first generic approaches to dealing with multiple variants of PSP in a single framework, according to an extensive review of the PSP literature over the past 20 years by the researchers involved.

ARMOPSO was tested on five variants of the medium-variance PSP, including typical financial market constraints such as minimum and maximum limits, cardinality, whole lot sizes, and pre-allocation. The results were compared using several specific metrics, such as spacing (S), generational distance (GD), diversity metric, hypervolume (HV), error (Er), mean return error (MRE), return error variance (VRE), as well as mean percentage error (MPE), minimum (MinPE), maximum (MaxPE) and median (MedPE).

The results of the extensive computational experiments demonstrated that ARMOPSO achieved a highly competitive performance in all variants and in most of the metrics evaluated, when compared to the specific methods for problems proposed in the literature. This highlights not only the efficiency of the unified method, but also its remarkable robustness.

The authors also point out that future work may involve the development of more effective ways to deal with the difficulty of practical application, helping the algorithm to find improved unmastered solutions and, consequently, a better quality frontier. Advancements in this regard can

also reduce the CPU time spent by the procedure, especially for large instances. In addition, it is believed that ARMOPSO can be applied to solve other multi-objective problems.

METHODOLOGY

DATA COLLECTION

For this study, the American companies that make up the Dow Jones Index were chosen. The daily closing prices of the assets of each market were collected, and then the logarithm of the daily price change was calculated, preparing them for subsequent analyses. Companies that presented less than 30% of the prices in relation to the days collected were excluded from the sample.

The time windows were defined as follows:

Janela 1 (*in-sample*) 1994-1998, janela 2 (*out-of-sample*) 1999-2003.

Janela 3 (*in-sample*) 2004-2008, Janela 4 (*out-of-sample*) 2009-2013.

Janela 5 (*in-sample*) 2014-2018, Janela 6 (*out-of-sample*) 2019-2022.

OPTIMIZATION APPROACHES

To carry out all the optimizations proposed by this work, the Spyder framework was used, which works through the Python programming language. The optimization proposals in question were: (i) CAPM (Sharpe), (ii) Omega CAPM (OCAPM), (iii) Multiobjective Evolutionary Algorithm 1 and 2

The following restrictions have been applied to all optimizations:

- 1- Cardinality constraint: corresponds to the maximum number of assets that the portfolio must optimize. The value used in the research was 8
- 2 – Budget constraint: refers to the sum of the weights of the assets being equal to 1
- 3 – Restriction of asset weights: The weight of each asset must be greater than or equal to 0

CAPM Optimization

In the CAPM optimization, the algorithm developed by Sharpe was used, which has in its composition the objective of solving quadratic programming problems, finding the weights of the assets that maximize the objective function in the following image:

$$\text{Maximizar } \sum_i w_i r_i - \frac{1}{r_t} \sum_{i,j} w_i w_j \sigma_{ij}$$

Where W_i is the weights of the i -th asset in the portfolio, R_i is the expected return of the i -th asset, R_t is the investor's risk tolerance, and σ_{ij} is the covariance between the returns of the assets.

It is still necessary to maximize the Sharpe ratio through the maximization problem described below:

$$SR = \frac{R_p - R_f}{\sigma_p} = (R_p - R_f)\sigma_p^{-1} = \left(\sum_i w_i r_i - R_f\right) \left(\sum_{i,j} w_i w_j \sigma_{ij}\right)^{-0.5}$$

$$\text{sujeito a } \sum_{i=1}^n w_i = 1 \text{ e } w_i \geq 0$$

Where R_p is the return of the portfolio p , R_f is the Risk-Free Rate, σ_p is the standard deviation of the portfolio p , w_i and w_j are the weights of the assets i and j respectively, r_i is the expected return of the i -th asset, and σ_{ij} is the covariance between the assets i and j .

The maximization of the objective functions previously mentioned were done through computational experiments through the Spyder framework, which uses the Python programming language. The code was fed by the logarithm of the variation in the prices of capital market assets in both the US and Brazil and was made in a single-objective manner.

OCAPM Optimization

To solve the issue of maximizing the Omega Index, which is considered a non-convex problem, it is necessary to solve a family of linear programs or a single fractional linear program, thus delimiting the traveled area, solving the problem of non-convexity. The code referring to the aforementioned maximization was made in Spyder based on the Scipy.optimize package in the Python language. The optimization of the OCAPM was also done in a single-objective way.

The formula for the objective function of the Omega Index can be seen below:

$$\text{Maximizar Índice } \hat{\Omega} = \frac{EG_p(L)}{EL_p(L)},$$

$$\text{sujeito a } \sum_{i=1}^n w_i = 1 \text{ e } w_i \geq 0$$

Where $EG_p(L)$ is the *Expected Gain*, $EL_p(L)$ is the *Expected Loss* both refer to the portfolio, L is a threshold, W_i is the weights of the assets in the portfolio i , and n is the number of assets in the portfolio.

Multi-Objective Evolutionary Optimization 1 and 2

Multi-objective optimization consists of several objective functions being executed simultaneously in order to maximize or minimize them, subject to a set of constraints that the solutions must satisfy. To perform this optimization, the general form of a multiobjective optimization problem conceptualized by Deb (2001) was used and can be seen below:

$$\begin{aligned}
 &\text{Maximizar ou minimizar} && f_m(x) \quad m = 1, \dots, N_{obj} \\
 &\text{sujeito a:} && \\
 &&& g_j(x) \geq 0 \quad j = 1, \dots, J \\
 &&& h_k(x) = 0 \quad k = 1, \dots, K \\
 &&& x_{lb} \leq x \leq x_{ub} \quad i = 1, \dots, N_{var}
 \end{aligned}$$

Where:

x is a vector with N decision variables

N_{obj} is the number of optimization goals

$g_j(x)$ are the constraints of inequality

$h_k(x)$ are the equality constraints

J and K are the numbers of inequality and equality constraints

X_{LB} and X_{UB} are the lower and upper bounds of each decision variable

Knowing that it is not possible to simultaneously optimize all objectives, the solution used to mediate this selection was the use of Evolutionary Algorithms (AE), which use the value of the objective functions of each individual's problem to, through classification tests, choose which ones will remain for the next interactions. GAs work by coding candidate solutions to a problem through the use of genetic operators, i.e., through the concepts of Darwinian evolution, mutation, and crossbreeding. In the present study, the NSGAI, NSGAIII, IBEA and GDE3 algorithms were used.

Based on these concepts, the multiobjective optimization used as central attributes the maximization of the Omega measure, the minimization of the *maximum drawdown*, and the conditional correlation of the VIX (CVIX). Like all the optimizations present in this work, both were also performed through the Spyder framework, based on the Python programming language.

RESULTS AND DISCUSSION

For the evaluation of the results, the accumulated returns outside the sample of the optimized portfolios, i.e., *out-of-sample*, were considered, these being the samples that represent the performance of the distribution of the weights of the assets in the portfolio obtained through the *in-sample optimizations*. Thus, it is possible to evaluate the performance of the portfolio obtained in the

optimization if it were implemented by an investor in practice in the years that comprise the *out-of-sample period*.

At first, it is important to point out that due to the convexity of the optimized Sharpe, Omega portfolios, they will converge in a single solution and have a single point. With regard to the evolutionary algorithms, the choice was made among the 50 best executions of the algorithm, for this reason the unmastered portfolios that represent more than one portfolio and do not have dominance between them were also considered, so aiming at the best understanding we chose to represent everything in the form of a *boxplot*.

Contextualizing the presentation of the results and their analysis, it is important to highlight the 6 metrics for analyzing the data obtained through optimizations. First, due to the nature of the optimization made by the algorithms used, i.e., in a multiobjective way, it is not possible to compare the solutions obtained based on the values of their objective functions directly, because the result of the optimization is a frontier of optimal solutions.

Thus, it is necessary that the first evaluation metric be the calculation of the hypervolume of the results presented by the algorithms used (NSGAI, NSGAIII, IBEA and GDE3). This evaluation metric seeks to evaluate the quality of the frontier obtained by weighting two central characteristics: The proximity of the Optimal Pareto frontier and the extent to which the solutions are well distributed along the frontier in order to identify the solution that best covers the frontier, so the first characteristic concerns convergence and the second refers to diversity.

The hypervolume metric was defined by Zitzler and Thiele (1998) and can be obtained by considering: S as the set of undominated solutions generated by a multiobjective algorithm, R as a reference point, dominated by all solutions of S , and v_i the hypercube formed from the space dominated by the $S_i \in S$ solution having the values of R as a limit. Once the hypervolume-based metric was obtained, as explained above, it was possible to identify the algorithm that presented the best set of optimal solutions. From the choice of the algorithm that presented the best performance, 5 more metrics were applied, 3 of them aiming to measure the risk associated with the portfolio formed (CVaR, maximum Drawdown and Coefficient of variation), one related to the return obtained in the *out-of-sample window* (Accumulated Return) and the last one measures the percentage of allocation in each asset chosen by the evolutionary algorithm previously chosen by the analysis of the hypervolume metric. At the end of the calculation of the chosen and previously mentioned metrics, it was possible to obtain the graphs, separated by time window and by evaluated market. All the mentioned metrics were applied both in the algorithm chosen as the most efficient in terms of the Sharpe and Omega ratios and also in the Index of the evaluated market, except for the hypervolume metric, because due to the nature of the indexes addressed, it is not necessary, since they present a single solution.

Before presenting the graphs obtained through the concepts mentioned above, it is interesting to contextualize the 3 risk metrics used for a better understanding of the analyses made, apart from CVaR, maximum drawdown and coefficient of variation.

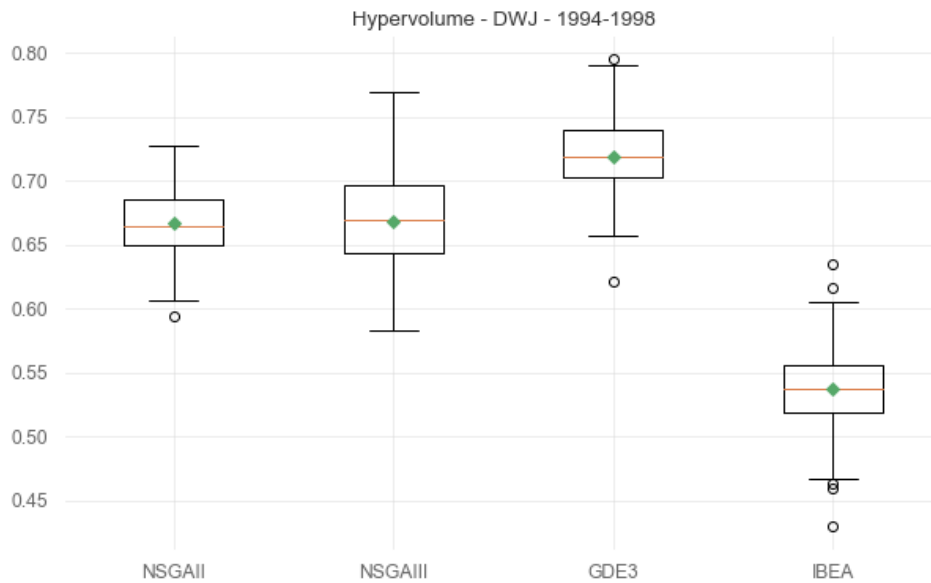
The CVaR, which stands for *Conditional Value at Risk*, can also be called Average Expected Loss or *Expected Shortfall* and aims to answer the question "What is the average loss incurred by the portfolio in x% worst-case scenarios?" That is, it quantifies the average size of the loss in the worst possible scenarios of the portfolio, and in the context used in the analysis of this article it will measure the average loss of the worst days of the portfolio formed, thus having the ability to detect the presence of catastrophic events. For its use, it is necessary to first define the level of reliability used in the metric, for example, a 95% confidence level means that the point of interest of the potential losses has been defined for 5% of the worst possible scenarios, thus being possible to calculate the average of the potential losses associated with these worst scenarios present in the chosen portfolio. The last example describes the level of reliability defined for the analyses of this study, so the CVaR will tell us the average loss of the 5% worst days of the portfolio being analyzed.

The maximum *drawdown*, on the other hand, is the percentage difference between tops and bottoms, thus being able to indicate what is the maximum "pain" point present in the portfolio, that is, what is the largest possible loss stage present in the portfolio formed during the defined period. It can also be understood as the largest percentage reduction in the value of an investment or portfolio, measured from its previous peak to its subsequent lowest point.

And finally, the coefficient of variation, which is used to measure the risk/return ratio of the portfolio, i.e. how many units of risk will be added for each unit of return. Therefore, it is interesting to always look for the lowest possible coefficients of variation, as this will indicate a better relationship between these two variables. It can be obtained by dividing the standard deviation of the returns by the expected value of the returns.

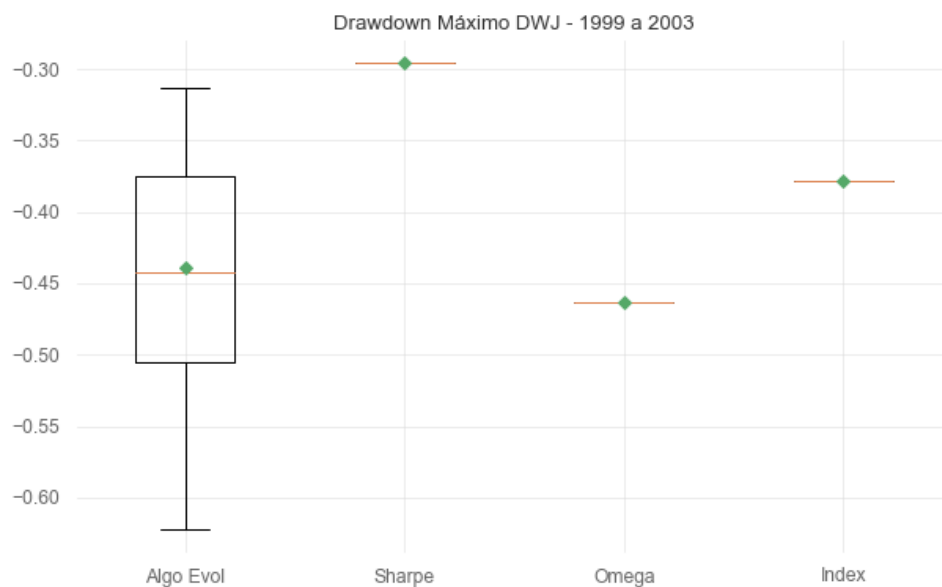
From here, the analyses were presented according to the market in which the optimization was made, as well as its previously defined time window.

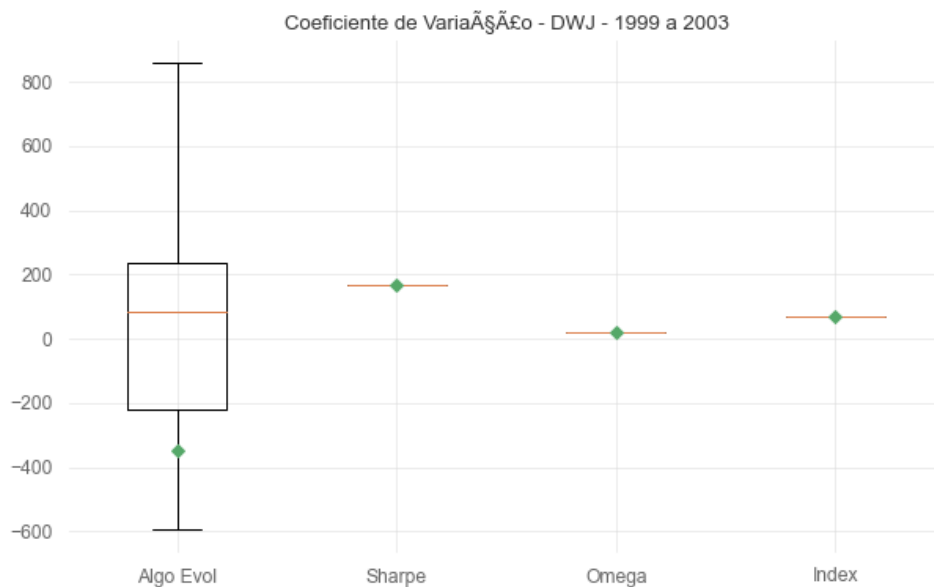
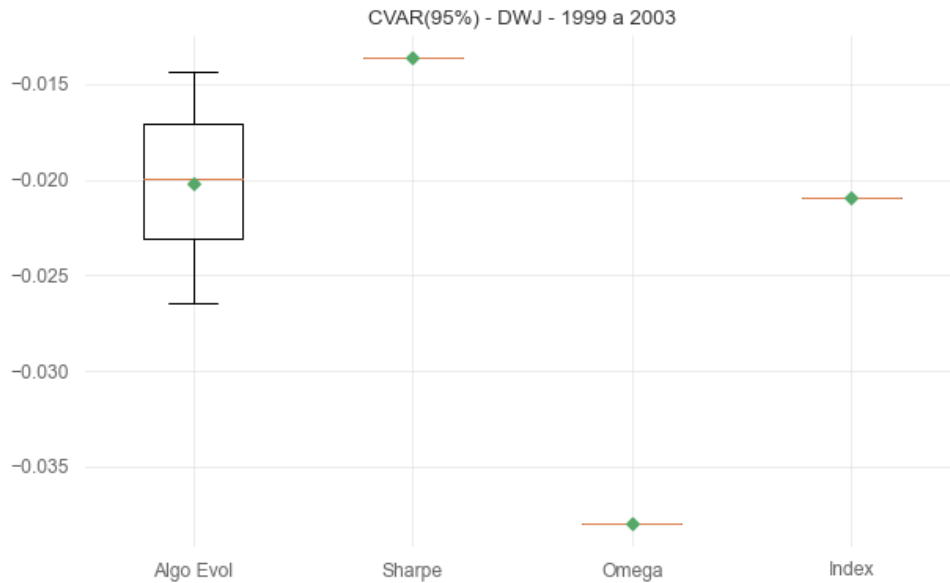
Window 1 – Dow Jones Companies – *Out-of-Sample* (1999-2003)



As can be seen, the algorithm that presented the best performance based on the hypervolume metric was GDE3, and therefore it was the algorithm chosen to make the comparisons with Sharpe, Omega and the Index of the market in question. Therefore, within that section, the legend "Algo Evol" on the charts is representing GDE3's performance.

The following are the 3 graphs referring to the risk metrics used:



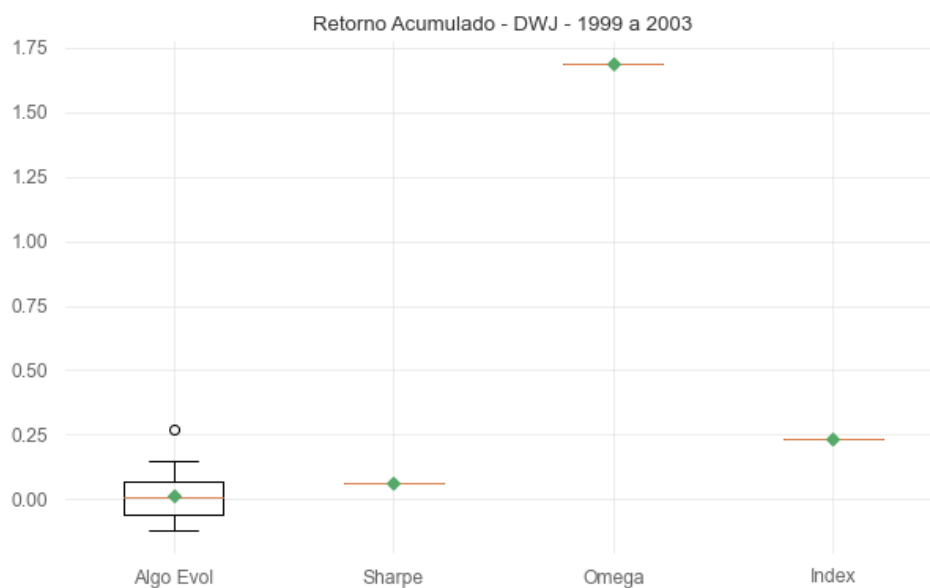


Regarding the risk metrics in the first window of the DWJ market, we can observe that the evolutionary algorithm together with the Omega measure presented the highest *maximum drawdowns* among the portfolios evaluated, representing a reduction of up to 45% of the initial capital along the way. It is also possible to lose an average of 2% on the worst days for the algorithm.

The portfolio based on the Sharpe ratio was the one that presented the best risk metrics in this window, but just like the evolutionary algorithm presented a cumulative return very close to 0, which ends up not making much difference to have good risk metrics in this case, as it proved to be inferior even to the Index of the evaluated market.

In addition, it is interesting to note that the Omega measure presented a huge associated risk, being able to lose an average of 4% on the worst days and more than 45% at some point in the time window, represented by *the drawdown* and this can be explained by the low diversification applied by the optimization made with the Omega measure, where the choice was to allocate 100% of the capital in a single company under the acronym UNH (UnitedHealth Group Inc).

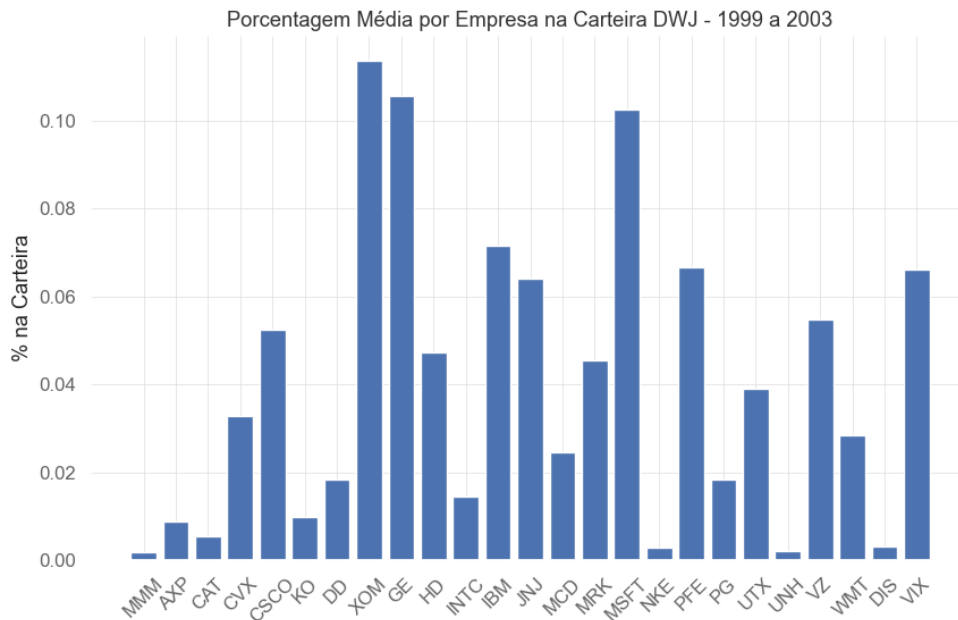
On the other hand, the evolutionary algorithm, despite having diversified much more than the Omega measure, was not able to mitigate the associated risks just by diversifying more, presenting results related to risk very similar to the Omega measure, but when it comes to the accumulated return it performed much lower, losing even to the DWJ Index (Characteristic that was only observed in the American market, where the Index due to the maturity of the market represents a viable allocation option, which does not happen in the Brazilian market, this concept was better worked in the IBOV time window)



As you can see in the chart above, the cumulative return of the evolutionary algorithm (GDE3) was very close to 0, as well as Sharpe, where both lose even to the Index in this first window of the DWJ market. With emphasis on the Omega measure, which presented a return close to 175%, however, as previously mentioned, the optimization based on this measure opted for the total allocation of capital in only 1 asset. And as has been demonstrated by the risk metrics presented, this represents a significant increase in the risk associated with the portfolio formed.

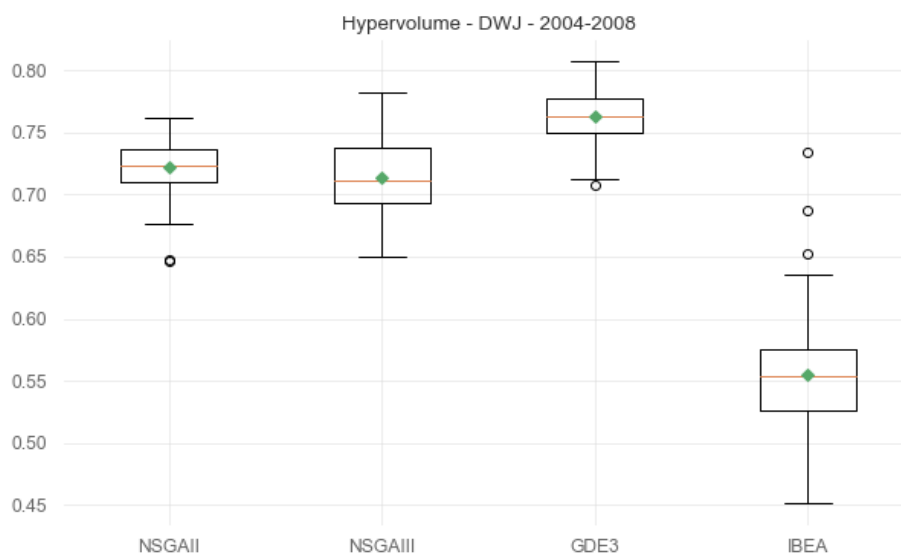
Next, the choices made by the evolutionary algorithm chosen as the best among the 4 evaluated can be visualized. The capital-allocation weights on each DWJ asset along with the allocation to the VIX, which is made on the basis of the CVIX. And although the VIX is not an asset

in itself, we chose it because it made the algorithm interpret such an index as one, so in times of great volatility in the market, it can choose to allocate a percentage of the available capital to this imaginary asset, as a form of protection, so that in practice the capital allocated to the VIX is actually out of the market and protected from its variation. This logic was applied to all other windows.



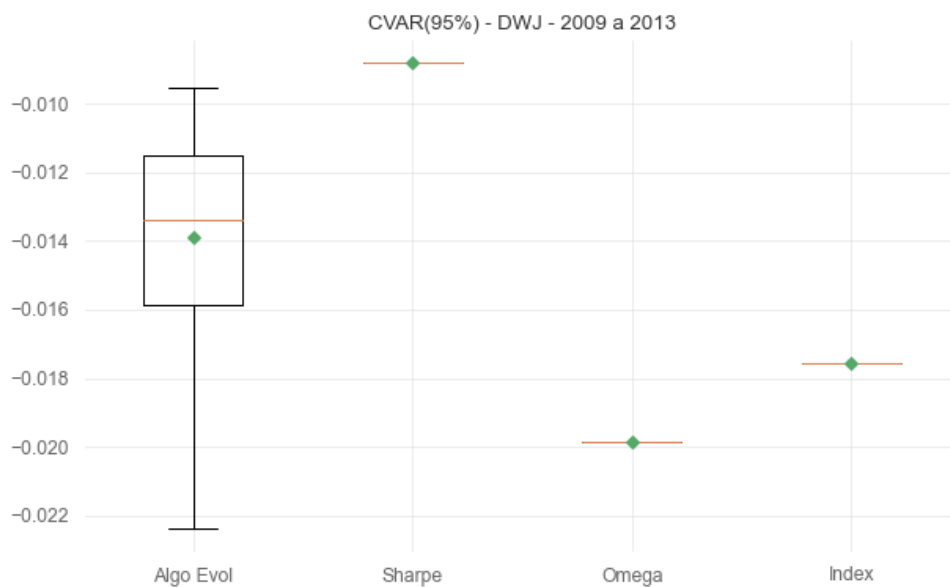
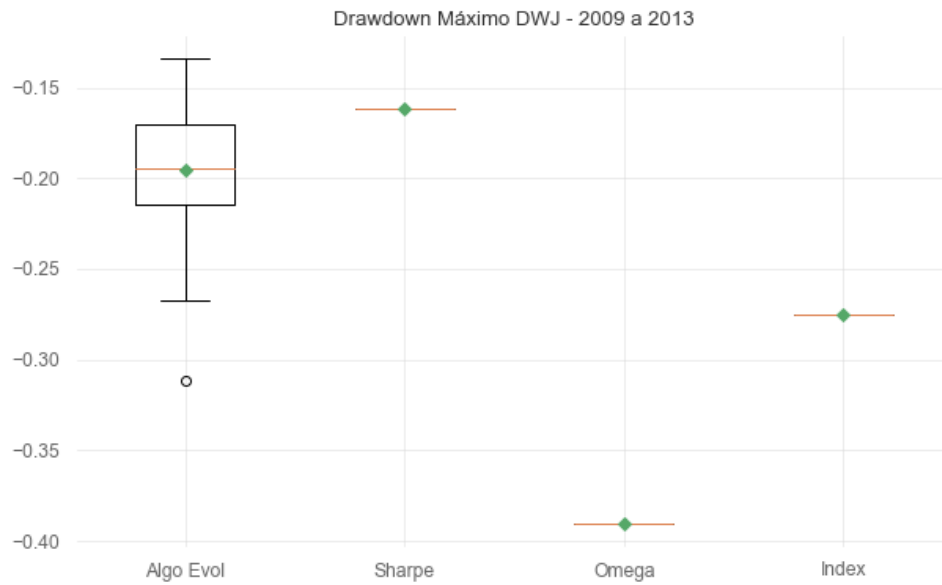
Due to the return close to 0 and below even the market index, this chart has no practical use in itself in the 1999-2003 time window.

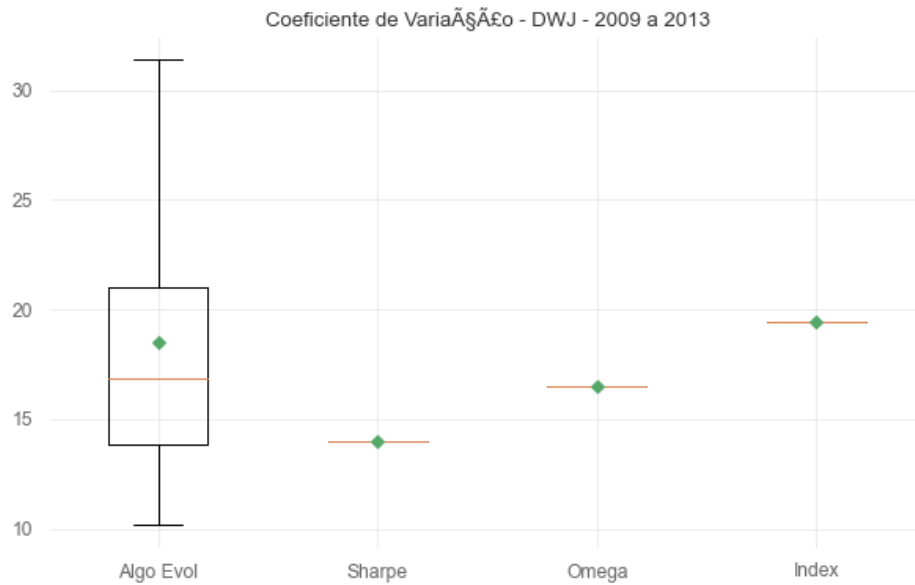
Window 2 – Dow Jones Companies – *Out-of-Sample* (2009 - 2013)



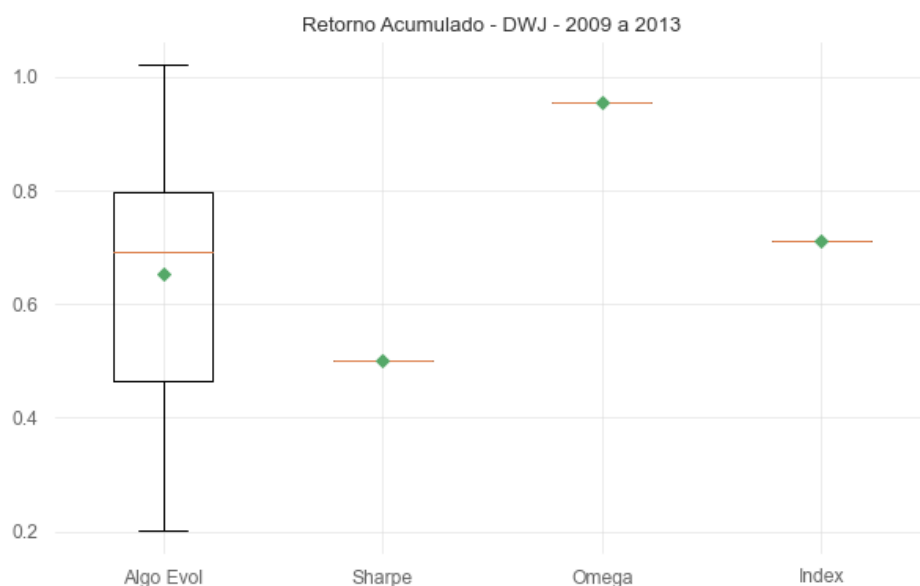
As in the previous windows, and in the subsequent windows, the winning algorithm within the hypervolume metric was GDE3 and so from here on the hypervolume graph needs no legend.

Risk metrics:



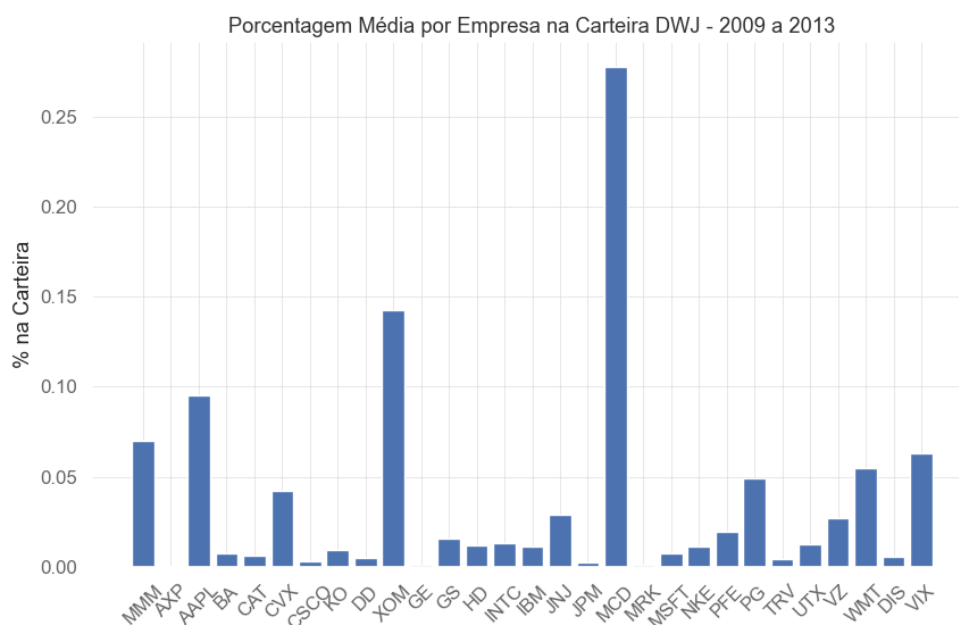


In this window a certain pattern repeats itself again, Sharpe presents the best risk metrics, along with the evolutionary algorithm in this specific window. Another thing that can also be observed and has already been discussed in previous windows and ends up being seen in this window is the optimization based on Omega presenting the worst risk metrics, this time accompanied by the market Index, even though it is the most mature market Index, the American one.



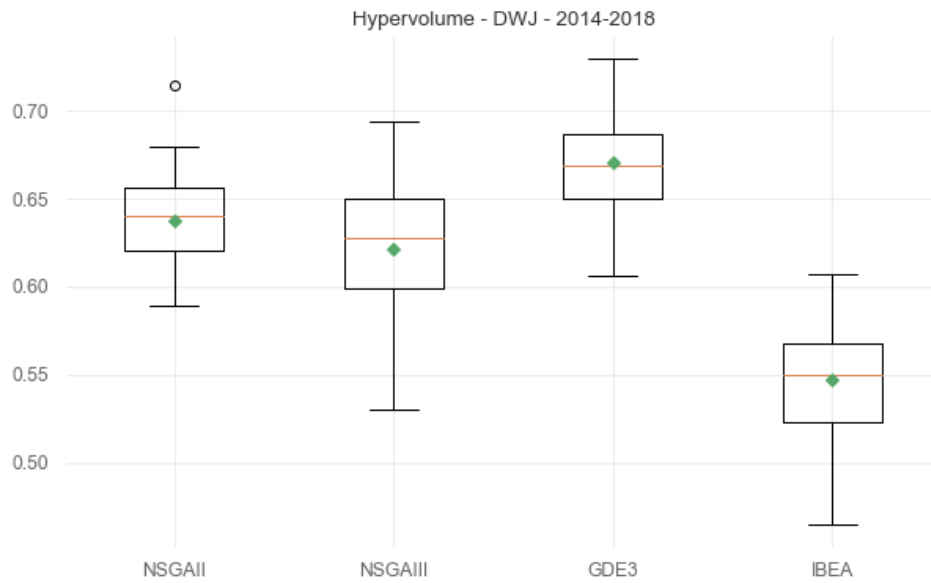
As for the accumulated returns, one more pattern can be identified, Omega presents the highest return by far compared to the other optimizations and in relation to the Market Index, which

on this specific occasion obtained a very satisfactory return, reaching a higher than Sharpe and the evolutionary algorithm itself. However, as in previous windows, the higher premium offered by Omega is directly related to a considerable increase in portfolio risk, which reforms the idea that despite the higher yield, it becomes more interesting to opt for Sharpe or even in this case for the evolutionary algorithm, which has shown to deal well with risk in this window. and was able to deliver a cumulative return of approximately 70%, even higher than Sharpe. The 70% performance of the Index in this time window can be explained by the global macroeconomic moment of the time, where after the 2008 crisis assets in general were "cheap" and consequently with the recovery of the economy in subsequent years offered a return above normal. As in previous windows, Omega has low diversification, but this time choosing to allocate 9% to the VIX and obtaining considerable returns despite not so interesting risk metrics. Sharpe, in addition to being more diversified, also chose to allocate about 10.5% of the capital to the VIX.

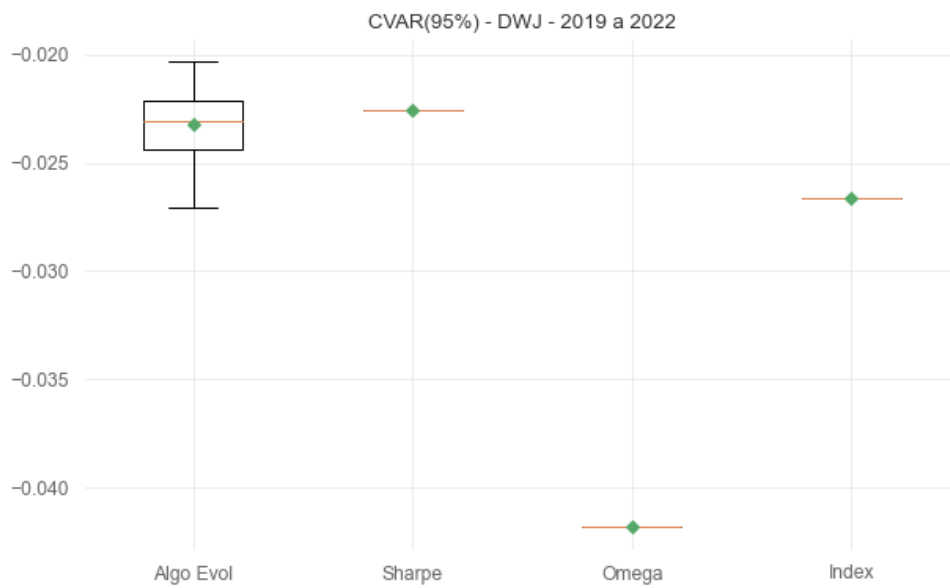


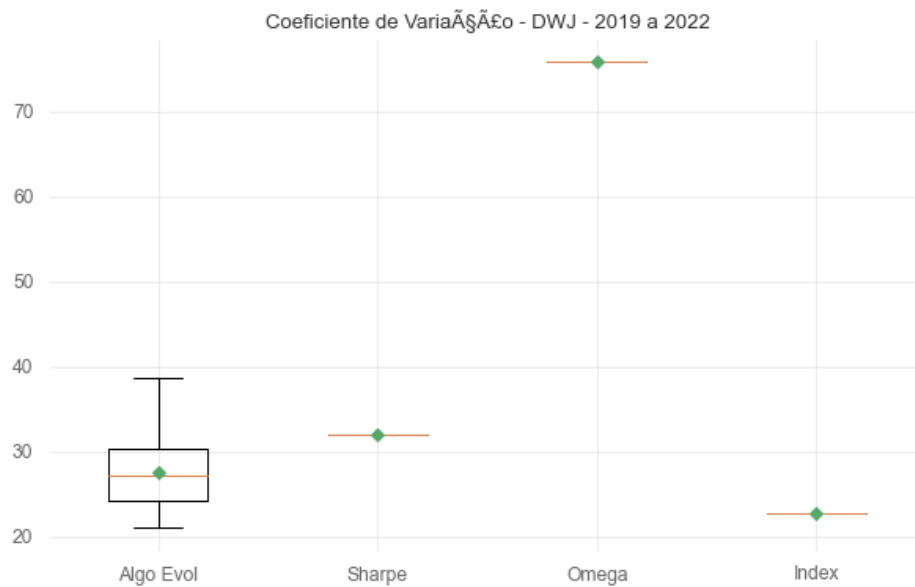
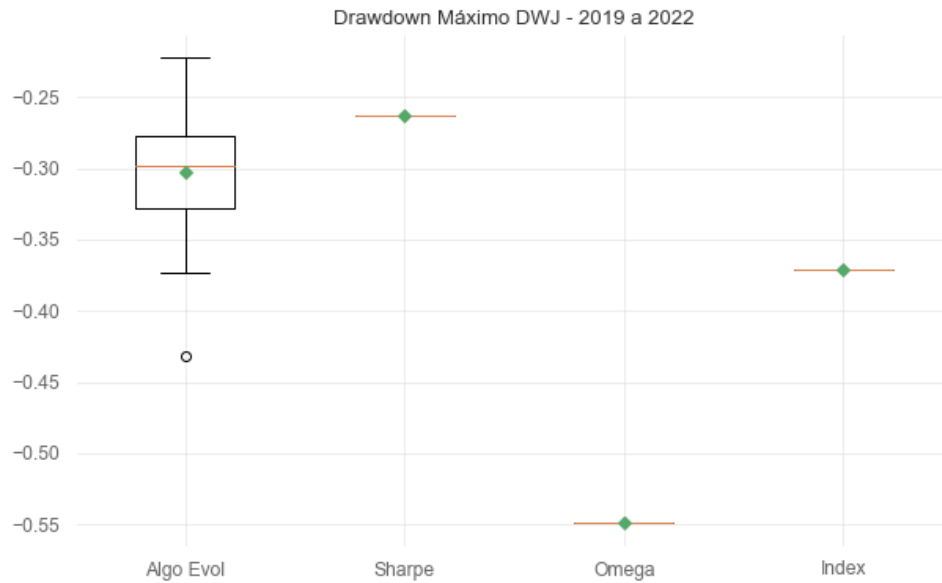
The choices made by the evolutionary algorithm are represented above, it is interesting to highlight the allocation of more than 5% in the capital, also in the VIX.

Window 3 – Dow Jones Companies – *Out-of-Sample* (2019 - 2022)

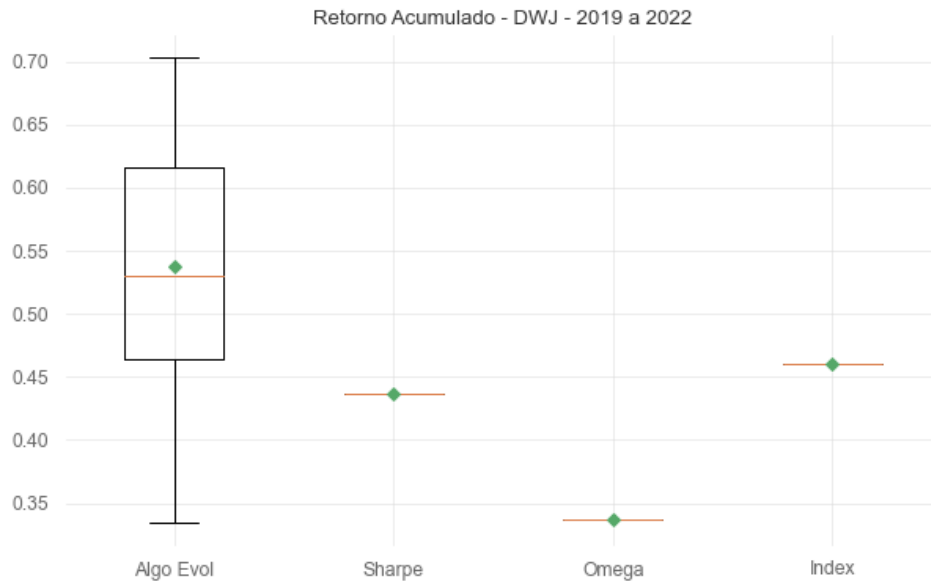


Risk metrics:

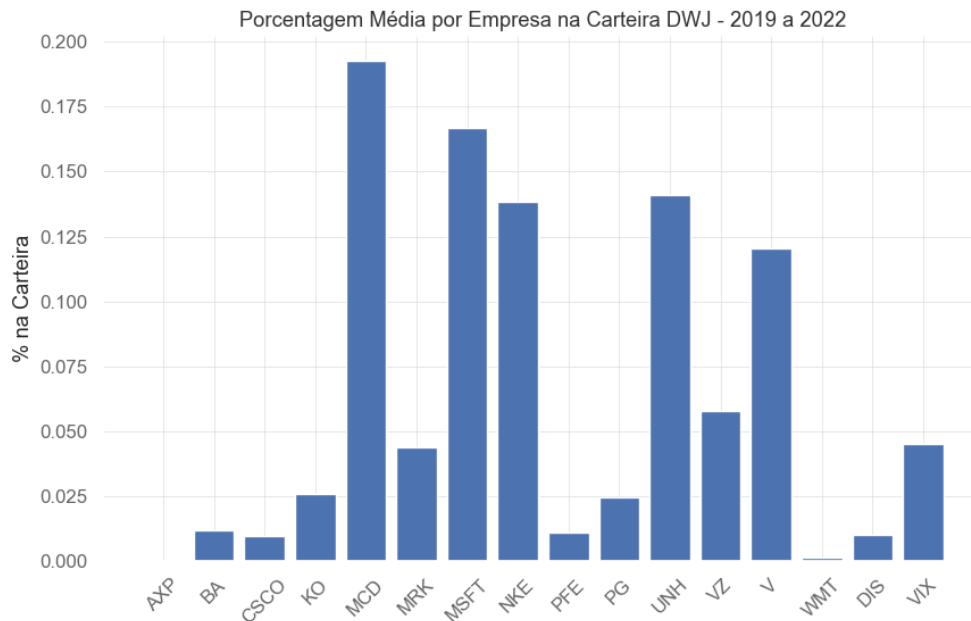




In the last window of the American market the results do not diverge from the analyses made in the previous two, once again the optimization made by Omega presents the worst risk metrics, with the Index having shown us a good performance as the risk metrics following the same pattern of the Index performing well in the more mature market of DWJ. Sharpe remains the winner in terms of risk-reward ratio, followed by the evolutionary algorithm. Making it so that once again the rational choice of the investor focuses on the choice between these two portfolios.



In this window, the risk associated with the choice for low diversification made by the Omega index is evident, which this time presented a cumulative return lower even than the Index of the American market. With emphasis on the evolutionary algorithm that presented the best accumulated return combined with good performance in relation to risk metrics, gaining considerably in accumulated return even from the Sharpe ratio, which had been presenting relatively better returns in relation to the associated risk until then. Omega chose to allocate 86% of the capital to only one company (GE), followed by 7% to IBM and 6% to the VIX, and even then presented accumulated returns lower than the index, indicating high exposure to risk and low accumulated return, unlike Sharpe, who again presented high diversification with 7% allocation to the VIX. The choices made by the evolutionary algorithm can be seen below:



It is important to highlight that the greater the diversification, not only in relation to the number of assets, but also in relation to the different sectors of the economy in which these chosen companies operate, the lower the coefficient of variation. This explains the high coefficients presented by the Omega measure. It is also important to point out that in all the optimizations made by the evolutionary algorithm there was part of the capital allocated within the VIX.

CONCLUSION

The objective of this work was to perform optimizations with purely convex attributes in a mono-objective way and then to compare the expected returns of the assets outside the sample of these optimizations with the results from the optimizations made in a multiobjective way with non-convex attributes, with emphasis on CVIX and *drawdown* maximum. Thus, it is possible, through the evaluation of the results, to know if the portfolios formed exceed the theoretical market portfolios suggested by the CAPM model. The multi-objective optimizations mediated by evolutionary algorithms showed us a better performance than the Sharpe and Omega portfolios with higher out-of-sample returns, as well as a better mean-variance ratio. The results then confirmed that the use of only the mean and variance in the construction of optimized portfolios should not be the only attributes to be considered, in particular this work demonstrates that the addition of an antifragile attribute as well as the *maximum drawdown in the portfolio optimization models can potentially increase the performance of the formed portfolio.*




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Public health and regulation in the management of human corpses in private funeral homes in Yucatán, Mexico

 <https://doi.org/10.56238/sevened2024.010-025>

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ABSTRACT

Objective: To analyze the problem of disposing of human corpses in private funeral homes in the state of Yucatán, Mexico. **Materials and Methods:** The study is based on the use of Legal Research Methodology through the analysis of the legal framework and institutional provisions that concern the treatment of human corpses. **Results:** It was found that the process of preparing and embalming human corpses is complex, due to the cultural burden present in the country and, therefore, in the different states of the Mexican Republic, where death has a deeply rooted space in social understanding. The process of preparing the body, in addition, contains a wide spectrum of derived problems, which involve other social actors, which are often not considered, but which go beyond the personnel who handle the bodies in hospitals or the Legal Medical Service. We are talking about private funeral service providers in charge of preparing bodies to carry out funeral ritual processes before burial or cremation.

Keywords: Access to public health, Social determinants of health, Public health policies, Socioeconomic inequality, Management of human corpses.

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INTRODUCTION

To present the proposal, we start with the following question: Who guarantees that your body is treated ethically and professionally after death? This issue is often neglected for various reasons, in some cases it is related to the fear of death, in other cases it derives from the sociocultural taboo that evokes that, by eliminating the variable bodily animation, the conception of a person refers to transcendence.

Some religions may associate it with divine or spiritual elements, while other sectors of society often think of the completion of a cycle. However, intrinsically part of the development of societies throughout history, they show a tendency to treat the deceased with solemnity and respect, or at least to use specific methods for their management. Therefore, in some cultures, the dead are an important part of their worldview. In the case of the state of Yucatán, the identity trait is called *Hanal Pixan*. The deep-rooted celebration of this event (celebrated under the name *Day of the Dead* throughout the national territory) is indicative of the fact that Yucatecan society maintains an idea of social and cultural responsibility towards the dead. Therefore, the concern of families with the appropriate management of the bodies of their recently deceased is latent.

Although we are faced with explanations loaded with ideological elements related to the meaning of the corpse and the rituality that is imprinted on the treatment of the body from a social and cultural point of view, the reality is that before burial, or cremation; There are normative provisions that, from a legal perspective, seek to regulate/approve the treatment of the body, arising from the understanding that the correct disposal of corpses corresponds to a public health function.

Therefore, it is necessary to draw attention to the need to regulate and monitor the way the body is treated within private bodies that perform embalming services. However, it should be noted that the disposal of corpses does not represent the only problem within the equation, since the lack of training of the service provider and the lack of hygiene in workshops that are not properly regulated by the Ministry of Health confront us. with another question: who guarantees the embalmer that he will not contract some pathology as a result of the body manipulation process?

Although the answer may seem simple, the objective of this text is to present a public policy proposal aimed at the adequacy and regulation of private funeral services in Yucatán, since it is necessary to make visible the intricate problem generated by the commodification of death, especially in the population more vulnerable. who, as a result of their low income, are forced to hire funeral services which, because they offer low prices, 1) do not have adequate facilities for the correct treatment of bodies, 2) operate with personnel who are not trained in the professional and ethical handling of the bodies corpses, 3) put the worker at risk due to working conditions and 4) use, in some cases, water wells as a way of disposing of organic waste, such as blood and tissues, as well as toxic elements, polluting the water table and the environment in general.

METHODOLOGY

The present work is in accordance with the methodology of legal research, which, although it has its origins in hermeneutics, in recent years has been discussed and analyzed by several researchers, including Martínez Zorrila, who highlights that "when we talk about legal methodology, we are fundamentally referring to the study and analysis of the procedure in order to determine what the legal answer is for the case we are examining (Martínez, 2010: 22, in Sánchez, 2011: 329). For the case presented below, we adapt to the so-called social legal research:

Bearing in mind that law is present in human societies, being an institution that arises within them, it is not uncommon for there to be research interested in seeing how legal norms work. This is why it seems appropriate to call this type of research *de facto*: legal-social. (Sánchez, 2011: 346)

PROBLEM IDENTIFICATION AND DEFINITION

The dynamics that are carried out during the treatment of the human body have different social actors, which can increase according to the degree of complexity with which the problem is understood, however, for the purposes of this proposal we focus on three main actors: 1) deceased people, 2) funeral service workers and 3) the Ministry of Health. Is it valid to treat the deceased as a social actor? We consider this to be so, since, from a legal point of view, article 346 states that "corpses cannot be objects of property and will always be treated with respect, dignity and consideration" (General Health Law, 2023, p. 155) . How does the body work? It acts in relation to the legal burden conferred on it by a right, at the same time as the social and cultural burden of which it is part, and which is not eliminated by death.

Social actors	Risk
Deceased	Being treated inappropriately by private funeral service providers
Funeral Director	Being treated inappropriately by private funeral service providers
Ministry of Health	Non-compliance with provisions cool contained in the General Health Law : Art . 17 bis; Article 79; Art. 116; Art. 117; Art. 129; Art. 133; Art. 313; Art . 346, art. 348; Art. 349; Article 350; Art. 350 to 7; Article 375.

Source: Authors' own elaboration with information from the General Health Law

However, this diversity of actors presents in itself a problem sensitive to the social context, because, although we are facing a problem of a universal nature, considering that death does not discriminate according to economic situation, sex, gender and nationality, in reality there are a greater risk in social actors 1 (deceased person) and 2 (service provider) resulting from the fact that the condition of marginalization, education, economic situation and even a situation of indigenous vulnerability make the family members of actor 1 are forced to hire non-professional embalming

services, and actor 2 is forced to accept low-paying jobs without adequate training and with high health risks.

Derived problem matrix

Problem		Derivatives		Risk by index population
		Qualitative Potential Risk	Quantifiable Potential Risk	
General	Lack of measures to regulate the responsible, professional and ethical disposal of human corpses in private funeral homes in the country. State of Yucatan	Yucatecan families resort to contracting unregulated mortuary services derived from their economic possibilities and their social and cultural needs to satisfy their spiritual and cultural needs.	In the case of Yucatán, the general population was estimated in the 2020 census at 2,320,898 inhabitants, of which 525,092 are of indigenous descent and 49.5% of the Yucatecan population is in poverty.	Contralto
private 1	Lack of professionalization and certification of personnel responsible for treatment of human corpses in private funeral homes in the state of Yucatán	One of the problems that arises from marginalization in the workplace is that jobs such as embalming are carried out by people who do not have any professional certification.	In Yucatán, the educational gap is 21.8%. The percentage of people with basic education and Higher secondary education is as follows: Elementary. 24.0%, Secondary 28.1%, High school 19.8%, Technical 2.23%	Low
private 2	Health problems among workers in private funeral homes in the State of Yucatán resulting from inadequate facilities and lack of training	Funeral service workers buy the They gain scientific and technical knowledge about the toxic substances used to process bodies and the damage they cause.	Embalming workers do not They are certified; therefore, they are not regulated and do not have any type of benefit. 24.7% of the population of Yucatán does not have access to health services. 44.4% of the population does not have access to social security.	Quite

<p>private 3</p>	<p>Lack of regulation of waste management and organic waste from human corpses and toxic substances from private funeral homes in the state of Yucatán</p>	<p>The type of soil in Yucatán, characterized by cavernous limestone and underground rivers that nourish cenotes, makes it easy for untreated waste dumped into groundwater to become a serious pollution and public health problem.</p>	<p>Derived from topographical soil characteristics and human activities, (Torres et al. 2014) through a quantitative methodology called DREATIC, They found that the risk of vulnerability to contamination in the state of Yucatán is 180 to 199 (High) in municipalities located south of the study area, 200 to 210 (Very High) in municipalities located in the center of the hydrogeological region of the Semicircle of Cenotes (SC) and a vulnerability index of 211 to 220 (Extreme) in the north of the SC region and in the coastal zone</p>	<p>Segregation from Top to End</p>
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Source: Prepared by the authors themselves with information from INEGI 2020; CONEVAL 2022; and Torres et al., 2014

Root cause analysis

Visibility of the interrelationship of the problems that constitute the main problem is necessary to understand the causes and establish possible actions that contribute to their attention and resolution. We find causes that threaten public health and human rights, against decent working conditions and against the protection of the environment.

General problem: The inadequate handling of corpses by service providers is due to the commodification of a service with the potential for universal acquisition, which cannot be questioned by those who receive direct treatment. The execution of work within private funeral homes is practiced based on the transmission of knowledge in an informal and empirical way, and not the professionalization necessary to deal with human bodies. Likewise, the central cause lies in the fact that the government entity responsible for regulating this type of establishment is the Ministry of Finance and Public Credit and not the Ministry of Health, despite the latter stating in its article 349 that "The deposit and handling of corpses must be carried out in establishments that meet the sanitary conditions established by the Ministry of Health" (General Health Law, 2023, p. 156), Likewise, article 350 mentions that "The competent health authorities will exercise sanitary control over the people involved in the provision of funeral services. Likewise, they will verify whether the facilities in which the services are provided comply with the sanitary conditions required under the corresponding regulations" (General Health Law, 2023, p. 156) . Although the provisions of the law

above are part of the regulation, the reality is that funeral services are regulated in accordance with the determinations of the tax authorities and irregularities in their services are forwarded to the Federal Secretariat for Consumer Protection, where complaints related only to the Federal Consumer Protection Law, which addresses issues related to monetary issues and compliance with advertised services. Likewise, the abandonment of health control and visits that must be made as part of the verification must be identified as a cause, since there is a tendency to pay commissions to avoid visits, as well as a support network among the members of the association of funeral homes to maintain an information channel about control visits.

Question 1: The main causes that lead funeral services in private establishments to employ untrained people to carry out the work of treating human corpses arise from: 1) the lack of employment opportunities for people without formal education, who are forced to work in these establishments because they do not require any type of certification; However, this means that employers do not offer regulated conditions, generating a greater profit margin, to the detriment of labor exploitation. 2) The lack of attention, verification and monitoring of the provisions of the General Health Law is its article 79, which establishes that in order to carry out embalming work and its facilities, among other services related to health, "it is required that the corresponding diplomas have been legally issued and registered by the competent educational authorities" (Lei Geral de Saúde, 2023, p. 57). The recurrence of this situation has led private funeral homes to not see the need to professionalize their workers, as they are not verified or sanctioned.

Problem 2: The main causes of health problems for workers who work with human cadavers are 1) inadequate conditions of facilities that do not have the necessary instruments to support the bodies, leading to hernias, and 2) respiratory problems and poisoning due to disposal of toxic materials without knowledge or protection, which in some cases leads to cancer of the esophagus and other respiratory organs. This reflects a violation of the General Health Law, which, in its article 129, states that the Ministry of Health is responsible for "II determining the maximum permissible limits of exposure of a worker to pollutants, coordinating and carrying out toxicological studies in this regard, and III exercise, in conjunction with state governments, sanitary control over establishments in which occupational activities are carried out, to comply with the requirements that must be met in each case, in accordance with the provisions of the respective regulations" (General Health Law, 2023, p. 69-70).

Theme 3: The causes of a high risk of contamination of the aquifer in the state of Yucatán are due to the fact that there is no universal sewage network. The type of soil described in the table above indicates the need to dig septic tanks in the vast majority of establishments and domestic units, however, the cavernous soil and underground rivers lead to the use of wells in the establishments' backyards to dump waste, taking advantage of the internal currents and connections of cenotes

present in the Yucatecan soil. It should be noted that funeral waste is not only due to the blood that must be extracted from corpses and organ tissue remains, but also to elements and substances necessary for embalming processes, such as formaldehyde $H_2C=O$. It should be noted that this form of disposal of waste and substances is covered by article 116 of the General Health Law, which states that "The health authorities will establish the standards, take the measures and carry out the activities referred to in this Law that aim to protect health against the risks and damages arising from environmental conditions". Likewise, article 117 states that "The formulation and conduct of environmental sanitation policy is the responsibility of the Ministry of the Environment and Natural Resources, in coordination with the Ministry of Health, in relation to human health" (General Law of Saúde, 2023, p. 67).

Solution Selection

Without a doubt, a solution to the problem of inappropriate handling of corpses is adherence to the provisions contained in the General Health Law. However, it is known that long-term solutions require more than good wishes and an alert for the completion of the work, That's why we believe that the way to solve the general problem posed is the creation of a professionalization and certification program for workers who work in private funeral homes. as a way of promoting the transmission of scientific knowledge suitable for work, which, in the medium term, will contribute to the technical professionalization of people who do not have formal education and who, therefore, have access to high-risk work, such as handling substances toxic substances and human corpses. In this way, instead of seeking the dismissal of people who are already working, but who, according to article 79 of the General Health Law, should not hold their position, what is intended is their professionalization through a program of technical education. It is believed that the technical and social knowledge acquired will greatly contribute to the gradual solution of the general problem and the problems mentioned above.

CONCLUSIONS

As can be seen, the inadequate handling of corpses represents a social and public health problem. Among the main causes are: 1) the cultural aspects that motivate the ritualization of the corpse, 2) the economic aspects that motivate the commodification of death through funeral services and 3) the lack of understanding of the problem due to the lack of synergy between the public health issue and the provision of funeral services. Derived from the above, this article proposes an alternative that can contribute to the solution based on the convergence between adherence to the legal provision and the professionalization of educational reinforcement through certification from the perspective of human rights. However, the analysis of the problem using the legal research




methodology allows us to observe that the proposal has high viability due to the fact that the substantial elements are in force within the General Health Law, but the lack of interest on the part of the responsible authorities the union of efforts between the various departments that are related represents one of its greatest limitations.



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Business management: Case study applied to Brazilian army information systems

 <https://doi.org/10.56238/sevened2024.010-026>

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ABSTRACT

This article examines the integration between Business Management and Information Systems within the Brazilian Army, highlighting how this confluence supports strategic and operational objectives in a military context. Focusing on the effective structuring of data and information with a view to facilitating usability and accessibility, the study investigates the management of resources and the application of information systems with a view to optimizing organizational performance and continuous improvement. Using a methodology consisting of document analysis, bibliographical research and field studies, including interviews and direct observations, the aim is to evaluate the efficiency of current practices and identify possible gaps and challenges faced by the institution. The relevance of this study is underlined by the need for business management approaches that are innovative, sustainable and socially responsible, especially considering the specific demands of security, secrecy and operational effectiveness inherent to military institutions. In addition, the article proposes an Information Architecture for strategic information management where the benefits of business management are discussed based on the GPD and PDCA methodologies that promote a systematic and objective-oriented approach that is fundamental to achieving consistent results in line with the Brazilian Army's strategic guidelines.

Keywords: Information Architecture, Business Management, Information Systems.

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INTRODUCTION

The intersection between Business Management and Information Systems represents a dynamic and crucial field for organizational success (Jabłoński & Jabłoński, 2020). This confluence focuses on the strategic *design* and organization of information, ensuring data is accessible, understandable and usable to support business objectives and operational requirements.

It is initially worth highlighting that: Information Architecture (AI) refers to the structuring of information and data within digital systems and environments to facilitate usability and findability (Kuhn Cuellar et. al., 2022); Business Management focuses on managing business resources, strategies and operations to achieve organizational objectives (Al-Omari et. al., 2022); Information Systems (IS) consists of an integrated set of technological and operational components designed to collect, store, process and distribute information (Benning, 2020).

The objective of this study is to analyze IS in the Brazilian Army (EB), specifically in the context of business management. The aim is to investigate how these systems are used, their benefits and challenges and the impact of their application. In view of this, an Information Architecture will be proposed to improve data processing, through mapping the information flow and identifying methodologies for business management.

The topic of business management applied to IS in EB is relevant due to the strategic importance that information management has in organizations. In the military context, effective management impacts information security, strategic decision-making and the operational performance of the armed force. Therefore, understanding how EB uses IS to manage its business is essential to improve practices and direct future actions.

THEORETICAL FOUNDATION

Information management contributes to achieving organizational objectives and information for its success (dos Santos & Damian, 2020). Strategic information management involves interdependent processes, such as: identifying, acquiring, organizing and storing, developing products and services, distributing and using information (de Carvalho Dutra & Barbosa, 2020; Monteiro & Duarte, 2018; Tarapanoff, 2002).

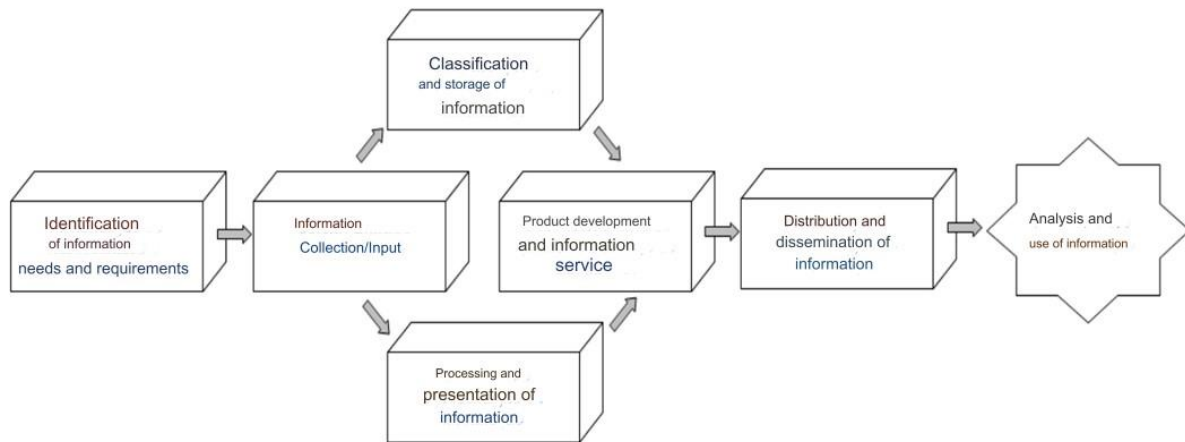
This information management model provides:

“Compatible objectives and methodologies for the entire information environment, and requires knowledge of the organization and the business, as well as methodologies and techniques for organizing and processing information, combined with a generic vision of technology, in order to manage information as a economic and strategic resource essential to the effectiveness of companies and government” (Cianconi, 1991 apud Tarapanoff, 2002).

Following the same line of thought, Taleby Ahvanooy et. al., (2023), dos Santos et. al., (2022), McGee & Crowley-Koch (2021), Da Cruz et. al., (2020) address a model that, by mapping

strategic data related to an organization's processes, IS development is possible, as exemplified in Figure 1.

Figure 1: Strategic Information Management Model.



Source: Santos (2023). The figure represents the steps necessary for strategic information management.

The model consists of 6 (six) steps that allow information management: identification of needs and requirements; collection/entry; classification/storage and treatment/presentation; development of products and services; distribution and dissemination; analysis and use.

Managing information in an organization is a complex process, which requires understanding the information path, the structures involved, as well as the users present in the process. This process is fundamental to guarantee the efficiency and quality of services provided by an organization oriented to business processes (Taleby Ahvanooy et al., 2023; dos Santos et al., 2022; McGee & Crowley-Koch, 2021; Da Cruz et al., 2020).

Now, **business management** constitutes a multifaceted field of study and practice, which is dedicated to exploring and managing the complexity that characterizes modern organizations (Doblinger, 2023). This domain stands out for adopting a critical approach in the analysis and application of theories and models related to organizational planning, organization, leadership and control.

The primary objective lies in promoting the optimization of organizations' performance in the face of the challenges presented by a business scenario that appears to be globalized and competitive (Palazzeschi & Di Fabio, 2018).

In turn, an **information system** can be understood by:

“A set of interrelated components that collect (or retrieve), process, store and distribute information intended to support decision-making, coordination and control in an organization. Furthermore, information systems also help managers and workers analyze problems, visualize complex issues, and create new products” (Kenneth et al., 2020).

IS helps organizations to improve the quality of their products or services, in addition to maintaining the consistency of that quality. To be able to improve the quality of the product, service or to ensure consistency, organizations need information from the past as a source of error correction and as a reference point for improvement or consistency (Abraham et al., 2019).

IS generally encompasses: Transaction Processing Systems (SPT), Office Automation Systems, Knowledge Worker Systems (STC), Decision Support Systems (SAD), Management Information Systems (GIS) and Support Systems to the Executive (SAE) (Kenneth et al., 2020). They are classified by categories, types and functions as shown in Figure 2 (Turban et al. 2013 apud Abed & Anupam, 2023).

Figure 2: Classification of IS by categories, types and functions.

Categorias de Sistemas		Tipos de sistemas	Função	
TURBAN, RAINER Jr. e POTTER	Sistemas de informação que apoiam grupos de organizações ou Sistemas de informação interorganizações (SIIs)	Sistema de Gerenciamento da Cadeia de Suprimento	Gerenciar fluxo de produtos, serviços e informações entre organizações (p.9).	
		Sistemas de Comércio Eletrônico	Permitir transações entre organizações e entre organizações e clientes (p.9).	
	Sistemas de Informação que apoiam áreas funcionais e operações específicas da Organização	Sistemas de Informação de Área Funcional ou Sistemas de Informação Departamentais	Cada sistema de informação apoia uma área funcional específica na organização. Exemplos são SI de contabilidade, SI de finanças, SI de gerenciamento de produção/operação (GPO), SI de marketing e SI de recursos humanos (p.6).	
		Sistemas de Informação que apoiam Empregados Organizacionais	Sistemas de Automação de Escritório (SAEs)	[...] apoiar as atividades de trabalho diárias de indivíduos e grupos (p.9). Grupos:[...] equipe de apoio administrativo, os gerentes de níveis inferior e médio e os trabalhadores do conhecimento (p.8).
			Sistemas de Informações Gerenciais (SIG)	Produzir relatórios resumidos dos dados de transação, geralmente em uma área funcional (p.9). Grupos: [...] gerentes intermediários, mas, algumas vezes, também para gerentes de níveis inferiores (p.8).
			Sistemas de Apoio à Decisão (SADS)	Fornecer acesso a dados e a ferramentas de análise (p.9). Grupos: [...] principalmente para gerentes intermediários e trabalhadores do conhecimento (p.8).
			Sistemas Especialista (SEs)	Imitar a experiência humana em determinada área e tomar uma decisão (p.9). Grupos: [...] primordialmente projetados para apoiar os trabalhadores de conhecimento (p.8)
			Sistemas de Informação Executiva (SIEs)	Apresentar aos executivos informações resumidas e estruturadas sobre aspectos importantes da empresa (p.9). Grupos:[...] os altos gerentes da organização (p.8).
	Sistemas de Informação que apoiam Organizações Inteiras	Sistema de Processamento de transações (SPT)	Sistema de informação que apoia o monitoramento, a coleta, o armazenamento e o processamento de dados das transações comerciais básicas da organização (p.19).	
		Sistemas de Planejamento de Recursos Empresariais (ERP)	Sistemas que integram firmemente os sistemas de informação de área funcional através de um banco de dados comum (p.19).	
	Outros sistemas	Sistemas de Gestão do Relacionamento com o cliente (CRM)	[...] integram dados de clientes de várias fontes organizacionais, analisam-nos e depois apresentam os resultados [...] (p.219).	
		Sistemas de Informação Estratégica	[...] proporcionam uma vantagem competitiva que ajuda a organização a implementar suas metas estratégicas e aumentar seu desempenho e produtividade. (p.34).	
		Sistema de Gestão do Conhecimento	[...] uso de tecnologias modernas [...] para sistematizar, aprimorar e disseminar a gestão do conhecimento dentro da empresa e entre empresas (p.110).	

Source: Turban et al., (2013) apud Abed & Anupam, (2023).

METHODOLOGY

The beginning of data collection was marked by carrying out a documentary analysis that was based on a wide source of references (Fernandes et al., 2018). This procedure focused on extracting relevant data from documents, following previously formulated hypotheses, together with conducting a bibliographic analysis.

Within this context, the approach through documentary and bibliographic analysis revealed the current state of the issue under study, as well as examining already completed research and operational definitions prevalent in academia. This initial stage included an introductory literature review and an exploratory study, both fundamental to identifying and presenting key concepts essential for the research.

The next phase included diving into the study topic through field research, using direct observation at the location of the events studied, in addition to interviews, focus groups and analysis of internal documents. These methodologies facilitated research into business management and information systems in the organization in question.

Structured interviews provided information about the characteristics of the group studied, while direct observation offered a real perspective on the participants' behavior, their social interactions and various organizational and cultural aspects.

A non-probabilistic sample, chosen based on criteria of typicality or intention, was determined within the context of the EB, focusing on those military organizations with direct responsibilities in the management of business and corporate information systems. This study addressed both strategic aspects within the EB, covering a spectrum of military functions (Hernández-Sampieri & Mendoza, 2018) and essential aspects for advisory, management or direction.

The selection aimed to cover the most representative set of the study population, aiming for precision in the conclusions drawn. The choice of participants was based on the researcher's in-depth understanding of the target population (Prodanov & De Freitas, 2013, apud Gil, 2019). Table 1 presents the population and sample.

Eight focus group sessions were conducted, each lasting between one and two hours. Before the start of each session, participants were informed about the specific objectives that the study intended to achieve, which are detailed below:

a) Objective 1: identify which methodologies are adopted in business management.

Purpose: understand which methodological approaches are used to manage and optimize business operations.

Importance: knowing the methodologies adopted helps to understand how teams organize, plan and execute their activities, influencing business efficiency.

Table 1: Population and Sample

Personnel Area	Business Managers	
	Universe	Sample
Senior Officers	15	6
Intermediate Officers	3	2
Junior Officers	0	0
Warrant Officers and Sergeants	0	0
Total	18	8

Source: the author, 2023.

b) Objective 2: identify the information flow from the business manager's perspective.

Purpose: Understand how information is collected, processed, stored and distributed within the organization from the perspective of business managers.

Importance: an efficient information flow is vital for decision making, strategic planning and daily operations.

c) Objective 3: identify which methodologies or tools are used to handle the information flow.

Purpose: discover methodologies used to manage the flow of information.

Importance: appropriate tools and methodologies can significantly improve the efficiency of information management and business operation.

d) Objective 4: identify whether the information desired by the customer is present in the Information System.

Purpose: to evaluate whether customers' information needs are effectively met and reflected in the information systems used by EB.

Importance: Ensuring that relevant information is available and easily accessible is crucial to customer satisfaction and business success.

e) Objective 5: identify difficulties encountered in business management.

Purpose: to discover the main challenges and obstacles faced by managers in managing their business.

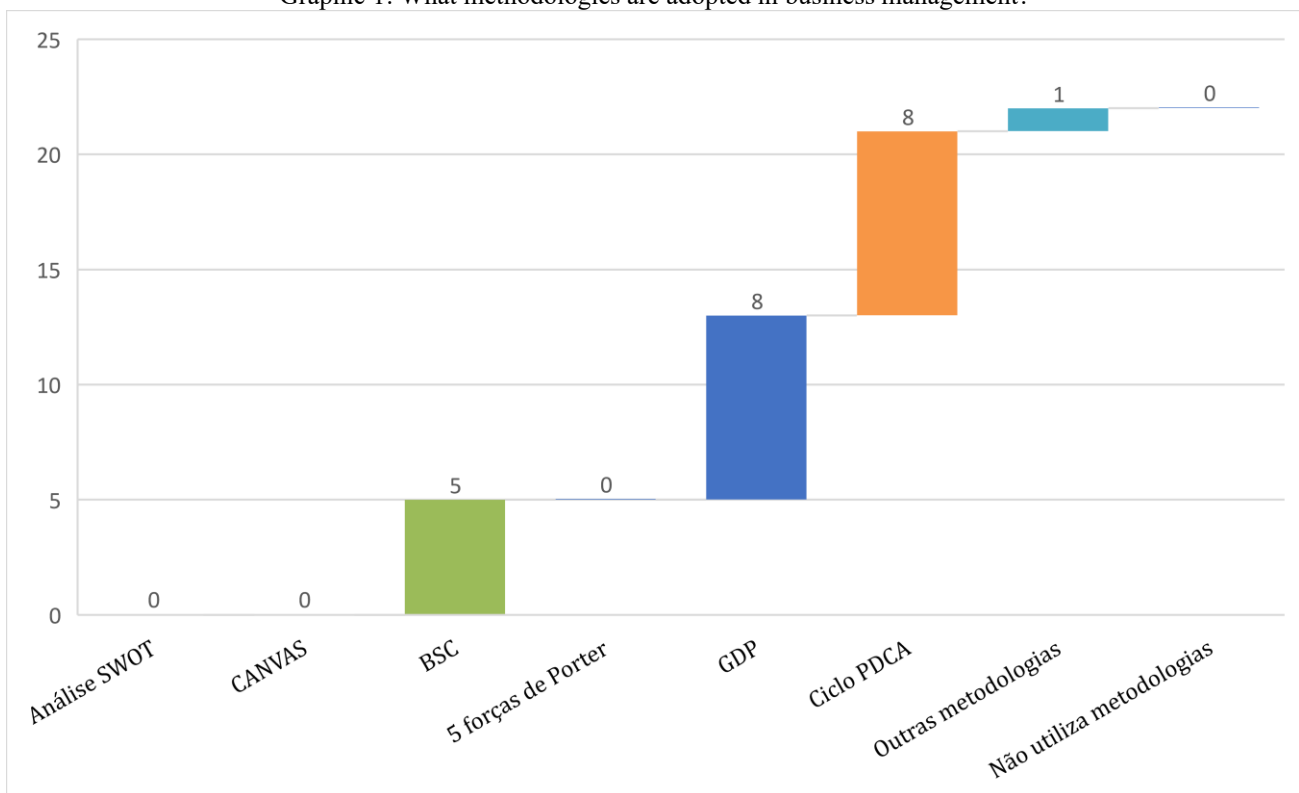
Importance: understanding the challenges faced can provide valuable indications for improvements, innovations and strategies to overcome problems.

RESULTS

METHODOLOGIES ADOPTED IN BUSINESS MANAGEMENT

Each interviewee was able to select which methodologies were used in the business area between 2019 and 2021. The analysis indicates that, while the organization strongly prioritizes Management by Guidelines (GPD), PDCA Cycle and *Balanced Scorecard* (BSC), emphasizing objectives clear and continuous improvement, it does not significantly adopt other methodologies such as SWOT Analysis, CANVAS, or Porter's 5 Forces. This suggests a very specific approach to strategic planning and management, with a particular focus on clear guidelines, performance monitoring and continuous improvement.

Graphic 1: What methodologies are adopted in business management?



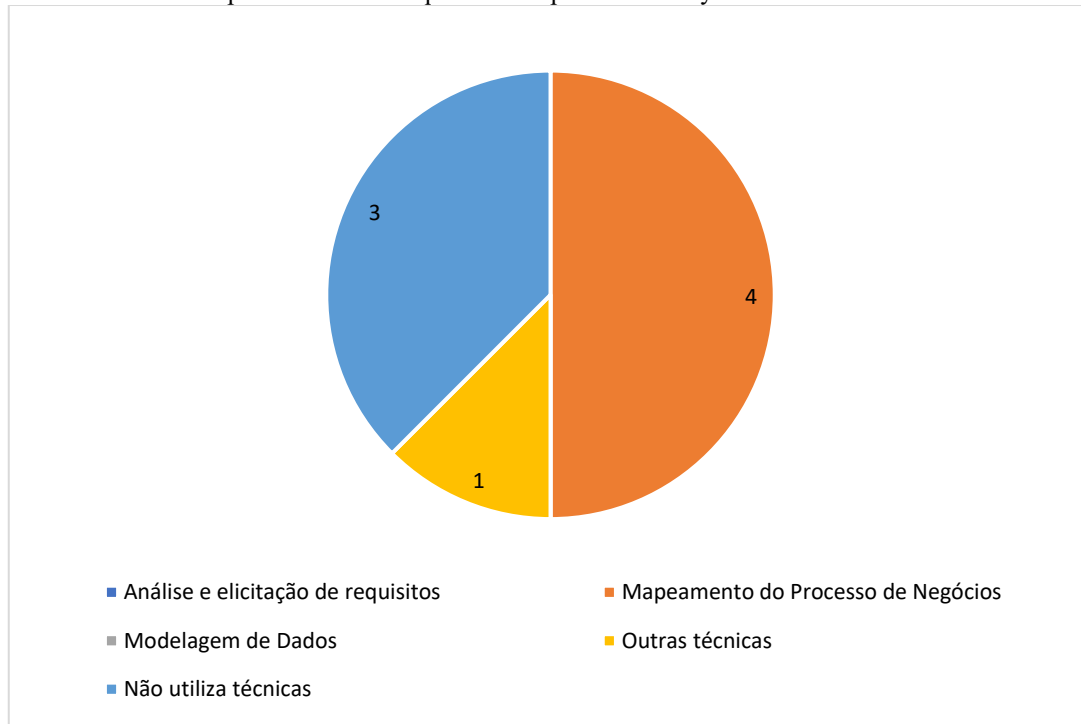
Source: the author, 2023. The graph represents the distribution of the sample of business managers considering the methodologies adopted by them when supervising projects that involve the development of information systems.

It is important to highlight that the “methodologies adopted in business management” are related to the proposed Information Architecture, since they are fundamental to integrate, optimize and align information management practices with the organization's needs and objectives. They play a vital role in ensuring that information is managed strategically contributing to the overall success of the business.

TECHNIQUES THAT ARE ADOPTED TO IDENTIFY THE INFORMATIONAL FLOW

Each interviewee was able to select which techniques were adopted to identify the informational flow, considering the information systems developed or maintained between 2019 and 2021, under their supervision, as business manager.

Graph 2: What techniques are adopted to identify information flow?



Source: the author, 2023. The graph represents the distribution of the sample of business managers considering techniques adopted by them to identify the information flow of their respective systems.

The analysis suggests that while there is some focus on process mapping, there is a lack of adoption of formal requirements analysis and elicitation techniques, as well as data modeling. This may represent an opportunity for the organization to strengthen its management and analysis practices, especially in areas that require a detailed understanding of system requirements and data structure. Adopting more structured approaches can help improve the quality of processes.

Finally, it is important to highlight that the “techniques that are adopted to identify the informational flow” are related to the proposed Information Architecture, since they are vital in determining the course of information in a corporation, focusing on refining the established processes. This method has the ability to automate manual functions, eliminate repetitions and improve operational efficiency.

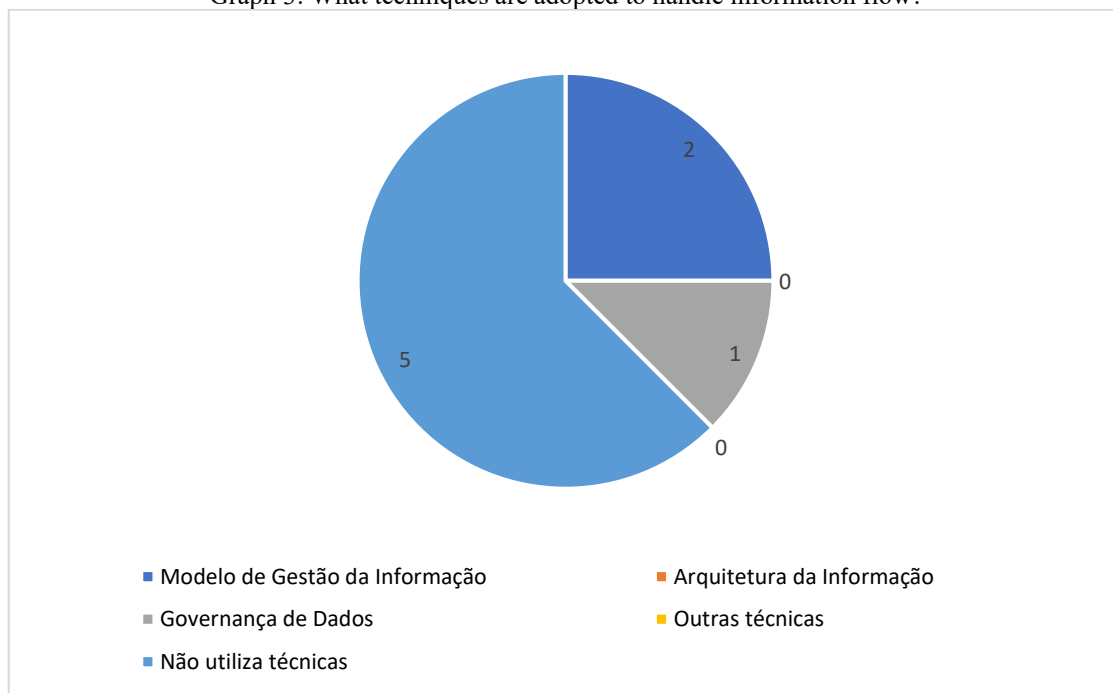
TECHNIQUES THAT ARE ADOPTED TO HANDLE INFORMATION FLOW

Each interviewee was able to select which “techniques were adopted to handle the information flow”, considering the information systems developed or maintained between 2019 and

2021, under their supervision, as business manager. This analysis suggests that the organization has a limited focus on formal information management, with some attention paid to the overall information management model and minimal recognition of the importance of data governance.

The absence of established information architecture practices and the prevalence of situations in which no formal techniques are used indicate potential areas for improvement and development. Integrating more structured and comprehensive approaches to information management could bring significant benefits in terms of efficiency, security and effective use of information.

Graph 3: What techniques are adopted to handle information flow?



Source: the author, 2023. The graph represents the distribution of the sample of business managers considering techniques adopted by them to handle the information flow of their respective systems.

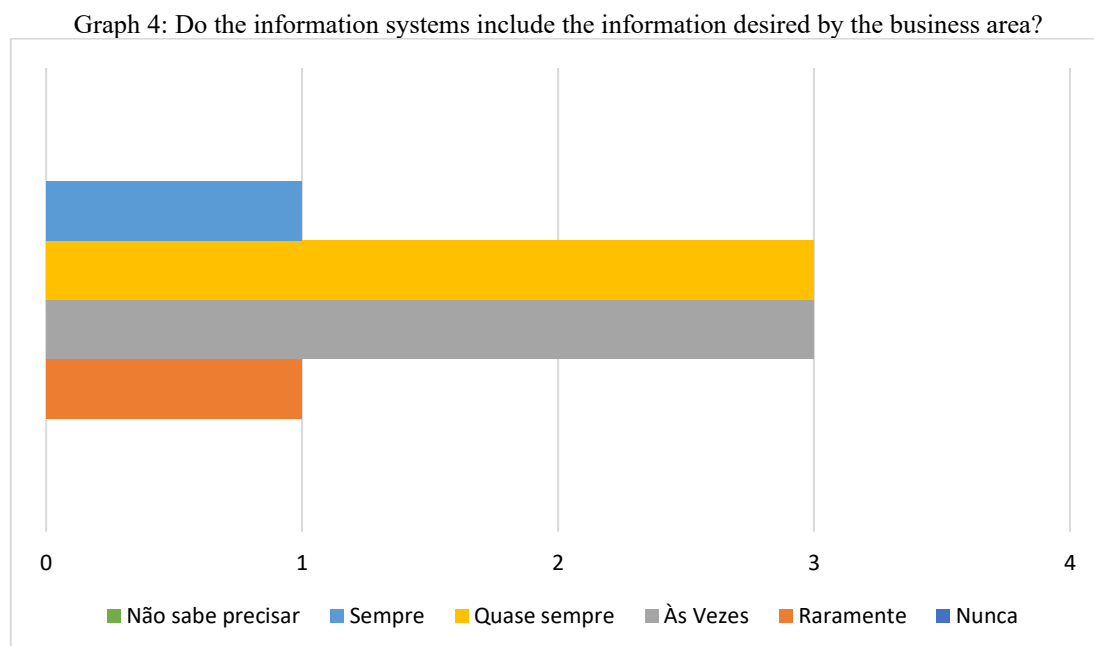
Finally, it is important to highlight that the “techniques that are adopted to handle the informational flow” are related to the proposed Information Architecture, since, in the military environment, the fine balance that determines victory or setbacks often resides in the foundation decisions based on accurate and current information.

INFORMATION SYSTEMS INCLUDE THE INFORMATION DESIRED BY THE BUSINESS AREA

The scale used in the research provides a way to evaluate the effectiveness with which information systems meet the needs of the EB's business area.

This scale helps to identify the degree of alignment between information systems and the needs of the business area. A rigorous assessment in these terms is crucial to ensure that IT

investments are aligned with the organization's strategic objectives and that information systems are contributing to business success.



Source: the author, 2023. The graph represents the distribution of the number of systems between the years 2019 and 2021 by the level of information desired by the business area.

The analysis suggests that, in general, information systems tend to meet the needs of the business area in a variable way, with a tendency to be effective "almost always" or partially effective "sometimes". This indicates a reasonable level of alignment between information systems and business needs, but also points to areas where improvements could be beneficial, especially in achieving consistency in meeting business needs.

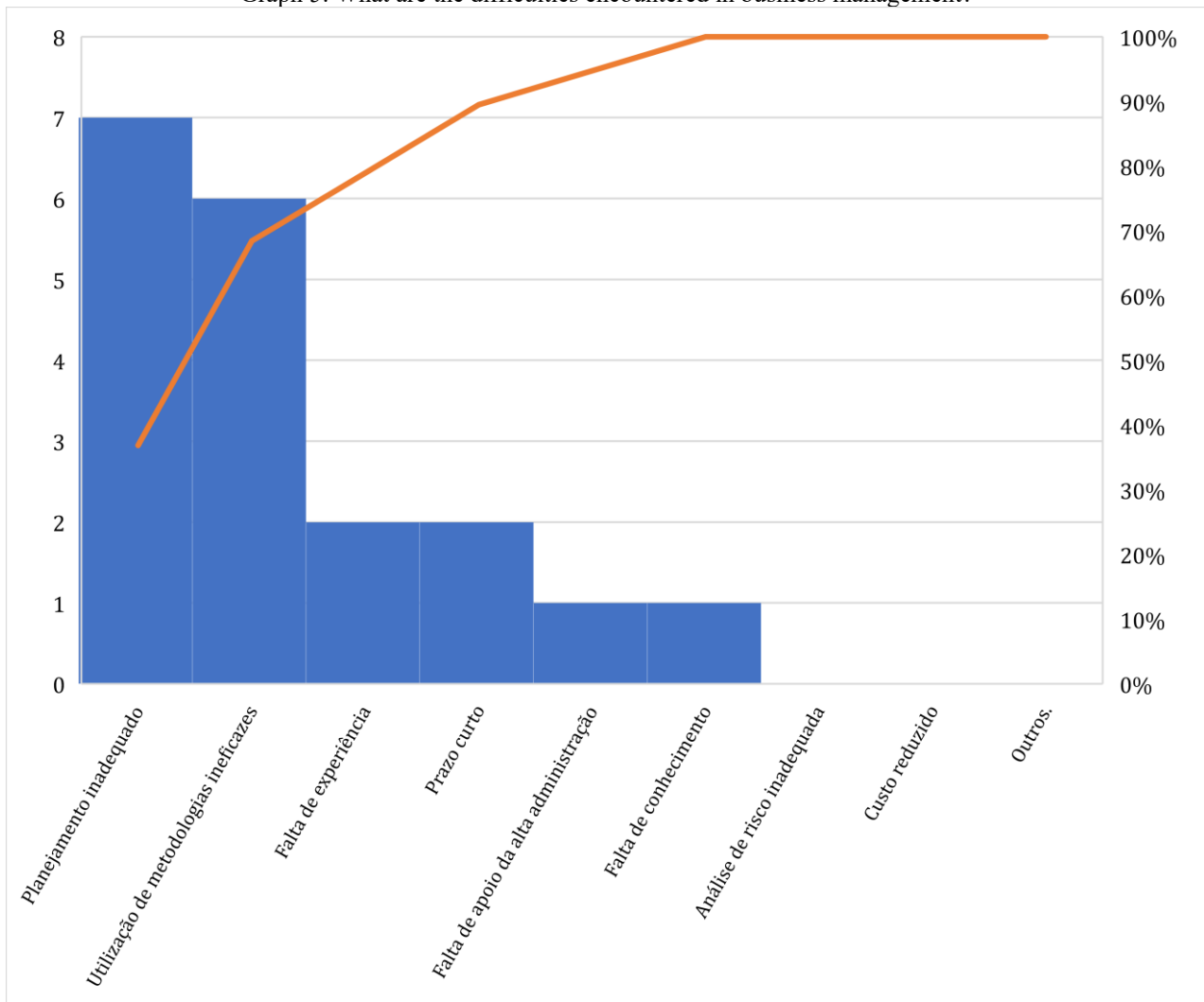
Finally, it is important to highlight that the "information systems that include the information desired by the business area" are related to the proposed Information Architecture, since the adequacy of information systems facilitates the identification of areas for continuous improvement in processes information management, contributing to continuous innovation and operational improvement.

DIFFICULTIES ENCOUNTERED IN BUSINESS MANAGEMENT

The analysis indicates that the biggest challenges identified are inadequate planning and the use of ineffective methodologies or the absence thereof. These are critical aspects that must be addressed to improve business management effectiveness.

While a lack of support from senior management and a lack of business management knowledge are minor problems, they also deserve attention to ensure more efficient and successful business management.

Graph 5: What are the difficulties encountered in business management?



Source: the author, 2023. The graph considers the years 2019 to 2021 and represents the distribution of difficulties encountered in business management.

Finally, it is important to highlight that “difficulties encountered in business management” are related to the proposed Information Architecture, since management problems can prevent the organization from adapting effectively to changes in the market or technological environment, limiting the growth and evolution of the information ecosystem.

FINAL CONSIDERATIONS

Business Management represents the synergy between business strategy and information technology. This component ensures that IT initiatives are in sync with the organization's goals and objectives, promoting strategic alignment and contributing to sustainable competitive advantage.

The Strategic Management Model (Taleby Ahvanooy et al., 2023; dos Santos et al., 2022; McGee & Crowley-Koch, 2021; Da Cruz et al., 2020), emphasizes the integration of information in the design of organizational strategy.

This paradigm advocates that information management must be a dynamic process, which influences and is influenced by the organization's strategy, resulting in an approach that recognizes information as a strategic resource and as an integral part of the strategic planning process.

In turn, Business management, through GPD and PDCA, offers a perspective on how organizational objectives are established, pursued and achieved. The definition of clear responsibilities, the establishment of goals, the deployment of these goals and the creation of action plans are vital elements that guarantee strategic and operational alignment. Continuous monitoring and the ability to make adjustments based on results are fundamental to effective and adaptive management.

GPD focuses on defining clear goals and objectives that guide the organization's activities, ensuring that all efforts are aligned with the organizational vision and mission (Lessard et. al., 2017). This strategic alignment is crucial to ensuring that individual initiatives effectively contribute to the organization's long-term goals.

The PDCA cycle, in turn, offers an operational method to implement these guidelines (Lu et. al., 2022). It starts with the “*Plan*”, where strategies are developed to achieve established guidelines. This is followed by “*Do*” (doing), the strategy execution phase. “*Check*” involves reviewing and analyzing the results obtained in comparison with the expected objectives. Finally, “*Act*” is the stage where adjustments and improvements are made based on feedback, closing the cycle and starting new planning.

The combination of GPD with PDCA creates a dynamic management system that not only directs the organization towards its strategic goals, but also facilitates the adaptation and continuous improvement of processes (de Araújo & Gonçalves, 2011). This integrated management system is ideal for responding to changes in the environment, promoting continuous improvement and sustaining innovation and competitiveness.

Figure 3 illustrates the proposed Information Architecture, that is, how methodologies are used to establish a continuous cycle of planning, execution, evaluation and improvement in an organization's processes and projects. These methodologies, when applied together, promote a systematic and objective-oriented approach that is fundamental to achieving consistent results aligned with EB's strategic guidelines .

Figure 3: Proposed Information Architecture



Source: the author, 2024. The proposed IA encompasses the GPD activities and PDCA steps used in Business Management.

The first activity in the GPD is to define the person responsible (or responsible) for the project. This individual or team will be responsible for leading the effort to achieve the established goals, coordinating activities, mobilizing resources and serving as a point of communication between different stakeholders (Campos, 2013). The appointment of a person responsible ensures that there is *accountability* and a clear focal point for making decisions and actions.

Next, the organization should establish one or more clear and measurable annual goals. These goals must be aligned with the organization's long-term vision and strategy and must be specific, measurable, achievable, relevant and time-bound.

Once the annual goals are determined, they must be broken down into specific objectives for different levels and departments of the organization. This unfolding process ensures that all members of the organization understand how their daily activities and individual projects contribute to global goals. Deployment creates a chain of responsibility and facilitates coordination between different areas.

With the unfolded goals established, the next activity is to develop detailed action plans to achieve them. This involves defining specific tasks, deadlines, responsible parties and necessary resources. The action plan serves as a roadmap for implementation, detailing what needs to be done, by whom, and when, to achieve the defined objectives.

Finally, it is critical to continually monitor progress toward goals and make adjustments as necessary. This may involve collecting and analyzing performance data, holding regular review meetings, and adapting action plans to address emerging challenges or seize new opportunities.

PDCA is divided into four stages, each aimed at ensuring the effectiveness of implemented actions and promoting continuous improvements (Isniah et. al., 2020).

In the planning stage, the focus is to clearly define the objectives to be achieved and develop an action plan to achieve them. What it involves:

- 1) Identify and analyze the problem or opportunity for improvement.
- 2) Set specific, measurable, achievable, relevant and time-bound goals.
- 3) Determine the performance measures or indicators that will be used to evaluate success.
- 4) Develop a detailed plan that establishes the strategies, activities, resources and deadlines needed to achieve the goals.

The execution stage involves putting the action plan into practice. What it includes:

- 1) Train and prepare the people involved, ensuring that they have the necessary knowledge and skills to perform their tasks.
- 2) Implement the activities defined in the action plan.
- 3) Collect data and evidence that will allow for subsequent performance assessment.

In the verification stage, the results obtained are compared with the established goals to evaluate the success of the implemented actions. What it comprises:

- 1) Analyze the data and information collected during the execution phase.
- 2) Evaluate whether the goals were achieved and identify any deviations from expectations.
- 3) Identify the causes of any problems or deviations so that they can be addressed in the next phase.

The last stage is where corrective or improvement actions are taken based on the analysis of the results. What to cover:

- 1) Adjust the process or action plan to address any identified issues.
- 2) Implement changes that aim to improve the process and prevent the recurrence of problems.
- 3) Standardize and institutionalize successful improvements to ensure benefits are maintained over the long term.
- 4) Start a new PDCA cycle, if necessary, to seek continuous improvements.

As a future study, it is expected that the integration of Business Management and Information Systems will continue to evolve, further emphasizing the importance of strategic planning. The evolution of GPD and PDCA methodologies must consider the impact of emerging technologies such as artificial intelligence, machine learning and *big data analysis*. *date* in the decision-making process.



It will be important to investigate how these technologies can improve organizations' ability to predict trends, automate processes, and customize business strategies for different market segments. The study should also explore how organizational culture and innovation capacity can be strengthened by adopting digital tools, resulting in better leveraging of knowledge and resources.

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Anthropogenic activities and the introduction of exotic species negatively impact the lotic ecosystem of the Trici River (Tauá, Ceará)

 <https://doi.org/10.56238/sevened2024.010-027>

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ABSTRACT

The city of Tauá, in the region of Inhamuns (about 350 kilometers from the capital Fortaleza), with a population of 54,271 inhabitants (Demographic census carried out in 2007). The city of Tauá is part of the municipality of Tauá, which has an area of 6,390 km² with a population of 230,538 inhabitants. The presence of vegetation in the lotic ecosystems of the Trici River and the lentic ecosystems of the Parque da Cidade lagoon, which are part of the natural landscape of the Inhamuns region, is conspicuous. However, for decades it has become evident that anthropogenic activities (raw sewage; uncontrolled burning; territorial expansion of neighborhoods; dumping of non-recyclable garbage, among other situations) are increasingly present in ecosystems, particularly in the lotic ecosystem of the Trici River, which runs through the city of Tauá. The objective of the present work was to carry out an initial study on the environmental threats, usually anthropogenic in nature, in the lotic ecosystem of the Trici River in a scenario of global warming and local drought. The preliminary results of the present study incontestably demonstrate that the lotic ecosystem of the Trici River presents numerous modifications of an anthropogenic nature, such as: pollution by garbage of all kinds; depredation and reduction of its banks; introduction of alien species to the ecosystem. Strong measures in the aspect of research and environmental education must be implemented urgently.

Keywords: Anthropogenic activities, Trici River, Ecosystem.

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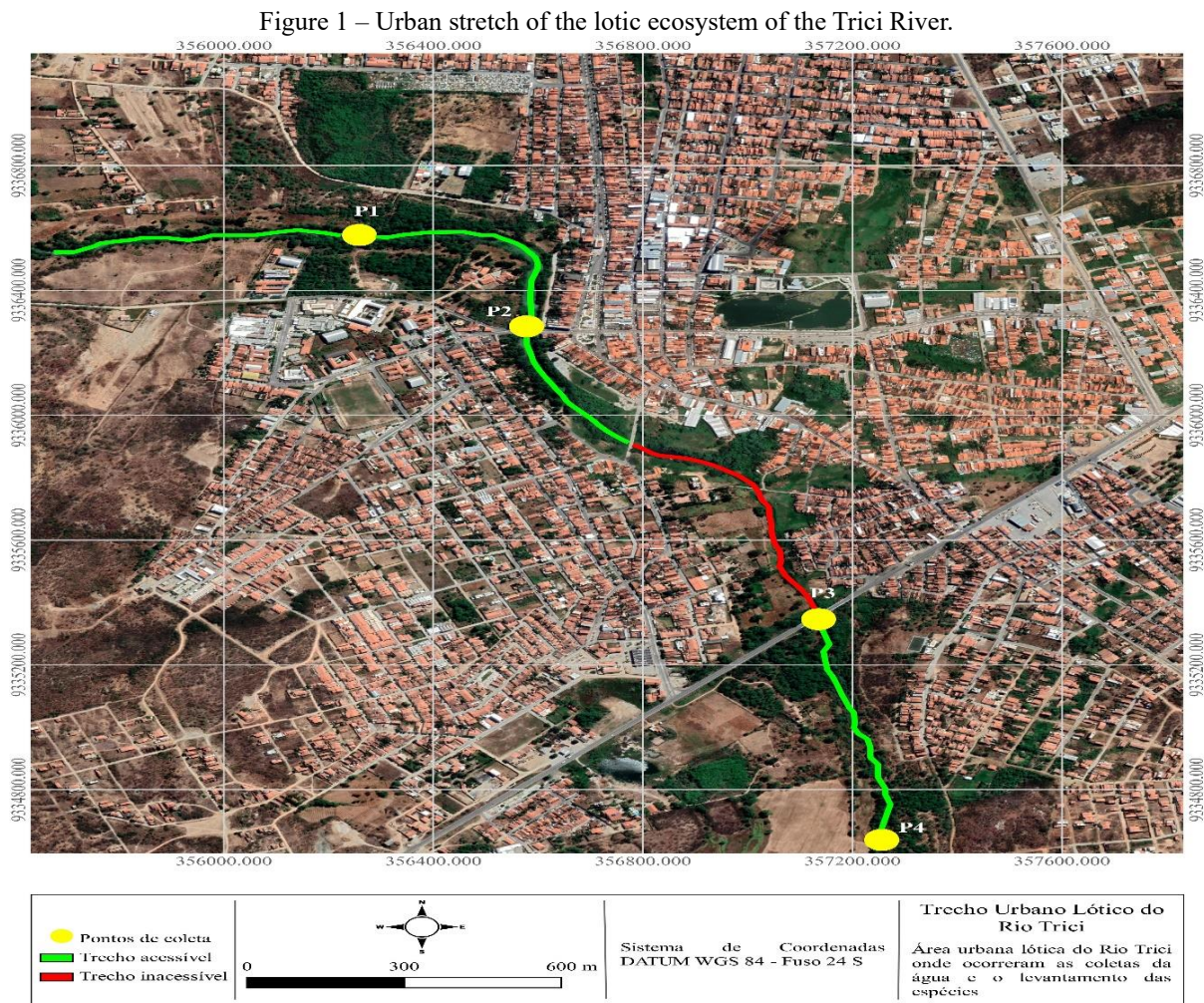
INTRODUCTION

Due to the importance of the biodiversity existing in the lotic ecosystem of the Trici River and, notably for the city of Tauá, in a scenario of global warming with climate change, it is important to carry out more consistent research work on this ecosystem. The city of Tauá, in the region of Inhamuns (about 350 kilometers from the capital Fortaleza), with a population of 54,271 inhabitants (Demographic census carried out in 2007). It has an altitude of 368 meters, with a semi-arid climate, with an average annual rainfall of 399 mm. Average annual temperature 24.2°C. The city of Tauá can be considered an aggregating pole of the other cities and districts of the Inhamun Region. The city of Tauá, although it is inserted in a semi-arid region, naturally with a scarcity of rainwater, has numerous lotic (Trici River) and lentic (Lagoa do Parque da Cidade) water resources. Although, from 2010 to 2018, it was characterized by a period of drought in the Northeast region, and particularly in the semi-arid regions of the State of Ceará. The city of Tauá, like all other cities, is considered a heterotrophic ecosystem (ODUM, 1883; REECE et al., 2015). In the last 10 years, the city of Tauá, as well as other urban areas in the State of Ceará, has expanded horizontally, invading natural spaces and increasing anthropogenic activities (Deforestation, sewage discharge *in nature*, fires, construction of streets and avenues, agriculture, among others). The maintenance of ecosystems in a healthy state in a proven environment of global warming becomes of crucial importance for all cities, and particularly for the city of Tauá. Thus, conducting a study on various aspects of the lotic ecosystem of the Trici River is unquestionably relevant to the heterotrophic ecosystem of the city of Tauá.

About 71% of the earth's surface is occupied by oceans, which hold 97% of the earth's water. The remaining 3% is present as water in ponds, streams, glaciers, ice caps, and as water vapor in the atmosphere. The Trici River (Figure 1) serves as the base of the aquatic food chain due to the possible presence of microalgae as a source of biomass capable of absorbing greenhouse gases, notoriously serving as a food source for the various species of fish and mollusks native to the Trici River. In addition, the presence of plants along the banks of the Trici River, including the riparian forest, possibly serve as places of habitation, exploration and refuge for numerous species of animals and birds, among others. Fernandes (2007) reported in an unpublished work some anthropogenic changes that affected the lotic ecosystem of the Trici River.

The presence of vegetation in the lotic ecosystems of the Trici River and the lentic ecosystems of the Parque da Cidade lagoon, which are part of the natural landscape of the Inhamuns region, is conspicuous. However, for decades it has become evident that anthropogenic activities (Sewage *in nature*; uncontrolled fires; territorial expansion of neighborhoods; disposal of non-recyclable garbage, among other situations) are increasingly present in ecosystems, particularly in the lotic ecosystem of the Trici River, which runs through the city of Tauá (FERNANDES, 2007). However,

the preliminary and outdated work prepared by FERNANDES (2007) needs to be updated due to the time factor and also due to the global warming scenario associated with a period of drought in recent years. In addition, new environmental threats, such as the presence and spread of microplastics, need to be studied.



Source: Authors/ Qgis 2022.

METHODOLOGY

The research carried out is classified as a descriptive exploratory research. No biological samples were collected, except for the water of the lotic ecosystem of the Trici River. The urban stretch of the lotic ecosystem of the Trici River in the city of Tauá, located in the Inhamuns Region, State of Ceará, with a territorial unit of 1,068.437 km² as well as in the city of Tauá with a territorial unit of 4,010.618 km². Both have characteristics of a semi-arid climate (CEARÁ, 2020). Photos were taken of the entire natural landscape of the lotic ecosystem of the Trici River in its urban stretch in the city of Tauá. The photographs were taken using a smartphone, and were used to catalog all the aspects involved in the present work, such as anthropogenic activities and the various existing taxa.

In addition, water samples were collected once a week, between 8:00 a.m. and 10:00 a.m. at four different points along the urban stretch of the Trici River (Figure 1). The material was collected in 15 mL Falcon polypropylene tubes; Immediately after collection, the material was taken to the Teaching Laboratory of the Biological Sciences Degree Course for pH and microbiological analyses.

RESULTS AND DISCUSSION

Unquestionably, water is one of the elements present in all living organisms on the planet, being responsible for the metabolic regulation of cells, so it is an essential element for the functioning and maintenance of life in organisms (SPERLING, 1996). With few parts of fresh surface water that are easy to use by animals and plants, it is clear that this is considered an important natural resource for everyone's survival. The use of this essential element for the life of animals and plants needs to be close to water bodies in order to survive. In many places, water is scarce or difficult to access, as is the case of the Caatinga Biome, which has regions of low rainfall and high temperatures. This makes life difficult for various species, even for humans.

The preliminary results of the present study demonstrate incontrovertibly that the lotic ecosystem of the Trici River is undergoing anthropogenic modifications that have not yet been fully dimensioned. The lotic ecosystem of the Trici River presents on its banks pollution by garbage of all kinds, depredation and reduction of its banks, with possible silting of the river in its urban section. Due to the importance of the biodiversity existing in the lotic ecosystem of the Trici River and, notably for the city of Tauá, in a scenario of global warming, it is important to carry out more consistent research work. It has also become evident that on the banks of the Trici River there is a great biodiversity of animals, fungi and plants. Thus, it is a place with a lot of life in its surroundings, but which is undergoing negative changes. It is worth noting that the number of species may vary according to the rainy season and environmental conditions at the time of observation.

Figure 2. Some species observed in the Trici River.



Source: Authors.

The Trici River has been suffering from the actions of humans, a fact proven by the introduction of exotic species such as grasses (Figure 2): Buffel grass (*Cenchrus ciliaris* L.) and elephant grass (*Pennisetum purpureum* Schum.) (CAMPO, 2020; REFLORA, 2023). Other changes occur indiscriminately in the riverbed, such as the release of raw sewage, dumping of construction materials, livestock production of cattle, incorrect disposal of garbage such as cardboard, plastic, clothing, tires, slaughtered animals, among others.

Figure 3. Photographic records made in the urban stretch of the Trici River. Introduction of exotic species (A), Body of dead animal (B), Cattle breeding (C), Disposal of plastic waste and cardboard, and Dumping of construction material (E)(F).



Source: Authors.

FINAL THOUGHTS


It is unquestionable that the maintenance of natural resources, such as rivers and lakes, was paramount to the survival of urban communities. With the expansion of cities, which are considered heterotrophic ecosystems, in a scenario of population increase that generates pollutants and global warming, these natural resources must be prioritized in relation to their conservation and preservation. Cities that are naturally located in arid and semi-arid regions (such as the city of Tauá) are at enormous risk from the degradation carried out in such ecosystems. It is undeniable that the lotic ecosystem of the Trici River is a source of good quality water and biodiversity. However, anthropogenic activities and the introduction of exotic species are proven to have a negative impact on the dynamics of the ecosystem. Reinforcing the need for further research. Strong measures in the aspect of research and environmental education must be implemented urgently.



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An analysis of the influence of international environmental law on international relations: Whaling in the Antarctic case

 <https://doi.org/10.56238/sevned2024.010-028>

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ABSTRACT

The objective of this study was to analyze the development of International Environmental Law and its influence on international relations and legal order, based on the examination of the case involving Australia's claim against Japan before the International Court of Justice (ICJ), and in which New Zealand intervened, regarding violations committed by Japan to the International Convention for the Regulation of Whaling (International Convention For The Regulation Of Whaling – ICRW), in which the evolution and modification of the interpretation of the ICRW was verified, which initially aimed only to guarantee the whaling trade, later becoming one of the instruments for the protection of whales and the marine environment. In this sense, this article brought an analysis of the general aspects of classical international law, addressing its concept,

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instruments and development, as well as its development and the emergence of international environmental law. In this way, the article addressed the main elements about the Convention and the dispute between Australia and Japan, for violations of the ICRW by Japan through its scientific program called JARPA II. It also discussed the decision of the ICJ and the separate vote of the Brazilian judge Antônio Cançado Trindade, who raised the principles of International Environmental Law as possible grounds for application to the case. From there, a general analysis was carried out regarding the influence of international environmental law on International Treaties and Conventions. The methodology used was the deductive method, with a qualitative approach of bibliographic research. It was concluded that there was the development of Classical International Law to Modern International Law, promoting the genesis of International Environmental Law, and this, in turn, has been having a growing development and strengthening, including the emergence of the notion of suprahuman law. Thus, it was found that there was an increase in its scope due to the serious environmental problems that arose with the modern era. Finally, it was concluded that there is an increasing tendency for convergence and unification of general international law and international relations with the principles and norms of international environmental law.

Keywords: International Environmental Law, Whaling in Antarctica, International Court of Justice.



INTRODUCTION

Whaling has been a practice since ancient times. With the emergence of advanced techniques, there was the development of the whaling industry and an increase in the demand for whale products, initiating serious damage to cetacean populations.

Thus, the need for whaling regulation at the international level arises only with the realization of the consequences of predatory hunting of cetaceans, such as the extinction of several species and the decrease of whale stocks. The first regulations, therefore, sought solely to ensure the survival of the whale trading industry.

In this scenario, the first multilateral conventions emerged, such as the Convention for the Regulation of Whaling of 1931 and the International Agreement of 1937 for the Regulation of the Whaling. However, the highlight is the International Convention for the Regulation of Whaling of 1946, still in force, which had the function of coordinating and codifying the pre-existing regulations.

However, in the course of the formulation of the historical formulation of the regulation of whaling there has been a gradual modification in the meaning of its purposes, shifting the focus from the promotion of the whaling industry to a framework for the protection of whale species themselves.

An internationally prominent conflict involving the 1946 International Convention for the Regulation of Whaling took place between Australia and Japan before the International Court of Justice (ICJ), in which Australia demanded the termination of the second Japanese Whaling Scientific Program under Special Permission, JARPA II.

Japan was accused before the ICJ of using special licenses for scientific purposes, with the sole purpose of covering up the practice of trading whales. It should be noted that this practice had been prohibited by the Whaling Convention since 1986, with the establishment of a zero limit moratorium on commercial whaling.

In its decision, the Court adhered to the technical aspects of the Convention, not applying the principles and foundations of international environmental law to its decision, thus generating effects only on the JARPA II program.

The case, however, ended up evidencing the trend towards a new interpretation of the Convention, more focused on the protection of whales, due to the international repercussion of the case, which reinforced the idea that whale conservation should be the main focus of the Convention. The Brazilian judge Cançado Trindade, a member of the Court, issued, when analyzing the case, a separate opinion, in which he points out that, with the maintenance of the commercial moratorium for a long time, the Convention translates into a living instrument, and with this it began to lean towards the conservation of whaling species.

Thus, it should be noted that, although not recognized by the ICJ, the Convention was influenced by the principles and norms of International Environmental Law in its interpretation, and

currently makes up the set of international legal protection for the protection of the marine ecosystem.

It is important to note that International Law is based on the idea of sovereignty of the Nation State, governed by the general principles of *pacta sunt servanda* and good faith, dealing with border relations and international repercussions. However, since the twentieth century, Contemporary International Law has increasingly included human rights agendas, as well as social and environmental issues, as a typical effect of large-scale globalization and industrialization.

These social changes and excessive consumption have brought drastic damage to the terrestrial ecosystem, such as air and water pollution, warming, extinction of species, degradation and imbalance of fauna and flora, among others. The finiteness of natural resources and the limitations of environmental resilience were also perceived. In addition, international actors have broadened, including not only states, but also international organizations, non-governmental organizations (NGOs, companies), and even the individual and humanity.

In this way, International Environmental Law has been standing out as an intrinsic element in the guarantee of other fundamental and social rights, gaining breadth in the various international relations. In addition, the international protection of the environment has been strengthened with the recognition of ecosystem rights.

From this perspective, this article aims to analyze, from the Case of the Whales in Antarctica, the scope of International Environmental Law, considering the development of the international legal protection of human, social and environmental rights that has been gaining strength in international relations and also reflecting on the interpretation and conduct of pre-existing Treaties.

THE INTERNATIONAL CONVENTION REGULATING WHALING OF 1946

The practice of whaling dates back to antiquity and is verified through records of activity in rock art. In the mid-eleventh and twelfth centuries, commercial whaling began, intended for various purposes such as food, oil extraction for energy production and handicrafts, initiating serious damage to whale populations. In the eighteenth century, there was a gradual growth in the whale trade, and in the twentieth century, there was a significant decline in populations, in addition to the extinction of several subspecies (Silva, 2019, p. 22).

In this context, the International Convention for the Regulation of Whaling (ICRW) was signed in 1946¹⁰ in the city of Washington, with the main purpose of guaranteeing the whaling industry through the conservation of cetacean stocks (Leite, 2022, p. 407).

¹⁰ Em inglês: International Convention for the Regulation of Whaling - ICRW



The Convention is open to any country that formally wants to accede to the legislation. It should be noted that the Brazilian State is one of the signatories of the Convention, promulgated by Decree No. 28,524 of August 18, 1950.

The Convention aimed to codify pre-World War II regulations and establish mechanisms for continuous updates as conditions change over time (ICJ, 2014, p. 247a).

The International Convention for the Regulation of Whaling signed in 1931 was aimed at the exclusive interests of the whaling industry, with a marked nationalist aspect. The normative provision of the 1931 Convention demonstrates "a first and fragile conservatory bias of whaling regulation, it concerns the calculation of the remuneration of those called, by the Convention, of gunners and crews of whaling ships" (Subtil, 2022, p. 179).

The 1937 Agreement applied to floating power stations, shore stations and whaling ships, subject to the jurisdiction of the Contracting Governments, and to the waters in which these floating power plants, shore stations and whaling vessels were engaged in whaling, and remained rooted in a vision of stability and preservation of the international whaling industry (Subtil, 2022, p. 188).

Since the International Convention for the Regulation of Whaling of 1946, however, a paradigm shift in the conduct of the International Agreement on the Regulation of Whaling has begun to be perceived.

In this vein, the 1946 Convention established the creation of the International Whaling Commission with competence to manage the obligations imposed by the Convention on the signatory States and to conduct the policy and technique of whaling within its scope, with a specific role in making recommendations to States Parties that demonstrate that the conservation of whale stocks is an important objective of the Convention (ICJ, 2014, p. 350c).

In principle, the Convention did not establish restrictions or sanctions for commercial whaling. Concerned about the end of marine resources, in 1986, the Convention ratified the moratorium on whaling for commercial purposes, since some species were practically extinct as a result of predatory hunting (Leite, 2022, p. 408).

The moratorium established a zero catch limit for whaling of all species for commercial purposes, and since 1986 it has been in force and has contributed to the recovery of some whale populations, in addition to being an essential instrument for the promotion of non-lethal uses in many countries (ICJ, 2014, p. 378c).

THE CASE OF AUSTRALIA V. JAPAN, AND NEW ZEALAND AS AN INTERVENER, AT THE INTERNATIONAL COURT OF JUSTICE.

In 2010, Australia filed a lawsuit against Japan at the International Court of Justice for large-scale whaling activities carried out in the second phase of the Japanese Antarctic Whaling Research

Program, JARPA II. In 2012, New Zealand filed a request for intervention in the case, based on Article 63 of the Statute of the Court, which was accepted in 2013 by the Court, unanimously (ICJ, 2014, p. 247a).

In short, Australia claimed that Japan was violating its obligations under the Convention, in addition to other international obligations for the preservation of marine mammals, by using scientific licenses for the JARPA II program to carry out essentially commercial activities (ICJ, 2014, p. 247a).

Soon after the moratorium ratified in 1986, Japan created a Program to carry out scientific research, called JARPA, which was followed by JARPA II, both with the permission of a special license to capture and kill whales for scientific purposes, whose quantity and other restrictions were defined by the granting Governments (ICJ, 2014, p. 247a).

The objective of JARPA was to monitor the Antarctic ecosystem and develop parameters that would support a new management of whaling resources. In this vein, "the capture of whales followed by death was used, although there are non-lethal study techniques. As soon as the pertinent studies were concluded, the meat was sold in the country's markets and restaurants" (Leite, 2022, p. 409).

The case, therefore, raised questions about the reality of the scientific nature of the JARPA II program. In addition, Australia and New Zealand defended the existence and feasibility of non-lethal study techniques for hunting for scientific purposes. (ICJ, 2014, p. 247a).

On March 31, 2014, the Court decided the case, issuing a Judgment that was divided into 3 parts, namely: I. the jurisdiction of the Court, II. The alleged violations of international obligations under the Convention (International Convention on the Regulation of Whaling), and III. The remedies. The main decision was that Japan should revoke any authorization, permit, or license granted under JARPA II, and would be prevented from granting future permission to that same program (Leite, 2022, p. 410).

Thus, although considered a *leading case* (precedent) due to its international importance, the decision limited its effects only to JARPA II and did not involve principled aspects of International Environmental Law, being strictly restricted to technical aspects of the program and the parties' convention (Leite, 2022, 410).

However, the separate opinion of Brazilian Judge Antônio Augusto Cançado Trindade, although he followed the majority of the Court in the merits of the claim, brings a broader approach to the case, raising essential points that were not developed by the Court.

THE SEPARATE VOTE OF JUDGE CANÇADO TRINDADE

A member of the International Court of Justice, Brazilian Judge Antônio Augusto Cançado Trindade issued a separate opinion, in which he addressed the following points: (a) the object and

purpose of the International Convention on the Regulation of Whaling (the teleological approach); (b) collective guarantee and collective regulation; (c) the limited scope of Article VIII (1) of the ICRW; (d) the evolution of conservation law: interactions between systems; (e) the ICRW as a "living instrument": the evolution of *the opinio juris communis*; (f) intergenerational equity; (g) conservation of living species (marine mammals); (h) the principle of prevention and the principle of precaution; (i) remaining uncertainties surrounding scientific research (ICJ, 2014, p. 348-349c).

As stated in the Brazilian judge's opinion, the 1946 Convention was indeed a pioneer, by acknowledging, in its preamble, "the interest of the nations of the world in safeguarding for future generations the great natural resources represented by whale stocks" (ICJ, 2014, p. 362c).

In the analysis, Cançado Trindade highlighted some relevant facts, such as the Convention's own supervisory body, the nature of a multilateral treaty comprising member states that do not practice whaling, and the adoption of a moratorium on commercial whaling within the scope of the Convention, which reveal the conception that the object and purpose of the Convention is not restricted to the development of the whaling trade. (ICJ, 2014, p. 349c).

To substantiate this assertion, Trindade considered that the Convention has mechanisms to ensure its own evolution in the face of changing conditions and new challenges, since the International Whaling Commission has a peculiar function of making recommendations to the States Parties, in the form of resolutions, which they must consider in good faith. The Commission's practice, focused on non-lethal methods of whale research, reveals, in fact, a constant concern with the conservation of whale stocks (ICJ, 2014, p. 350c).

Cançado also highlights, in his separate vote, the existence of the Annex of Regulations that is part of the Convention and has legal force, through which "changes have been made regularly to the schedule, in order to deal with international environmental developments" (ICJ, 2014, p. 350-351c). The aim is to combat unilateral actions, such as control for the conservation of whales.

The judge notes that the configuration of the Convention is beginning to be concerned with establishing a balance between the use of whaling resources and the conservation of species, with a view to curbing the overexploitation of whales (ICJ, 2014, p. 350c).

It is appropriate to highlight the argument raised in the separate vote, about the evolution of conservation law based on interactions between systems, with the growth of international instruments relevant to conservation. Thus, "none of them is approached in isolation from the others; it is not surprising that the coexistence of international treaties of this kind has required a systemic perspective, which has been pursued in recent years" (ICJ, 2014, p. 357c).

Cançado (ICJ, 2014, p. 357c) cites as examples:

[A] 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES Convention), the 1979 Convention on Migratory Species of Wild Animals, the 1980 Convention on the Conservation of Antarctic Marine Living Resources, the 1982 United

Thus, "the systemic view seems to be flourishing in recent years" (ICJ, 2014, p. 357c), which could be observed at the meeting of the Conference of States Parties to the Convention on Biological Diversity held in 2000, which addressed the relationship between climate change and the conservation and sustainability of biological diversity in the various interconnected fields, including, but not limited to, marine and coastal biodiversity. (ICJ, 2014, p. 357c).

In view of all this, it can be seen that, although the Treaties are linked to their context of conception, they also have the capacity to adapt to changes, so that their interpretation and application over time demonstrate that they are living instruments, that is, they need to evolve so as not to become unusable. In the words of Trindade (ICJ, 2014, p. 381c): "the ICRW of 1946 is no exception to this and, endowed with its own supervisory mechanism, has proven to be a living instrument".

In the various fields of international law, treaties and conventions, especially those aimed at protection, have demanded the pursuit of their own hermeneutics, as living instruments. This is true not only in the current realm of conservation and sustainable use of marine living resources, but also in other areas of international law.

Therefore, Cançado points out that the case of whaling in Antarctica "has brought to light the evolution of the law on the conservation and sustainable use of living marine resources" (ICJ, 2014, p. 381c). And in a way, it has contributed to the progressive formation of an *opinio juris communis* in contemporary international law.

In this sense, "the voluntarism of the State gives way to *jus necessarium*, notably in the current era of international courts, in the midst of growing efforts to ensure the long-awaited primacy of *jus necessarium* over *jus voluntarium*" (ICJ, 2014, p. 382c).

Cançado Trindade's vote elucidated the impact of International Environmental Law on the evolution of International Treaties, with special emphasis on the principles of the common heritage of humanity, intergenerational equity, in addition to the principles of cooperation, prevention and precaution.

Thus, Trindade reinforces that "intergenerational equity is present today in a wide range of instruments of international environmental law and, indeed, of contemporary public international law" (ICJ, 2014, p. 366c).

Therefore, the strong role of International Environmental Law in contemporary international relations is revealed, including in the interpretation of International Treaties and Conventions already entered into under the norms and principles of classical International Law.



ASPECTS OF INTERNATIONAL LAW: CONCEPT AND FOUNDATIONS OF TREATIES

International Law is a legal system that has been formed and developed throughout history, formed by a set of principles and norms that regulate the complex relationships experienced in the international environment between the subjects of international law (More, 2011).

In the traditional conception, only independent countries were recognized as subjects of international law, called Sovereign States. However, with the transformation of the League of Nations into the United Nations (UN) at the end of World War II, there was an increase in the importance of international organizations and, in the same vein, the gradual recognition of certain entities as holders of international legal personality, including human beings (More, 2020).

According to Novo (2018), the existence of international law dates back to antiquity, but it was recognized by most jurists only after the Peace of Westphalia (1648), when the notions of national state and sovereignty emerged. To substantiate this assertion, Novo explains that there would be no other power over the state above itself.

After the French Revolution, the concept of nationality began to be strengthened in the contemporary era. Thus, Modern International Law developed in the nineteenth century, with "the creation of the first international bodies to regulate transnational affairs, the proclamation of the Monroe Doctrine and the first of the Geneva Conventions, among other initiatives" (Novo, 2018).

In the twentieth century, important milestones began, such as the creation of the League of Nations, which then gave way to the United Nations Organization, highlighting the codification of norms such as the Vienna Convention on the Law of Treaties and the Convention on the Law of the Sea. 2018).

In this sense, Contemporary International Law is increasingly including human agendas and social and environmental issues in the various international adjustments, as a typical effect of globalization.

According to the Vienna Convention on the Law of Treaties of 1969, a treaty is an international agreement concluded in writing between States and/or international organizations and governed by international law, whether it is contained in a single instrument or in two or more related instruments, whatever their specific name. They can be bilateral and multilateral, general and special, universal, regional and local. In addition, the Vienna Convention provides for the duty to comply with the Treaties, under the Principles of *pacta sunt servanda* and good faith.

Also noteworthy is the Charter of the United Nations, of which the annexed Statute of the International Court of Justice (ICJ) is an integral part, signed in San Francisco on June 26, 1945, on the occasion of the Conference of the International Organization of the United Nations. The Charter was promulgated by the Brazilian State through Decree No. 19,841 of October 22, 1945.

DEVELOPMENT AND KEY ASPECTS OF INTERNATIONAL ENVIRONMENTAL LAW

In general terms, International Environmental Law has been consolidated since the first International Conference on the Environment held in Stockholm, Sweden, in 1972, and, consequently, with the development of international documents on the subject (Guerra, 2007).

Martins (2013) argues that international organizations, which previously played a restricted role, began to play an active role in the global governance process, presenting their normative and technical contributions, as is the case of the International Maritime Organization.

In this way, the Treaties of International Environmental Law became negotiations under the auspices of International Organizations, with a more generic and fractional approach, aiming at consensus and approval of the text and leaving open the issues of dissent or scientific updates for future transactions through protocols, amendments, adjustments, annexes and lists.

In this field, the environmental issue has ceased to be a matter of local nature, but has become an international interest, being considered "in the political programs of the States, as well as in the context of international society, giving rise to the proliferation of various international treaties and conventions on the subject" (Guerra, 2007).

With globalization, the industrial revolution, scientific and technological progress, the excessive and accelerated increase of industrial activities, in addition to population growth and consequent dysfunctional urbanization, in recent decades it has been faced with a picture of environmental crisis that includes the depletion of many natural resources, extinction of species and degradation of flora, in addition to the serious problems of global warming and contamination and scarcity of adequate water (Reato, 2022, p. 20-21).

Such environmental damage has gone beyond border barriers. In this sense, there is a need for an increasingly active and differentiated environmental protection at the international level, especially in view of the planetary limits of ecosystem resilience.

International Environmental Law stems from a process of expansion of modern International Law, "which deals not only with borders, as in classical international law, but also with common problems, a process typical of a period of legal globalization" (Guerra, 2007).

In this regard, it is important to mention the recognition of the international protection of human rights in a collective dimension, such as the recognition of traditional communities as subjects of international law (Silva, 2014).

Humanity also comes to be recognized as a subject of rights, in the sense of corresponding to the set of all members of the human race, both in the spatial plane of the Earth and in the temporal plane (past, present and future generations). In the individual sense, therefore, each human being carries the whole of humanity in him, and in the abstract sense humanity expresses itself in the feeling of goodness, benevolence of the one who is human. The common interest of humanity,

therefore, includes the common concerns of life in society, generating the duties of doing no harm, sharing of benefits, and duties of cooperation.

Thus, the notion of common concern of humanity emerges, which was expressly provided for for the first time in the Convention on Biological Diversity of 1992, when it stated in its preamble that the conservation of biological diversity is a common concern of humanity.

This transformation is strengthened by Latin constitutionalism, which introduces the notion of non-human or suprahuman rights. Suprahuman right refers to extending protection rights to fauna and flora, that is, to the ecosystem as a subject of rights, decentralizing the environment only as a resource destined to human interests (Reato, 2022, p. 34-35).

In the heart of South America, a cry was heard for Mother Earth, Pacha Mama: if we do not change the system, the climate will continue to change, making the planet uninhabitable. Pacha Mama is Mother Earth for the Andean peoples of Peru, Bolivia, Argentina and Chile. It can also be understood as nature (Ferreira, 2013, p.421).

In view of all the above, Ferreira's assertion (2013, p. 421) that "humanity must be placed in the arms of Pacha Mama, to integrate with her, to promote the rights of nature, is justified. Social movements and indigenous peoples are central actors in the struggle for the freedom of nature."

Ecuador's Political Charter was a pioneer in attributing to nature the status of a subject of law. In Bolivia, in 2012, the Law of the Rights of *Madre Tierra* was proclaimed, which led to an expansion of the defense of the rights of the *Pachamama* (nature), notably the rights of the rivers (Reato, 2022, p.36). This Law presents nature as a subject of rights, by stating in its article 1 that mother earth is a living being, being a single community, indivisible and self-regulated, of interrelated beings that sustains, contains and reproduces all the beings that compose it.

In New Zealand, "the Indigenous system of water governance now enjoys full legal recognition, with rivers defined as living entities" (Di Carli, 2022, p. 134). In India, the Supreme Court has recognized the legal personality of its largest rivers, the Ganges and the Yamuna and its glaciers (Di Carli, 2022).

Mexico has a declaration of the rights of rivers, approved by society. And at the United Nations, there is a program called Harmony with *Nature*, with dialogues between experts and activities around the world in defense of the rights of *Madre Tierra*. (Di Carli, 2022).

Thus, it can be observed that International Environmental Law (IAD) is a "new arrangement of international environmental regulations that goes beyond the legal regime, advocating for utilitarian structures and referrals that incorporate other sciences, new actors and instruments of confrontation" (Silva, D., 2014).

Continuing on this critical journey, International Environmental Law emerged from the second half of the twentieth century as the set of international legal norms through treaties and

agreements between Nation States and gave way to International Environmental Law that is gradually advancing, clothed in active structures, such as the Framework Conventions regulated by the COP's that favor a dynamic and interdisciplinary global environmental governance. promoting "the relationship of States and International Organizations with new international entities, mainly through networks" (Silva, D., 2014).

ANALYSIS OF THE INFLUENCE OF INTERNATIONAL ENVIRONMENTAL LAW ON INTERNATIONAL LAW

As is obvious, from globalization and social changes, Classical International Law gives way to Modern International Law, which begins to include issues of collective interest in its agendas. This also leads to the inclusion of environmental issues in the various more modern treaties (Guerra, 2007).

Guerra (2007, p. 49) clarifies that this trend requires from "public international law a process of continuous expansion, solutions to the global problems they present, as well as conceptual enrichment to face the realities of the new times".

Guerra (2007, p. 50) argues that:

Although the domains of human protection and environmental protection have been treated separately so far, it is necessary to seek a closer relationship between them, since they correspond to the main challenges of our time, ultimately affecting the course and destiny of the human race.

Therefore, human rights issues have demanded a direct relationship with the protection of the environment, thus imposing a systematized contemporary treatment.

For Aoki (2004, p. 3), the Principles of International Environmental Law have been gaining prominence, especially because environmental issues have become expressively present in daily life, being a reality that affects the very existence of humanity.

Unquestionably, there is an increasing reach of the Principles of International Environmental Law in the international scenario, driven by emerging environmental issues and scarcity of resources that reflect in the change of ways of consumption, of life, including in the management of companies and people's behavior, "all based on a convergent point of interests, which is summarized in the term sustainability, which is divided into three pillars: economy, environment and society" (Reis, 2019, p. 22)

Reis (2019, p. 23) also reinforces that "changes in the international context have caused, and continue to cause, changes in the way organizations in all sectors should act and behave in the face of environmental dynamics in the world". Finally, he points out that the conflict between environmental issues and the purposes of companies "has been generating changes in the international scenario, and



gives rise to international treaties, standards, agreements, recommendations and codes that balance the relationship between corporations and the future of the environment" (Reis, 2019, p.23).

The Convention on the Regulation of Whaling, as we have seen, began to highlight the contours of a new interpretation focused on the environmental law of marine ecosystems, becoming part of the set of the main regulatory frameworks for cooperation and protection of whales, together with the United Nations Convention on the Law of the Sea and the Convention on Biological Diversity.

With regard to the Brazilian State, Federal Law 7.643 of November 18, 1987 was sanctioned, in order to adapt the national legislation to the Convention, prohibiting the hunting or any form of intentional molestation of all species of cetaceans in the waters under Brazilian jurisdiction.

In this sense, under the aspect of the uniqueness of the ecosystem and interdisciplinary interaction, it is relevant to mention that scientific studies have pointed out that whaling involves major impacts on the ecosystem, generating environmental crises such as global warming, water pollution with waste such as plastics, nets and hunting accessories, as well as sound noise, chemical debris, among others (Leite, 2022, 421).

The importance of mammals for the balance of the ecosystem has already been demonstrated "being biologically considered keystone species" (Leite, 2022, p. 421), and from the 90s onwards "the International Whaling Commission began to pay greater attention to the correlation between cetaceans and climate change" (Leite, 2022, p. 421).

It is also noteworthy that in studies carried out it was identified "that whales have a broad capacity to store carbon and protect the marine ecosystem from destabilizing stresses" (Leite, 2022, p. 421). According to the International Monetary Fund (IMF), in 2019, whales could store 1.7 billion tons of CO₂ per year (Leite, 2022, p. 421).

There are no doubts about the importance of whales for the balance of the ecosystem in which they are inserted, since, without them, "countless ecological cycles of the ocean would collapse" (Leite, 2022, p. 422).

It should be noted that international regulations recognize the environment as a common right, which requires "mutual cooperation of States, with binding rules, through the principled applications that guide the idea of environmental preservation" (Leite, 2022, p. 424).

Studies focusing on medical ecology demonstrate the uniqueness of the environment and its reflection in a direct link between the environment and human health. "What is currently observed in the health-disease process is the practical separation between the environment and human health" (Lima, 2014).



Thus, Lima understands that it is necessary to admit that the human being is an integral part of the environment and that "approaches and attitudes are therefore necessary for the promotion of health, quality of life and prevention of diseases associated with the environment." (Lima, 2014)

In addition, the concept of natural ecosystem services helps to describe the global processes that contribute to and are essential to the health and well-being of human beings (Souza, 2022). For example, "green areas contribute to urban drainage, acoustic and thermal comfort (noise reduction and climate regulation), air purification, and moderation of extreme weather events, making cities more resilient" (Souza, 2022, p.80).

This multidisciplinary knowledge has been raising the awareness of global subjects for decision-making both in the formulation of new agreements and in the interpretation and application of existing conventions.

It can be seen that the evolution of International Environmental Law has been, therefore, a relevant factor in the transformation of relations between international society, as it is a multidisciplinary system, which involves several areas of knowledge and human relations.

The growing cross-border issues have demanded the observance of norms of International Environmental Law in the various types of public and private International Law relations, in an apparent convergence of these to the international environmental legal protection.

CONCLUSION

What can be concluded, from all the above, is that the damage to the species and quantities of whales, at first, caused the fear of losses in the whale industry, which moved international actors to regulate whale hunting with a totally commercial vision, culminating in the creation of the International Convention for the Regulation of Whaling of 1946.

The Convention was ratified under the auspices of the rules of classical public international law, governed in particular by good faith and the principle of *pacta sunt servanda*, with the main objective, initially, of ensuring the survival of the whaling industry.

However, the Case of Whaling in Antarctica, between Australia and Japan and with New Zealand as an intervening party, in the sphere of the International Court of Justice, of great international repercussion, revealed that the Convention adopted a configuration that allowed its evolution and adaptation over time, especially related to the activities of the International Whaling Commission and the adoption of a zero moratorium on commercial whaling in force to the present day and supported by the vast majority of its Members.

This aspect was demonstrated in the separate opinion of Brazilian Judge Cançado Trindade, a member of the Court, who stated in detail that the Convention is a living instrument, which has recently changed its objectives. Thus, nowadays, the Whaling Convention would no longer aim to

guarantee the whaling industry, but, in a diametrically opposite sense, would be focused on the interests of the marine ecosystem, becoming an instrument for the protection of International Environmental Law.

In other words, the Convention has undergone a growing and radical change in its conduct and interpretation, with the concept of systemic interpretation of International Environmental Law, that is, an interpretation that is carried out in conjunction with the other instruments that regulate the relations of States with regard to maritime life, and these, predominantly, aim to ensure the protection and conservation of the oceanic aquatic environment.

In this regard, the vote of the Brazilian judge of the Court, Antônio Augusto Cançado Trindade, deserves special mention, who reaffirmed the need for the mutability of international treaties in the face of paradigmatic changes in society and the importance of strengthening the pillar of the environment.

It should be noted that, although it may be considered a precedent due to its importance in the international scenario, the Court limited itself, in its collegiate decision, to examining the technical terms of the JARPA II program, having as a parameter the International Convention for the Regulation of Whaling and its schedule, without going into the principled aspects of International Environmental Law, that is, without any mention of the common heritage of humanity, intergenerational equity and the principle of prevention and precaution.

In due course, Judge Cançado Trindade, during his vote, did not limit himself to following the understanding of the majority of the judges of the Court, but also discussed how the aforementioned principles would be applied in the analysis of the specific case.

From this case, an analysis of the configurations of international law was made, and it was observed that the industrial revolution, globalization and large-scale consumption give rise to broader social and human issues, directing Contemporary International Law to increasingly encompass human, social and environmental issues.

Thus, International Environmental Law begins to deal with the international protection of human rights in a collective dimension, the recognition of traditional communities as subjects of international law, among other international actors, the notion of common concern of humanity, Latin constitutionalism that brings the notion of non-human or supra-human rights, which are those proper to nature.

A new order of international environmental protection is emerging, characterized by dynamism and interdisciplinarity to face serious environmental crises, whose structures enable a more active and dynamic international governance.

Thus, it can be seen that environmental legal protection currently radiates to the various international agreements, of different themes. It was found that International Environmental Law has



directly influenced the new adjustments and interpretation of existing treaties, such as the International Convention for the Regulation of Whaling of 1946.

Knowledge such as the uniqueness of the ecosystem, the global awareness of the disastrous consequences of man's actions on the environment, and the perception of the reflection of the punctual changes of the various ecosystems on the global flow of the climate and on the quality of the environment, has led to the standards of living, consumption and behavior in general, and notably has led to public and private international agreements.

Thus, considering the intrinsic interconnection of the various issues with the environment, international regulations in the public, health, and business areas, among others, are absorbing norms of International Environmental Law, such as intergenerational equity, the principle of prevention, and the principle of precaution, to regulate their activities aimed at conserving the environment.

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The importance of volunteer agents of Civil Protection and Defense in the communication of accidents and disasters: A case study of the mapping of occurrences in Nova Iguaçu-RJ

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

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ABSTRACT

This article presents the benefits of a tool that trains volunteers who support the Municipal Coordination of Civil Protection and Defense, working in risk reduction and in the management of accidents and disasters. The research focused on the study of the role of volunteering in civil protection and defense in Brazil, identifying the type of disaster, by neighborhoods, most relevant in the municipality of Nova Iguaçu, which caused the greatest damage and losses: flooding and flooding. In addition, the relevance of the trained volunteer and the performance of the Training Center for Emergencies and Disasters in the training and preparation of volunteers for a more technical vision were considered. The research methodology was qualitative, with the researchers analyzing the information, actions and activities listed, to obtain data on the practical actions, involving the community target audience. The information was of paramount importance for the preparation of the map and for its maintenance through the reports of the volunteer agents of the NUPDECs, who were in

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Interconnections of Knowledge: Multidisciplinary Approaches

The importance of volunteer agents of Civil Protection and Defense in the communication of accidents and disasters: A case study of 456 the mapping of occurrences in Nova Iguaçu-RJ



the affected communities. It is positive to conclude on the relevance of the tool created, despite the difficulties in obtaining data for its elaboration, which were overcome with the partnership of several actors involved.

Keywords: Volunteer, Training Center for Emergencies, Disasters, Civil Protection and Defense and NUPDEC.



INTRODUCTION

PROBLEMATIZATION

How important is it for volunteer agents to provide real-time information on accidents and disasters?

OBJECTIVE

Present the advantages when information on adverse events is passed on, in real time, by volunteer agents to a Municipal Coordination of Protection and Civil Defense (COMPDEC), for the reduction of risks of accidents and disasters.

METHODOLOGY

According to Yin (2015), a case study was carried out with the Civil Protection and Defense Centers (NUPDECs), formed by groups of individuals and legal entities, which support the Municipal Secretariat of Civil Defense of the Municipality of Nova Iguaçu, to deepen knowledge about disaster risk reduction, as well as in responses to accidents and disasters. especially natural disasters (Brasil, 2022), which, in 2024, affected the municipality during the seasonal rains in the months of February and March. The Municipal Secretariat of Civil Defense of Nova Iguaçu prepared a mapping of events and set up a tool, translated into a map of accident and disaster points, informed by the members of the NUPDECs, according to the GIS geographic information system, by neighborhoods that were affected, in order to base its response planning on minimizing suffering. damages and losses to the society of the municipality. The map was made available at the Network/SVAC, from where, by the inductive method, data were analyzed and discussed with the tool produced.

THE CIVIL PROTECTION AND DEFENSE CENTERS (NUPDECs) THE TRAINING CENTER FOR EMERGENCIES AND DISASTERS (CETRED)

The Civil Protection and Defense Centers (NUPDECs) and the Training Center for Emergencies and Disasters (CETRED), are established institutional tools to train and train volunteers, including, among others, community leaders, residents' associations, and governmental and non-governmental representatives, working in the provision of free courses and seminars in order to address various aspects of emergencies and disasters.

Volunteering, based on Federal Law 9.608/98 (Brasil, 1998), can be defined as a "voluntary service" and thus as unpaid activities, where an individual disposes of or employs his or her workforce for altruistic purposes, restricting this service in favor of a non-profit legal entity of public or private law (Reis, 2022).



Generally, the volunteer's bond with the Civil Defense is through the so-called Civil Protection and Defense Centers (NUPDECs), which was based on Federal Decree 5,376/2005 and Resolution No. 2, of December 12, 1994, of the National Civil Defense Council, which instituted the National Civil Defense Policy. The following National Policy for Civil Protection and Defense (PNPDEC), Brazil (2012), does not expressly mention the term "NUPDEC", however, it does mention volunteer associations when it assigns powers to municipalities to encourage participation and promote the training of volunteer associations (Law 12.608 of April 10, 2012. Art. 8, XV).

In Nova Iguaçu, in the State of Rio de Janeiro, CETRED, created based on Rio de Janeiro (2020), has been seeking to involve all members of society and the Government, unifying all citizens of the municipality, towards a common goal focused on disaster risk reduction (DRR) and support for the management of responses to accidents and disasters (Cetred, 2023).

Reiterating, therefore, that the research was carried out in February 2024, based on the legal norms in force: Law 12,608 of April 10, 2012, Brazil (2012), Federal Law 14,750 of December 12, 2023, Brazil (2023) and RJ State Decree No. 46,935/20, in articles 4, XIV and 8 I, Art.14o VIII, Rio de Janeiro (2020), which establish guidelines for the participation of civil society and the prioritization of preventive actions aimed at minimizing disasters.

Communication is a crucial and conditioning factor for the execution of the work, in the scope of prevention, mitigation, preparation, response and recovery, because it is the condition that articulates the actions, it is the channel in which the orders are manifested and the acts on the territory are articulated.

The importance of the community in the pre-disaster and post-disaster period is crucial, the support for initiatives, the training and capacity building of volunteer agents for civil protection and defense creates a culture of prevention, making the community, as a whole, more resilient. People, previously prepared, face adverse situations with a different look, being able to act in the notification and communication with the Civil Protection and Defense Agencies during the occurrence of rains, floods and landslides and in the dry season, inform and communicate about forest fires, whether in urban or rural areas, especially in Nova Iguaçu, a municipality that, according to MAPBIOMAS (2024), has a vegetation cover with a large percentage of its territory under vegetation cover, distributed by conservation units (UC) of full protection and conservation unit of sustainable use (Brasil, 2000).

The purpose of the research in question is to report the importance and role of this channel with the volunteer, as a collection of reliable information, through the report of a series of locations, in order to create a list of affected neighborhoods for the preparation of a map with a visualization legend, easy to understand, whose reading, through the QGIS geographical map, will indicate the neighborhoods that were affected by the rains in the month of February 2024, using as a source of

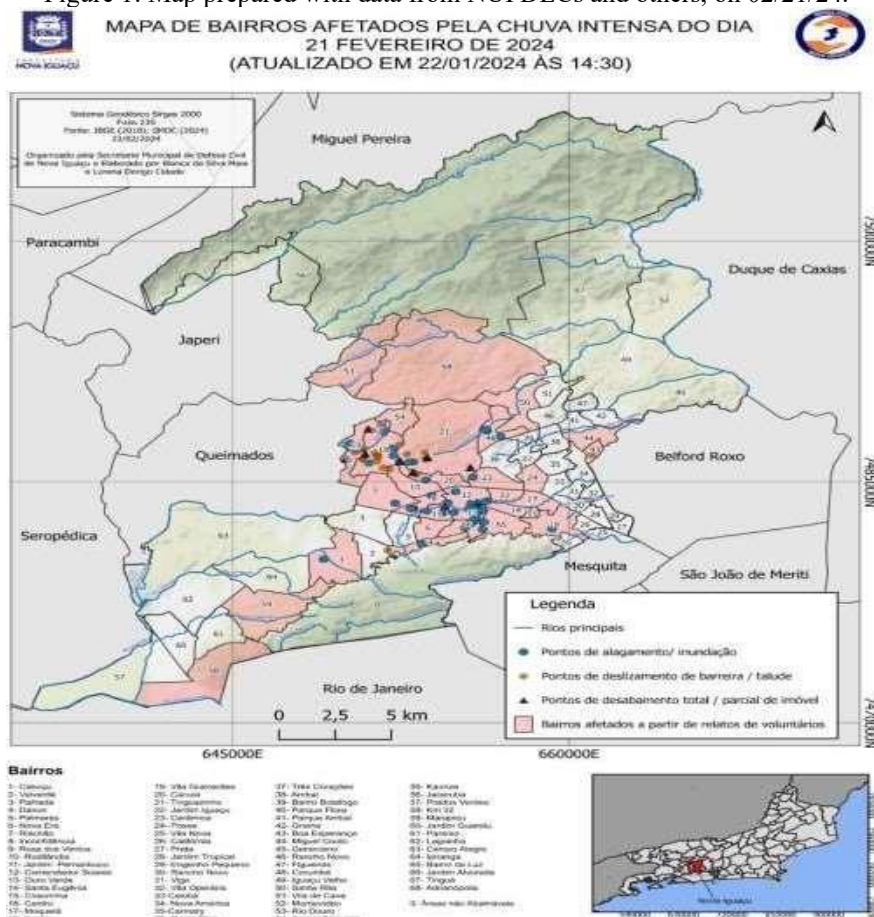
information and communication the data indicated by public agents and, above all, by civil protection and defense volunteers, from the Civil Protection and Defense Centers (NUPDECs).

It should be noted that the volunteer agents of the NUPDECs are officially recognized and their members are registered in the Municipal Network of Servers, Volunteers and Friends of the Community (REDE/SVAC, 2010), formed by employees, volunteers and friends of the community.

DATA COLLECTION AND ANALYSIS

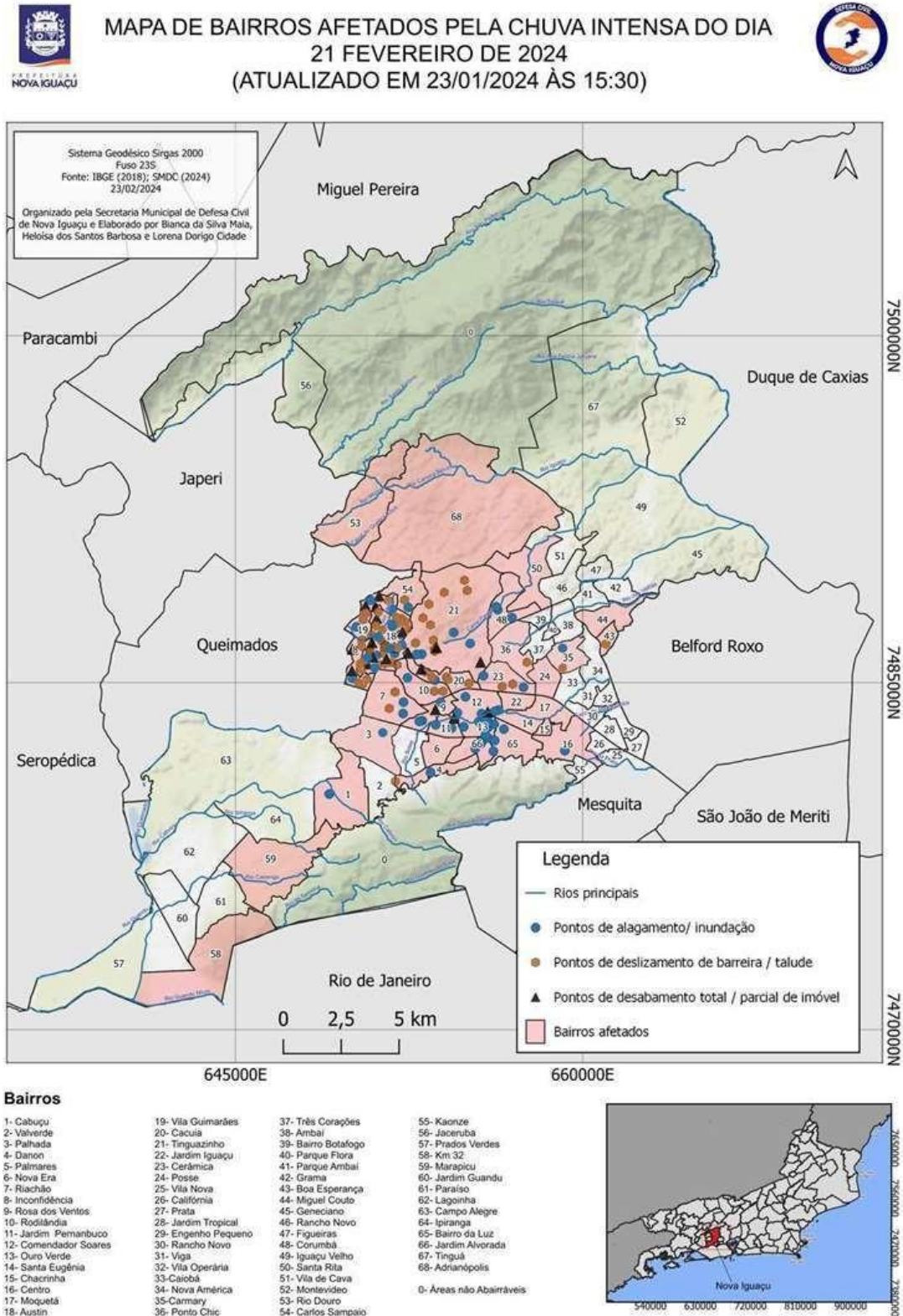
The data collected are described in the maps in Figure 1 and Figure 2, where the authors of this article participated, sometimes as public agents, sometimes as voluntary agents of civil protection and defense, and went on to the analysis and discussion of the data, which are present in the respective legends of each map, where the bases and technical sources of the maps are analyzed and verified; the distribution and totalization of neighborhoods in the municipalities; the municipalities that surround the Municipality of Nova Iguaçu and that border it and also, the main fluvial description, of the rivers that make up the Hydrographic Basins of the Region; flooding points; barrier/slope slip points; points of total/partial collapse of the property; and, above all, the neighborhoods affected by reports from volunteers.

Figure 1: Map prepared with data from NUPDECs and others, on 02/21/24.



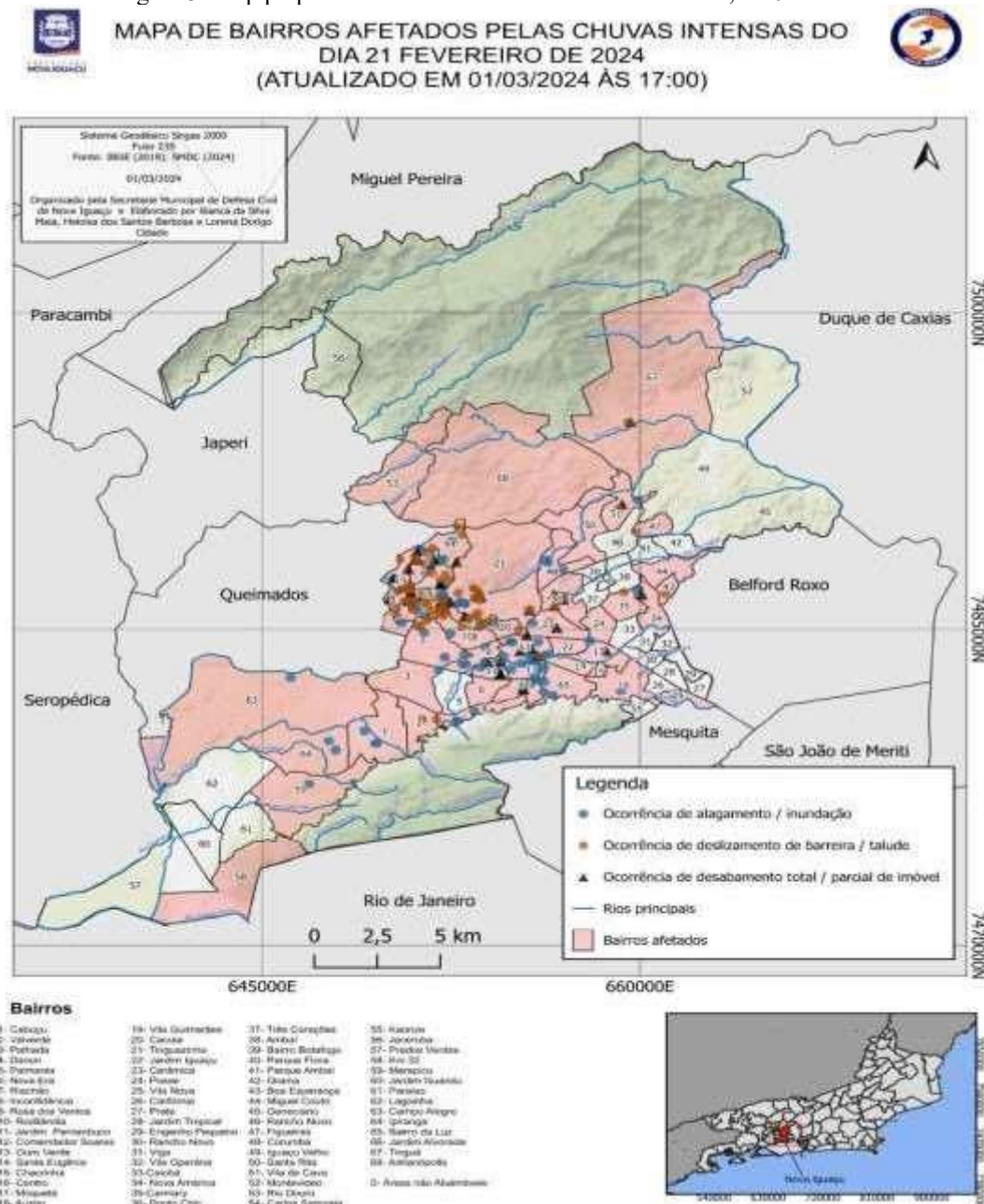
Source: Municipal Secretariat of Civil Defense of Nova Iguaçu - SMDC (2024)

Figure 2: Map prepared with data from NUPDECs and others, on 02/21/24.



Source: Municipal Secretariat of Civil Defense of Nova Iguaçu - SMDC (2024)

Figure 3: Map prepared with data from NUPDECs and others, on 02/21/24.



Source: Municipal Secretariat of Civil Defense of Nova Iguaçu - SMDC (2024)

RESULTS AND DISCUSSION

The Civil Defense Secretariat of Nova Iguaçu allowed the disclosure of the data used in the academic article. Permission was granted on the condition that the data be used exclusively for academic purposes.

The article in question presents an unprecedented analysis of the Civil Defense data, which means that the information was used in a different and original way. This analysis contributes to the improvement of knowledge about the dangers and disasters in the region of Nova Iguaçu.

Located in the Baixada Fluminense region of Rio de Janeiro, Nova Iguaçu stands out for being a relevant urban center in constant growth. With approximately 785,867 inhabitants (IBGE data from 2022), the municipality is the second most populated in the state, behind only the capital.

Interconnections of Knowledge: Multidisciplinary Approaches



To make the administration of the city of Nova Iguaçu more effective, it is divided into nine (9) Regional Government Units (URGs), each with its own peculiarities and characteristics. The following is a complete summary of each URG, with its 68 sub-neighborhoods:

URG 1 Centro – Bairro da Luz, California, Caonze (K11), Chacrinha, Engenho Pequeno, Jardim Iguaçu, Jardim Tropical, Moquetá, Prata, Rancho Novo, Santa Eugenia, Viga, Vila Nova, Vila Operária.

URG 2 Posse – Ambaí, Bairro Botafogo, Carmary, Cerâmica, Kennedy, Nova América, Parque Flora, Ponto Chic, Três Corações.

URG 3 Comendador Soares – Danon, Jardim Alvorada, Jardim Nova Era, Jardim Palmares, Jardim Pernambuco, Ouro Verde, Rosa dos Ventos.

URG 4 Cabuçu – Campo Alegre, Ipiranga, Lagoinha, Marapicu, Palhada, Val-verde

URG 5 KM32 – Jardim Guandu, Paraíso, Prados Verdes.

URG 6 Austin – Cacua, Carlos Sampaio, Inconfidência, Riachão, Rodilândia, Tinguazinho, Vila Guimarães.

URG 7 Vila de Cava – Corumbá, Figueira, Iguaçu Velho, Rancho Fundo, Santa Rita.

URG 8 Miguel Couto – Boa Esperança, Gerenciano, Grama, Miguel Couto, Ambaí Park.

URG 9 Tinguá – Adrianópolis, Jaceruba, Montevideo, Rio D'Ouro.

It should be noted that in the period chosen for study, the disaster was caused by heavy rains that occurred from Wednesday night (02/21/2024). All neighborhoods, characterized as urban or rural areas contained in the URGs, suffered to some extent from the extreme event. More precisely, there were 41 neighborhoods affected by the heavy rains out of the total number of 68 neighborhoods. Of these, 25 neighborhoods are bordering other municipalities, which suffered from the same event.

During the event, through communication and input from volunteers, we identified the needs of the 26 neighborhoods that were most affected. With this information, collected in real time from the volunteers, it was possible to create a map, as shown in figure 03.

Figure 1, which represents the beginning of the event, provides an initial idea of the situation. However, it is in Figures 2 and 3 that the power of real-time information is revealed. Figure 2, obtained during the event, shows a significant increase in community participation and volunteering. This engagement, motivated by the urgency of accurate information, has made it possible to identify new affected areas, flood hotspots, and a growing demand for assistance.

Figure 3, which shows the last update and the end of the event, reinforces the importance of real-time information. With the participation of the volunteers, it was possible to accurately map the affected areas, assess the damage and direct recovery efforts more efficiently.



Volunteering is more than real-time data collection. Their work contributes to a deeper understanding of the issues in the city's neighborhoods, especially in relation to climatic events. By standing at the front, volunteers directly suffer the effects of flooding, which makes them able to have a unique and valuable look at the needs of the community.

In view of the above, it is also possible to analyze the relevance of volunteering for the understanding of the problems existing in the neighborhoods of the municipality with regard to the aforementioned climatic events.

Thus, based on community communication, it was observed that volunteering registered occurrences in most of the neighborhoods, either by direct connection to the network, or by information from third parties, family members or acquaintances of any nature.

It is also worth mentioning that the municipality of Nova Iguaçu has local peculiarities, whether of a social nature, or even material in the morphological sense, or better said, geomorphological, being susceptible to accidents due to floods. The Municipality is located, in the first observation, in the middle of two alkaline complexes, one referring to the alkaline complex of the "Serra do Mendanha" and the other in the Tinguá Biological Reserve, an integral component of the Serra do Mar that extends along a considerable part of the Brazilian coast.

In addition, the hot and humid climate favors intense rainfall, directly interfering in the relationship between occupation and risk, especially because a large part of the territorial occupation is distributed along the drainage of water bodies, which are present throughout the administrative territory, increasing the vulnerability of this population.

Emphasizing this issue, we put another not so unusual peculiarity, referring to the floodplains, which, in a past historical moment of the Municipality, allowed it to be an area suitable for cultivation, so much so that a fruit such as the orange became a form of representation of the place, based on a past of the city where it was even known as the "perfume city".

After this agricultural cycle, the city was recognized with a new nomenclature: "Dormitory City", as it began to house a large part of the working class of the state of Guanabara. However, it is not of interest at the moment to discuss historicity in such a direct way, but its historical pair is fundamental for the understanding of the relations that are made in the present, in the face of the materiality of the objects that are placed in the face of the relations that are based on it.

It is also relevant to bring up that the municipality of Nova Iguaçu is a watershed divider, and as much as, mostly, the competing portion of the Guanabara Hydrographic Basin is more present in the territory, part of the Guandu Basin also marks its presence.

Considering the geographic space as a factor and condition for the reproduction of living conditions, the Hydrographic Basins gain prominence in our analysis, because the studied Municipality is a municipality that recurrently suffers from intense rains and, consequently, from



flooding, flooding and flooding, especially in the neighborhoods that are cut by the main river of the Region. the "Botas River" and its tributaries, whose drainage converges into this main river.

Another situation to be highlighted is landslides and mass movements, which occur less frequently, but no less catastrophic and important for civil defense preparedness and response plans and territory management. In this area, it is appropriate to return to the discussion about the relationship "occupation X risk", due to the perception of the effective occupation of these inappropriate areas, which are, however, the product of a historical disordered occupation process that precedes the elaboration of this article, so that what is put on the agenda are the forms of training, communication, communication, structuring and organization of this same territory, in order to contemplate better forms of prevention and responses, such as the mitigation of the impacts of the phenomena.

CONCLUSIONS

The research revealed the relevance of trained volunteering as an important link between the Civil Protection and Defense Agency and communities affected by disasters, in the face of floods, floods and forest fires, which are the most challenging events in the researched territory. The training tool, combined with the close liaison with NUPDECs, proved to be effective in supporting the response, decision-making and allocation of resources to the sites affected by accidents and disasters, thus minimizing their negative impacts.

The technical training of volunteers, offered by initiatives such as the Civil Defense Training Center (CETRED), as conceived by the Civil Defense Secretariat of Nova Iguaçu, prepares agents to multiply information and guidance for the communities. This acquired experience is the true answer to the problem question of the research, as trained people will act as local leaders, directly supporting civil protection and defense actions, promoting the safety and well-being of the population, reducing their social vulnerability and making them more resilient to adverse events as a whole, these are the advantages that the research sought to show.

Despite having faced some difficulties, the positive results achieved prove its relevance. The advantages lie in the benefits arising from the agility in the response and the restoration of social normality, that is, minimizing the damage and accelerating the recovery of the affected areas.


Therefore, by investing in the training of volunteers and the promotion of cooperation between different sectors, the Civil Defense of Nova Iguaçu contributes to a safer future. Information, organization and joint action make it possible to face the challenges posed by accidents and disasters in more efficient and effective ways, protecting lives and property.



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A new approach: People management and environmental education as assumptions for business and social development

 <https://doi.org/10.56238/sevned2024.010-030>

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ABSTRACT

This article addresses people management and environmental education, as prerequisites for business and social development. The importance of the topic is justified, as environmental issues have rarely been the subject of training and qualification of people managers in today's business and social organizations. Due to the urgent need for sustainable development and international and Brazilian legal regulations, environmental

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education becomes an integral part of the training of people managers. The general objective is to demonstrate that people management from the perspective of environmental education constitutes contemporary assumptions favorable to business and social development and human emancipation. The methodology used to carry out the research consists of the deductive method and the historical auxiliary method. As for its nature, it is descriptive and bibliographic and as for its techniques, it is qualitative and theoretical. Human resources administration in Brazil needs to evolve according to political, economic and social facts of each era. Currently, strategic people management, mainly as a result of the development of organizations and a greater level of complexity in the labor market, requires the inclusion of environmental issues, which involve organizations, which has come to require a continuous process of training of people managers with a vision of professional emancipation. To this end, the process of training-emancipation of people managers, people and consumers/citizens must be permanent and in accordance with the new environmental demands, rights and obligations that are emerging, so that society can develop in a positive way. Sustainable and lasting way from your place.

Keywords: People management, Environmental education, Development, Human emancipation.

INTRODUCTION

Not so long ago, human resources (HR) was considered only a personnel department. It operated in a mechanistic manner, with the employee obeying and performing tasks, and the boss being responsible for centralized control. The sector was seen as merely responsible for hiring or firing employees. Today the scenario is different, because this sector, in addition to being responsible for the entire process of hiring people (selection, hiring, compensation and training), is responsible for maintaining communication between employees and the company and providing, in the broad sense, professional emancipation (Marras, 2000). According to Chiavenato (2014), current people management is composed of six main processes: aggregate, apply, reward, develop, maintain and monitor.

For a better structuring of the text, the study was carried out in four approaches. The first deals with the historical aspects of people management in Brazil until 1930, the second addresses people management from 1930 to 1985, the third mentions people management in the period from 1985 to the present day and, finally, environmental education as a contemporary focus on people management.

The transformations brought about by these professionalization processes generate impacts that induce the re-elaboration of concepts, such as sociocultural identity, which includes the notion of "place" of work, citizenship, labor relations and the environment. Emancipation involves a series of issues, such as: the individual, recognition, the place of the subject in social practices, the mediations between the existence of individuals and social life, the interconnections between forms of life and social structure, the links between social movements and classes, the different forms of conflicts, the limits and potentialities of emancipatory actions and environmental issues in the process of people management.

METHODOLOGICAL ASPECTS OF THE RESEARCH

To carry out this research, the bibliographic-reflexive method was used. The methodological technique employed consists of a bibliographic review in order to obtain systematized, synthesized and re-elaborated information based on the authors' critical reflections.

The study is classified as a descriptive research, using the literature review method. According to Ribeiro (2007), the main objective of a literature review is to gather ideas from different sources, aiming to build a new theory, or a new form of presentation for an already known subject.

According to Berto & Nakano (1998), research classified as literature review is the product of critical reflections on a phenomenon or issue observed in the literature, compiling and opposing arguments and theories of different authors on a given theme.



On the other hand, according to Minayo (2001), qualitative research deals with everyday processes and phenomena, such as the issue of human resources management, with a focus on people management in the most diverse organizations. Therefore, such questions cannot be reduced to only quantifiable or variable data, without a reflexive analytical focus on them.

It is also noteworthy that the bibliographic-reflexive method enables the recovery of the historical evolution of personnel management in Brazil, so it was opted for a sequential description of the important facts that marked each era.

Among the historical milestones of people management, some collections of public and constitutional policies were used: Ministry of Labor, Industry and Commerce [MTIC] (1930); National Department of Labor (1931), Union Tax (1940), Consolidation of Labor Laws [CLT] (1943), Professional Card (regulation of working hours in commerce and industry, creation of mixed conciliation commissions, definition of the right to paid vacation, establishment of working conditions for minors and women), General Command of Workers - [CGT] (1962), the Central Única dos Trabalhadores [CUT] (1983) and the General Central of Workers [CGT] (1986).

RESULTS AND DISCUSSIONS

HISTORICAL FOUNDATIONS OF PEOPLE MANAGEMENT IN BRAZIL UNTIL 1930

We are living in an era of great transformations, where human capital becomes increasingly relevant for organizations to achieve their goals. In the knowledge society, human talent and its ability to adapt are seen as competitive factors in the globalized labor market.

At first, management or administration in Colonial Brazil (1500-1889) was characterized by total economic and political subordination to the Portuguese crown and by slave labor. According to Dutra (2002), colonial Brazil received as a legacy of the Portuguese monarchy the administrative incapacity, marked by the lack of systematic rules, by the absence of a clear definition of the attributions and competences of the authorities, by the overlapping of organs, by casuistry and by particularism in the determinations of functions (Dutra, 2002).

According to Dutra (2002), in 1874 there were 175 factories in Brazil and, ten years later, there were already 600 factories, concentrated in the states of São Paulo, Rio de Janeiro and Rio Grande do Sul, employing about 20 thousand workers. Despite the numbers, the Empire of Brazil did not develop an industrial manufacturing model due to pressure from England, the greatest economic and political power of the time. Such intervention had a negative impact on the development of Brazilian management, leaving a bitter legacy of backwardness and oppression.

In Brazil's first republican period (1889-1930), the management of organizations took on a liberal character, which implied a mode of management not regulated by higher state and legal instances; and also exclusionary, which distanced the economic and political power of social groups



"from below" in the structure of society. The economic organization was based on agricultural production aimed only at export, especially coffee. Thus, the management model of the coffee plantation slowly evolves from the standard of the big house and slave quarters (monoculture, slave labor and the direction of a patriarch) to a system based on salaried labor and made up mostly of immigrants (Freyre, 2004).

However, Viscano and Estork (2004) interpret that the human resources department emerged around the nineteenth century with the task of accounting for workers' notes, delays and absences, and that the heads of this department, at that time, presented as characteristics inflexibility, strict compliance with legislation and were called owners of incalculable coldness. Especially when it comes to laying off employees.

This period was also marked by moments of remarkable labor effervescence, having received a significant contribution from European workers. They settled mainly in São Paulo and in cities in the south of the country (Dutra, 2002). It was in the 1920s, according to Viscaino and Estork (2004), that the human relations movement brought a challenge to the head of the personnel sector, that is, a new administrative paradigm based on the relationship between employees and employers.

Marras (2000) refers to the phase prior to the 1930s as the accounting period, a pioneer of personnel management, characterized by concern with the organization's costs and profits. Workers, on the other hand, were seen exclusively from an accounting point of view, labor was purchased and, therefore, the inflows and outflows from this account had to be recorded in the accounts.

This phase is also called prehistoric, as labor legislation was only implemented in the 1940s. Meanwhile, human resources activities were restricted to tasks corresponding to the calculations of the remuneration to which workers were entitled for their work (Viscaino and Estork, 2004).

Therefore, the people manager performed his activities in a mechanistic way, as being only a controller of the organization's workforce, without considering the humanistic aspect of the human resources indispensable to the production of capital and the company's profits. From 1930 onwards, people management entered a second phase, as Brazil began the debate on the regulation of labor standards, which took place in the following decade, a subject that will be addressed in the sequence of the study.

PEOPLE MANAGEMENT FROM 1930 TO 1985

From 1930 onwards, there were significant changes in labor relations in Brazil. The government of Getúlio Vargas (1930 to 1945), which was installed through a revolutionary act, promoted extensive interventions in labor issues, both with regard to social protection measures for workers and the process of organizing workers' associations (Marras, 2002). According to Dutra (2002, p. 53):

In 1937 the new constitution tied the unions to the state and prohibited strikes. In 1940 the union tax was created. In 1943 the Consolidation of Labor Laws emerged. The labor legislation enacted during this period created the professional card, regulated working hours in commerce and industry, defined the right to paid vacations, instituted mixed conciliation commissions, established the working conditions of minors in industry, etc.

It was in 1945 that the first definitions and studies on leadership, human motivation and democracy at work appeared. In this context, the head of personnel needed to be concerned about the employee and the company, because at this time the main legal and union issues occurred. Thus, the head of personnel becomes the personnel manager, however, he continued to be connected to the bureaucratic issues that he has always performed, complying with the rules and norms (Viscaino and Estork, 2004).

Dutra (2002) considers that the Estado Novo had put an end to trade unionism and the workers' movement. This consideration is justified by the fact that the union elections were concealed, since the Ministry of Labor consolidated the right to recognize the elected directors and to intervene in the unions. It was only with the fall of the Estado Novo in 1945 that the workers' movement began to re-emerge. As a result, the right to strike was guaranteed by the 1946 Constitution. And, although the unions continued to be linked to the Ministry of Labor, there was a more intense participation of the union leaders at the end of that decade.

Marras (2000) points out that in this phase the power, until then only focused on the figure of the overseers (heads of production) over the employees, passed into the hands of the head of personnel due to the domination exercised over the legal rules and norms imposed by the Consolidation of Labor Laws - CLT (1943).

On the other hand, the 1950s were characterized by significant changes in the field of labor relations. During this period, the expansion of the steel, oil, chemical and pharmaceutical industries and the implementation of the automobile industries took place. In this way, the modern sectors of industry came to dominate, both in terms of production and in terms of number of employees, the traditional sectors. In this decade, the transformation of the department began, and the role of personnel manager was renamed human resources manager (Dutra, 2002).

As previously seen, the president at the time, Juscelino Kubistchek (1956 to 1961) implemented the automobile industry in the country. Thus, entrepreneurs began to accept the industrial relations manager in their organizational charts. These changes now require the presence of a new professional to manage personnel problems. However, the education system was not adequate to prepare this new professional and companies began to fill their positions by taking advantage of the old chiefs of staff. For this reason, in many companies, the only change observed was the nomenclature of the personnel body (Dutra, 2002).



However, at the beginning of the 1960s it was possible to notice the progressive acceleration of the politicization of the working class. The trade unions began to group themselves into federations corresponding to each branch of industry. In 1962 the Trade Union Central was created, which had the General Command of Workers [CGT] (1986). All these factors contributed to the military coup that deposed President João Goulart in March 1964 (Marras, 2000).

In 1964 the military installed a dictatorial government with unified organs and the workers' movement was dissolved. However, there were few cases of strikes during this period. For this reason, companies did not have any difficulties in negotiating with their employees. However, the period between 1950 and 1965 is called the technicist phase, and the American model of people management was implemented in Brazil, leveraging the HR function to the organic status of management (Marras, 2000).

In the period from 1965 to 1985, the administrator became more valued as a human resources professional, becoming, along with the economist, the most required professional to give rationality to the economic system. From 1968 to 1973 the country went through a remarkable spurt of economic growth, businesses grew and modernized. This new economic model came to be characterized by the process of income concentration. It resulted in the establishment of large companies and, consequently, came to be attributed to planning, technology and specialized professionals (Dutra, 2002).

However, from 1973 onwards, the country's economic situation no longer allowed for much optimism on the part of companies. Then came the oil shocks; inflation levels have risen again; Labor became scarcer in the large industrial centers and the labor movement, stifled for a whole decade, manifested itself again. This scenario has come to require companies to take more concrete actions in relation to the management of their resources, both material and financial, as well as human. As a consequence, many companies began to pay greater attention to certain areas of human resources that had been little considered until then, such as: training and development of personnel, positions, salaries and benefits (Dutra, 2002).

The 1980s, however, were marked by economic recession and inflation. Unemployment levels have risen significantly and workers have generally earned lower wages. In addition to the changes resulting from economic factors, the human resources area was also greatly affected in this decade by new management theories and techniques aimed at reducing personnel costs, processes and other managerial expenses (Dutra, 2002).

Marras (2000) describes the period between 1965 and 1985 as an administrative (or syndicalist) phase, which created a historical milestone in the relations between capital and labor, insofar as a true revolution was moved by the workers' rank and file and implemented by the trade union movements, calling it a new unionism. The phase, registered a significant change in

denomination and responsibility, until now manager of industrial relations. The position came to be called human resources manager, so this change was to transfer the emphasis on bureaucratic and purely operational procedures to more humanistic responsibilities, focused on individuals and their relations (with unions and societies) (Marras, 2000).

In the 1980s, professionals began to be more challenged, requiring new skills, such as negotiation, as well as greater knowledge regarding management theories and techniques. Some optimism began around the 1990s, with the proposals put forward by then-President Collor. However, his proposals did not succeed and unemployment increased and wages fell considerably (Gil, 1994).

Bertelli (2004), following this evolution and transformation of society and management models, has also evolved people management." The current HRA tends to accelerate its movement of change, adapting to political, economic, social and technological transformations, needing to adapt faster and faster to qualify and be able to manage employees in organizations. Therefore, from 1985 onwards, a new phase in people management began, the theme of which will be addressed in the sequence of the work.

PEOPLE MANAGEMENT FROM 1985 TO THE PRESENT DAY

From 1985 onwards, the people management process moved to a strategic phase, marked by the introduction of the first strategic planning programs, linked to the central strategic planning of the organizations. It is at this stage that the first long-term concerns on the part of the companies' boards with their workers were registered. As a result, a new organizational leverage of the position of human resources manager began, which, from a managerial position, at the third level, at a tactical level, began to be recognized as a directorship, at a strategic level in organizations (Viscaino and Estork, 2004).

From the 1990s onwards, with Fernando Collor de Melo as President of the Republic of Brazil, there were profound changes in the national and international scenarios with globalization and capitalism. Then, there was a need to search for new management paradigms, where it was sought to understand the company and people as managers and employees, respectively, as well as to understand the new concept of people management (Albuquerque, 1988).

On the other hand, the most significant event of this decade, related to technological development in the field of information, was the globalization itself established by the dominant and excluding markets. The economic recession has also significantly affected the human resources area of companies. As a result of layoffs and the decrease in the flow of hiring, as well as the outsourcing of many activities, companies began to require leaner personnel departments.

On the other hand, with the development of Informatics, some activities in this sector, especially related to the recruitment and selection of personnel, have become more simplified.



However, due to all these difficulties, many companies innovated in terms of human resources, as innovation became one of the most important dogmas of the new administrative tendencies and a great differential with regard to competitive strategy (Albuquerque, 1988).

From this new structure (the new structural context), managers began to assume new responsibilities and, in order to fulfill them, they needed to learn new conceptual and theoretical skills, in addition to developing human skills to deal with their work teams.

As seen in the various phases of people management within the scope of private and social organizations already mentioned above, environmental issues, healthy quality of life and well-being, were not an essential concern of companies regarding people management. However, there is an urgent need to establish a debate about a contemporary vision of the company, which is to include environmental issues in the process of people management, through environmental education aimed at the manager and the entire chain of people that involves civil organizations, a subject that will be discussed below.

ENVIRONMENTAL EDUCATION: A CONTEMPORARY APPROACH TO PEOPLE MANAGEMENT

People management in organizations has been studied and discussed nowadays. Changes that have been occurring with regard to people management under the organizational context. In this topic, the theme presents an approach focused on environmental education in the training of people managers, as a paradigm of contemporaneity and humanistic business and social development.

Such changes, in turn, stimulate the questioning of paradigms, provoking in managers a state of openness to (re)discuss, (re)see and (re)create a new way of thinking and acting in relation to people management. In the 1990s, both the impact on the alignment of human resources (HR) processes in the implementation of the organizational strategy and the positive aspects brought by narrowing and compatibility began to be considered. In this way, HR, as a strategic partner, went through the conceptions of the perspective of personnel, compensation, alignment and high performance.

However, in recent decades, human resource management (HRM) has been changing its focus in order to align with the business strategy. Soviensi and Stigar (2008) observed that "people management is characterized by the participation, training, involvement, and development of an organization's most precious asset, human capital, which is nothing more than the people who compose it."

The concern with the human dimension and the valorization of people has been increasingly intensified and has acquired strategic relevance in the business environment. In this panorama of transformations, Tachizawa; Ferreira and Fortuna (2004) in the era of the digital economy, internet

and e-commerce, the relationship between the organization (suppliers and customers), people's behavior, intellectual capital management, competence management and knowledge management, represent new concepts that have transformed the traditional human resources management.

People management needs to be prepared to face a series of transitions, such as: from operational to strategic action; from the administrative to the advisory nature; from reactive to preventive; from policing to partnership; from cultural preservation to cultural change; from the hierarchical structure to the lean structure; from focus on activity to focus on solutions; from internal to consumer-focused; from the emphasis on function to the emphasis on the business; from short-term to long-term planning; from the emphasis on procedures to the emphasis on results; from isolation to benchmarking; from the operational routine to consulting; from the pursuit of internal efficiency to organizational effectiveness; from personnel administration to talent management and from the emphasis on control to the emphasis on freedom (Tachizawa et al., 2004).

In view of this, a new profile is outlined for these professionals, who need to be able to serve internal and external users, remain open to new administrative technologies, and provide companies and employees with concern with the quality of life in the work environment (Araújo, 2006).

Nowadays, the people manager needs to be concerned with knowing the organization's business and its clientele, with a view to developing strategies that enable the personal growth of its employees while ensuring the achievement of goals and achievement of the company's mission and the satisfaction of its customers (Chiavenato, 2014).

The organization, by recognizing people as partners, invests in their training and improvement, thus expecting better productivity, greater performance and, consequently, financial return combined with environmental preservation. However, the people manager must maintain an ethical and environmentally responsible behavior, consistent with the principles that guide all the activity of organizations, based on international and Brazilian standards of environmental preservation and quality of life.

To this end, the contemporary bias in people management is the training in environmental issues for the manager and the entire chain of human resources and consumers related to the organization.

According to Tachizawa et al. (2004), capturing and understanding the main trends that are emerging for the coming years is vital for people management to manage everyday problems. A people management detached from social reality and environmental issues can stumble over more immediate obstacles and compromise the survival of the organization.

According to Rodrigues (2022), when the functionality of the organization does not consider the environmental balance and the precepts of the principle of sustainable development, it compromises its functionality in what the environmental standards establish.



In the view of Toffler (1995), the people management sector has a great responsibility in the training of the professional that the organization wants, aiming at the development and growth of both the organization and the employee. To this end, people management should seek to make employees aware that their actions must be supported by the following principles:

1. Responsible and ethical development of its activities; II. Ability to act based on the principles of entrepreneurial management; III. Ability to perform tasks that incorporate technological innovations; IV. Ability to network; V. Ability to act flexibly. VI. Knowledge of the mission and institutional objectives of the organizations in which they operate; VII. Master the content of the organization's business area; VIII. Ability to act as an internal consultant to the organizations in which they work.

Following the principles mentioned above, Rodrigues (2022) understands that every Public and Private Law company has a constitutional obligation to develop environmental education policies, both internally with its human resources staff, and externally with its employees, such as its consumers. Thus, managers are compelled to construct environmental knowledge as a basic principle for their professional training in contemporary times.

Thus, to develop these actions, the manager must also have a systemic vision, teamwork, good interpersonal relationships, planning, entrepreneurial capacity, adaptability and flexibility, quality culture, creativity and communication, leadership, initiative and dynamism according to the reality of the company and the society where it is inserted. The development of these skills and competencies is important for the manager and the employee, which constitute elements of people's personalities applied to their professional praxis (Toffler, 1995), so that, within the scope of the company, the factors representing the barbarism suffered by workers in past times or management policies that prevent human emancipation are not reproduced.

Emancipating, according to Adorno (1995a), means that education can never be fixed in pre-established models, that is, in standardized and uniform teaching models. This modeling, according to him, formalizes education, which prevents it from developing, and therefore from becoming critical of itself. When the school is not open to reflect critically, it behaves like factories, placing itself at a distance from the student and treating them as if they were "objects". This "model" of education based on formality prevents the student (administrator) from emancipating himself autonomously.

Autonomy refers here to the conditions of relating to people in an egalitarian way in relation to subject to subject free of coercion, presupposing self-expression and recognition of the individual, as well as an identity based on a critical posture towards the world, others and oneself (Almeida, 2005).

In the present context, it is important to emphasize that the people manager of an organization has in his training baggage, a series of emancipatory knowledge and attitudes, which go beyond the

formality established by a closed and authoritarian management model, and that he does not consider environmental issues as factors that promote the integral and human development of the same.

Rodrigues (2022) points out that environmental education needs to be incorporated into the training of people managers. Policies for the preservation and maintenance of environmental balance are educational factors that lead managers, owners and consumers to build a critical view of the development of the company, society and conscious consumption with a healthy quality of life. Thus, environmental education, in this work, comes to be seen as a contemporary paradigm of the business and social development of a new ethic, the so-called environmental ethics.

As already mentioned, Adorno explains that education needs to be directed towards human emancipation. Therefore, it should be noted that, in the process of training the manager of organizations, environmental education is considered a contemporary paradigm, which will reflect in the scope of the company, consumers and society itself, as being necessary assumptions for business and social development from a sustainability perspective.

By opening up to the debate of ideas of development for emancipation, the school and society (which includes the administrator) must be providing both itself and society itself with the exercise of autonomy and human emancipation. In the words of B. Pucci (1995, p. 51), education and reflection on evolution have a primary function in the formation of a society that "is guided more by reason, in the struggle for autonomy and emancipation."

Environmental education as human emancipation, in one of its principles, mentions the construction of environmental knowledge. "Environmental knowledge seeks the recovery of meaning; but this does not appear as an escape from the symbolic order outside the field of social interest and production as an emancipation of the cultural-symbol outside the socio-historical order" (Leff, 2011, pp. 149-150).

According to the same author (2011, p. 237), environmental education will provide the necessary conditions for, "[a]n new ethics that orient social values and behaviors towards the objectives of ecological sustainability and social equity. A new conception of the world as a complex system leading to a reformulation of knowledge and a constitution of knowledge." "Environmental education is understood, therefore, as the formation of a conscience based on a new ethic that must resist exploitation, waste and the exaltation of productivity conceived as an end in itself" (Leff, 2011, p. 210).

It is important to mention that, "[...] a society strictly centered on a system of large-scale production and productivity of disposable, polluting and short-lived products, of a marketing system that at all times determines consumption needs and of a consumer eager to acquire goods [...]" (Rodrigues, 2017, p. 77), should never be part of the performance of the human resources manager of a civil organization, when it comes to a contemporary management paradigm.

Thus, environmental education does not intend to attribute a behavioral aspect to the individuals who make up the human resources of a civil organization, nor to its consumers. But, to provide the necessary conditions for the formation-emanicipation of a contemporary concept of entrepreneurs, managers of people and consumers in relation to development allied to environmental balance.

Environmental education became mandatory at the international level through the Stockholm Declaration on the Human Environment of 1972. On the other hand, the 1977 Tbilisi Intergovernmental Conference, which established the general principles guiding the policies of an education focused on the environment, deals exclusively with the principles, objectives and purposes of environmental education. The document establishes the three purposes, which are mentioned by Dias (2014, pp. 109-110):

Promote understanding of the existence and importance of economic, social, political and ecological interdependence. To provide all people with the knowledge, the sense of values, the interest and the attitudes necessary to protect and improve the environment. To induce new forms of conduct in individuals and in society with respect to the environment.

Thus, the principles are vectors to guide the regulation of environmental education policies in the internal norms of the signatory States of the 1977 Conference, as well as those that may not have been part of the Assembly of States that approved the document. They are an integral part of the training process to be adopted by the school at all its levels of education, as well as by society in general through its civil organizations.

The 1977 Conference mentions the principles to be considered by States regarding the standardization of their environmental education policies. Dias (2014, pp. 112 to 124) mentions all the principles. In this context, two important principles are highlighted to be considered in the integral formation of the people manager, namely: "1) consider the environment in its totality, that is, in its natural aspects, and created by man (political, social, economic, scientific-technological, historical-cultural, moral and aesthetic); 2) To build a continuous and permanent process, through all phases of formal and non-formal education."

With regard to Brazil, the Federal Constitution of 1988 (Brasil, 1988) in its article 225 § 1, VI establishes that environmental education is a right of all individuals, and at the same time, a duty of public and private schools, as well as of civil organizations in general, to develop educational policies in favor of the entire staff and their clients. So, it's about formal and non-formal environmental education.

In turn, Federal Law No. 9,795 of 1999 regulated article 225 of the Federal Constitution regarding the obligation of the school at all its levels throughout the Brazilian Federation, plans and executes environmental education policies for its students, such as training schools for people



managers, so that environmental issues are considered during the exercise of their activities within the scope of organizations private or social in nature. Otherwise, the manager has the legal obligation to plan, develop and evaluate environmental policies within the framework of the staff under his responsibility, as well as within the scope of consumers or associates of the civil organization.

This Law mentions in its article 5, combined with article 7, that environmental education has as its fundamental objective to encourage individual and collective participation through formal and non-formal education (Rodrigues, 2017) in school education policies at all levels of Brazilian schools, as well as non-formal education in the context of civil organizations. In order for the non-formal to take place in the form of regulatory legislation, the people manager is compelled to undergo the general process of training, in order to meet the necessary conditions for the execution of environmental policies in his civil organization.

Thus, environmental education does not provide for the formation of an individual ready and endowed with a wealth of knowledge that leads to the production of profit at the expense of environmental pollution. The legislation does not establish models, but paths for defining, implementing and evaluating participatory educational policies with all actors in a place at a given time.

FINAL THOUGHTS

People management has gone through a long trajectory, from scientific management at the beginning of the last century, with an emphasis on labor and legal relations for human resources management, to the current nomenclature: people management. Thus, human resources management in Brazil has evolved according to the political, economic and social facts of each era, and the strategic management of people has been consolidated, mainly as a result of the development of organizations and the higher level of complexity of the labor market.

It is worth mentioning that the people manager is an administrator with the task of managing and improving processes, aggregating, applying, rewarding, developing, maintaining and monitoring people. Never consider people as simple resources of companies, such as a movable asset or a piece of inventory.

However, in order to act effectively, it needs to develop new attitudes and postures. Among these new attitudes is the willingness to consider employees as partners and not as mere resources that the organization can dispose of. It is necessary that employees are guided by the manager to reveal a posture that boosts the organization in a positive way, that is, that it presents practical results.

It can be said that education emancipates the administrator, which in turn should increase business performance, favoring people management. The training of the administrator will be through

the development of a critical and reflective vision, where people are seen as intellectual capital and not just as mechanical resources that produce profits without measure.

Thus, environmental education is considered a contemporary approach in the training of people managers in organizations. The process of formation-emancipation of the manager of people, people and consumers must be permanent and in accordance with the new environmental demands, with new rights and obligations that arise, so that society can develop in a sustainable and lasting way from its place. According to Rodrigues (2022, p. 88) "[...] The role of the school and of organizations in general needs to be focused on the production of environmental knowledge, which is necessary for popular education from the place. It will no longer be that of constructing a finished individual through a baggage of knowledge [...]" aimed at the commodification of nature, but the construction of environmental knowledge based on the interests of the place, where the school and the organizations are inserted.

Formal and non-formal environmental education according to Law 9.795 of 1999, that is, that which should take place in the context of schools and that in the scope of private and social civil organizations, constitutes a contemporary factor for the training-emancipation of the people manager, because until the present moment it has not been an issue taken seriously. The issues of environment, health and quality of life for all, as mentioned in article 225 of the Federal Constitution of 1988, are issues that the people manager was unaware of during the process of school education and in the various forms of qualifications offered by organizations. There was an understanding that such matters hindered the company's performance in terms of production and accumulation of profits and economic growth.

The school, at all its levels of education, is committed to developing environmental education policies in its process of individual formation. Thus, students of university courses, especially those focused on the training of managers, have the same obligation, according to the legislation mentioned above. In the same way, the qualification in environmental issues will take place informally in private and social organizations, which provide opportunities for the promotion of environmental knowledge, through the performance of its manager.

The manager of organizations is challenged to act in the development of environmental knowledge, developing environmental education policies aimed at the training of people, such as owners, associates, directors, consumers and in the production line, in order to promote to the entire chain of people of the company, the awareness of the need for environmental balance. as a contemporary paradigm aimed at promoting human, business and social development.

Therefore, it is understood that the research will bring important contributions to society in general and to the school at all levels of education in Brazil, especially that focused on the training of



managers of organizations. However, it is understood that the purpose of the theme is not to end the debate, but to create the basis for the deepening of the subject in future works.


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Maturity analysis of small companies AEC for the implementation of management by simultaneous engineering

 <https://doi.org/10.56238/sevned2024.010-031>

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ABSTRACT

The work presents an analysis of maturity in architecture, engineering and construction companies, in relation to the objectives of Simultaneous Engineering. The main objective was to understand the impact on the maturity of small companies in the architecture, engineering and construction industry when using collaborative computational tools in the implementation of Simultaneous Engineering concepts. To develop the research, bibliometric analyses were made to characterize the main authors involved with the themes of Simultaneous Engineering. These authors formed the theoretical basis for the development of the interview protocol in multiple case studies. After the elaboration of the research protocol and its improvement based on a pilot study, interviews were conducted with representatives of nine companies in the sector and from their answers maturity analyses were developed. As a result of the analyses, the following conclusions were obtained: small companies need greater self-knowledge to balance their business maturity; Architecture firms have a different maturity profile from engineering and construction firms, and architecture firms are positively influenced by their tools, engineering and construction firms still have low levels of maturity in these relationships; The tools currently used by companies do not help in the integration of business and intercompany processes, which hinders the implementation of Simultaneous Engineering concepts.

Keywords: Simultaneous Engineering, AEC Industry, Colaborarious Computer Systems.

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INTRODUCTION

Planning in civil construction is a systemic process where the existing concepts for the determination of this structure for works and the constraints between activities are not addressed such as the process of elaboration of a Project, where the existing concepts that structure the calculation memorials and the criteria of constraints in the development of the design are strictly followed. Therefore, there is a need for studies that deal with the planning process (CHIBINSKI, 2012).

Civil construction, in its current structure, uses a sequential practice for the development of activities within its production cycle. This traditional practice results in the evident separation between the design phase and its respective execution. This segmentation has resulted in non-conformities, such as: schedule delays, budget failures and low construction quality (SILVA, 2013).

According to Chen (2008), because of the intensity and diversity of information, efficiency in information management is crucial for the construction industry. Therefore, tools and technologies must be increasingly applied with a focus on improving the quality of data management.

Concurrent Engineering (CE) incorporates two key principles: integration and concurrency. Integration is the relationship of processes and the content of information and knowledge, between and within stages of the project, and all the technologies and tools used in the development of the project. Simultaneity is determined by the way tasks are planned and the interaction between the different actors (people and tools) and the product development process (ANUMBA et al., 2007).

What is the impact on the technological maturity of small companies in the architecture, engineering and construction industry when using collaborative computational tools in the implementation of Simultaneous Engineering concepts?

The delimitation of the research comprises a multiple case study regarding the technological maturity of small companies in the architecture, engineering and construction industry, which operate in the city of Curitiba, in the State of Paraná.

The objective of this article is to present the results of the maturity analysis of the small companies interviewed, thus initiating a set of theoretical reference articles for the application of business maturity studies that allow the development of the management methods of companies for the future of the construction industry, based on collaboration between all those involved in the supply chain.

BIBLIOMETRIC ANALYSIS

SCOPUS ANALYSIS

According to Gil (2016), the privileged place for the location of bibliographic sources has been the library. However, due to the wide dissemination of bibliographic materials in electronic format, research through databases and search systems is of great importance.

Scopus is the largest database of citations and abstracts of peer-reviewed literature: scientific journals, books, and conferences. Presenting a comprehensive overview of the world's research output in the fields of science, technology, medicine, social sciences, arts, and humanities, as well as presenting intelligent tools for tracking, analyzing, and visualizing research. (ELSEVIER, 2017)

To use the Scopus search system, it is important to define the keywords that actually cover the search. Therefore, initially, a spreadsheet is prepared with all the potential words that refer to the work and then a selection is made of those that will really support the research. The table of keywords for the research related to this study is presented in Chart 1.

TABLE 1 Keywords used in the Scopus survey

Referenciais Teóricos	Em inglês	Palavras similares ou sinônimas
Engenharia Simultânea	<i>Concurrent Engineering</i>	<i>Collaborative Engineering</i>
Sistemas Colaborativos Computacionais	<i>Computer Suported Collaborative Work</i>	<i>CSCW</i>
Engenharia de Requisitos	<i>Requirements Engineering</i>	<i>RE</i>
Ambientes Computacionais Integrados na Construção	<i>Computer Integrated Environments in Construction</i>	<i>CIE</i>
Indústria da Construção Civil	<i>Construction Industry</i>	<i>AEC and Real Estate</i>
Gerenciamento, Planejamento e Controle de Obras	<i>Construction Management</i>	<i>Building management and construction planning</i>

ANÁLISE BIBEXCEL PAJEK

The 153 authors who have publications related to the research theme form a citation network, which is represented in Figure 1 due to the number of citations per author.

FIGURE 1 Author Clusters and Their Interaction Networks

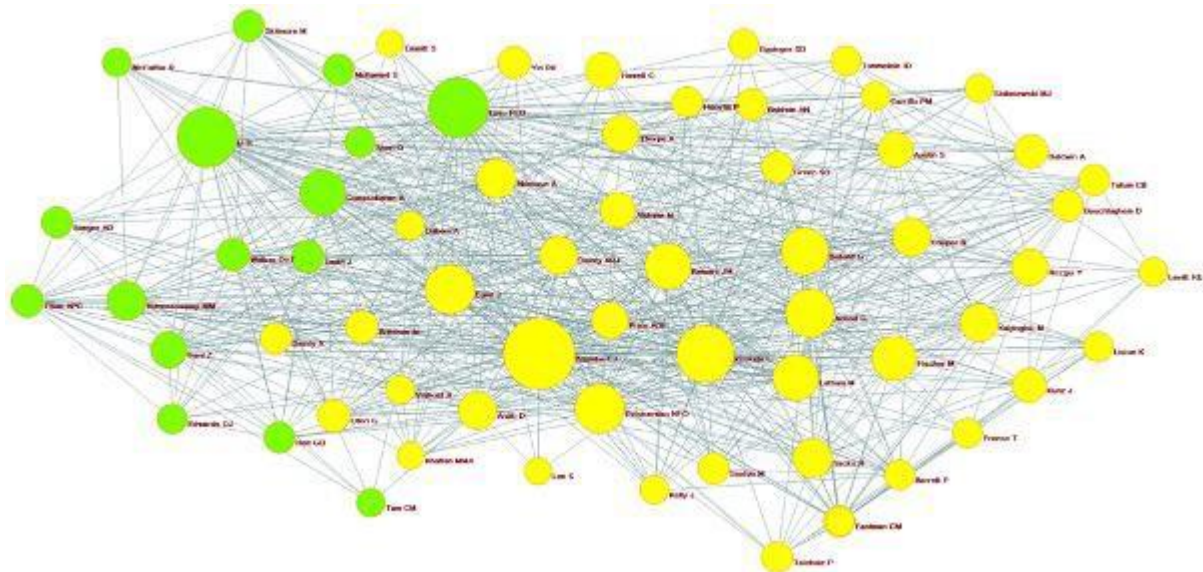


Figure 1 shows 2 groups (or clusters) of authors that have a higher degree of co-citations, i.e., authors who, when producing their work, tend to cite other authors more often than from the other

groups.

The yellow group is made up of researchers who are related, mainly by the strand produced by the author Anumba C.J., whose works are related to Simultaneous Engineering, but also to the use of computerized systems and techniques that enable the integration of those involved, as well as the fulfillment of customer requirements.

The other cluster of researchers, the green group, is directly related to the research authored by Love, P.E.D., whose work has the strand of research production in relation to the reduction of rework on construction sites due to the principles of Simultaneous Engineering.

CONCURRENT ENGINEERING

According to Winner et al. (1988), Simultaneous Engineering is a systematic approach to the integrated and concurrent design of products and their related processes, including production and support. This approach aims to have designers, from the outset, consider all elements of the product life cycle from conception to disposal, including quality, cost, timeline, and user requirements.

For Khalfan (2001), there is an urgent need to improve the construction supply chain, and for this it is necessary to understand the entire life cycle of the project from its beginning, taking into account all the requirements raised for the operation and maintenance of the structure.

According to Anumba et al (2007), another justification for adopting Simultaneous Engineering in construction is the fact that its objectives and strategies (principles) are directly related to the problems encountered in the construction industry, as shown in Chart 2.

TABLE 2 The reasons for adopting Simultaneous Engineering in Construction

Necessidade de Mudança na Construção	Objetivos e Princípios da ES
A necessidade de mudança na construção vem à tona no que diz respeito à falta de competitividade natural dessa indústria, e também na inabilidade de satisfazer seus clientes em relação aos custos, tempo e qualidade.	Os objetivos e princípios da ES incluem: satisfação do cliente, competitividade para o negócio, redução no tempo e custos de desenvolvimento do produto, melhoria na qualidade e valor.
A integração dos processos da construção são vistos como uma das mais importantes estratégias para aprimorar a fragmentação tão notória na indústria da construção.	O uso da ES facilita a integração dos membros das equipes de desenvolvimento e produção, dessa maneira aprimorando os processos de desenvolvimento dos produtos.
Estratégias emergentes para aprimorar os processos da indústria da construção são inadequados; elas apenas levam em conta um aspecto do problema, resultando em "ilhas de automação", como é o caso das estratégias da construção relacionadas à sistemas computacionais integrados	Como é uma fusão de outras metodologias, ferramentas e técnicas, a ES prevê não apenas um framework para a integração dos processos da construção, mas também várias outras ferramentas e tecnologias usadas no processo.

Source: Anumba et al, 2007, pp 6 (translated by the author)

In Love (1998), it is possible to understand that in order to be successful in the implementation of HE in any organization, the objectives to be achieved are:

- a) Improve understanding of customer and end-user requirements;

- b) Improve collaboration between project participants;
- c) Improve the effectiveness of teams and projects;
- d) Reduce rework and variations (in redesign and non-conformities);
- e) Reduce project time and cost.

For Lakka et al. (2001), there are several tools that can assist in the implementation of Simultaneous Engineering in companies, each with its advantages and disadvantages. Therefore, it is necessary to understand and evaluate a tool that achieves the objectives of the research and, consequently, helps companies to identify their technological maturity in relation to Simultaneous Engineering.

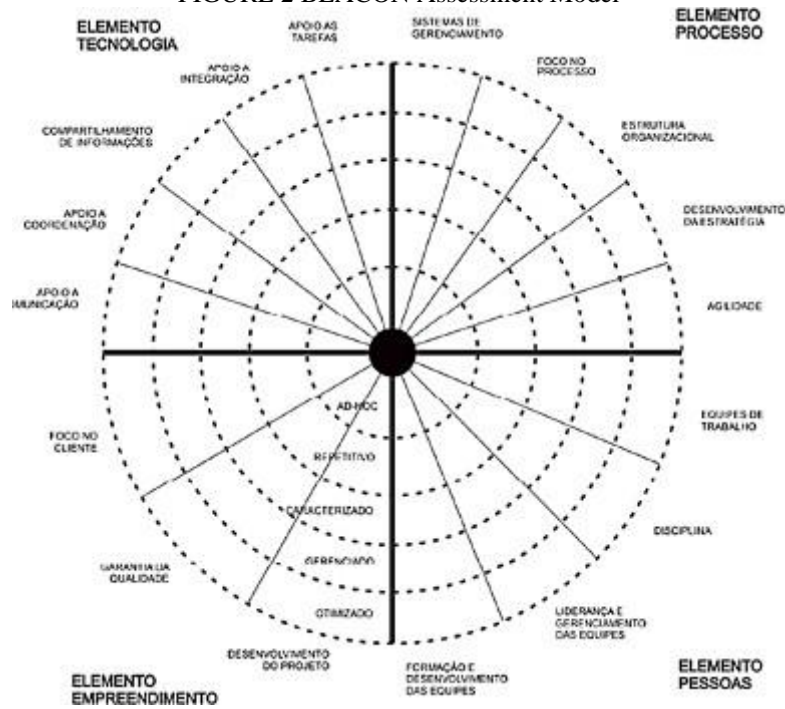
According to Khalfan (2001), the process of implementing the concepts of Simultaneous Engineering should go through four stages. The first is part of the company's knowledge of the benefits of CE. The second is related to the analysis of the measures of the company's potential, in this case the assessment of business maturity. The other two stages are application and then process improvement.

Among the various models used for validation, the RACE (Readiness Assessment in Concurrent Engineering), which according to Pretti (2013), is an evaluation model created by WVU's Concurrent Engineering Research Center and aims to be a more general tool, which can be used for various types of industries, underpins the analysis structure of another model, the BEACON (Benchmarking and Readness Assessment for Concurrent Engineering).

BEACON is divided into four key elements: processes, people, project and technology, which in turn are divided into critical factors, with a series of questions for each factor. (PRETTI, 2013).

In Khalfman (2007) it is possible to understand that the critical factors of these four elements, in order to have their level of maturity assessed, must be answered in the following context, Figure 2.

FIGURE 2 BEACON Assessment Model



Source: Pretti, 2013

However, Pretti (2013) felt the need to adapt the system to the characteristics of the Brazilian construction industry, since the BEACON proved to be very complex with regard to management questions, which ended up confusing the interviewees.

RESEARCH METHOD

It is a Multiple Case Study because, according to Yin (2010), this type of study is used to understand complex group, organizational and social phenomena, allowing the investigator to retain holistic characteristics of real behavioral events.

According to Yin (2010), the protocol is more than a questionnaire or an instrument. First of all, the protocol contains the instrument, but it also contains the procedures and general rules to be followed in the use of the protocol.

DATA COLLECTION INSTRUMENT

Data collection for the research will be done from interviews with engineers and architects who work in companies of the size relevant to the research. With this data, the level of maturity in relation to the systems will be structured, as well as the flow of project development and execution.

With the maturity analyzed, it was possible to understand how the main computer systems used by companies are related to the activities practiced by them. This relationship will make it possible to evaluate the impact of the computational tools of the three types of companies studied (architecture, engineering and construction).

In the first stage of the questionnaire, the interviewed companies are characterized, with questions related to the time of experience of the professional and the company, field of activity and an initial analysis of the importance of simultaneous engineering objectives in the company.

With the collection of responses from the interviewees concluded, the response process begins according to the maturity of the company in relation to the objectives of Simultaneous Engineering. This stage consists of answering 76 questions. These issues are related to the mapping of the maturity of processes, projects, people and technology of companies and crossed with the objectives of Simultaneous Engineering.

BUSINESS MATURITY ANALYSIS

In Khalfan (2001), it is stated that the BEACON maturity analysis model is based on the RACE maturity analysis, which is a type of analysis that validates software development. BEACON was studied and developed to do this same analysis for the construction industry with a focus on Simultaneous Engineering. From certain levels of maturity, Table 3.

According to Khalfan (2001), there are 5 types of positioning of a company in this industry, which can range from the lowest level in which the company does not have control over any of its processes, through the company that is prepared to introduce the concepts, to the one in which Simultaneous Engineering is already applied and can be improved.

TABLE 3 Maturity Levels

Nível de Maturidade	Pontuação Questionário	Descrição da Situação da Empresa	Escala
Ad-hoc	Até 20%	Este nível é caracterizado por processos e controles não definidos, e por equipes confusas e desorientadas que não entendem suas funções nem como operar eficientemente. Interações informais com o cliente são observadas, o gerenciamento do desenvolvimento dos processos dos projetos não são aplicados consistentemente nos empreendimentos, e ferramentas e tecnologias modernas não são aplicadas consistentemente.	1
Repetição	Entre 20% e 40%	Métodos e práticas padronizados são utilizados para monitorar o desenvolvimento dos processos dos projetos, mudança de requisitos, estimativa de custos etc. O processo é repetitivo. Existem barreiras na comunicação com a equipe de desenvolvimento dos projetos. Interação com o cliente é estruturada, mas é apenas no começo do projeto. Pouquíssimo uso de computador ou ferramentas computacionais.	2
Caracterizado	Entre 40% e 60%	O processo de desenvolvimento dos projetos é bem caracterizado e relativamente bem compreendido. Uma série de melhorias organizacionais e de processos são implementadas. Equipes podem brigar e vir a terminar em razão de conflitos, porém a equipe começa a respeitar diferenças individuais. A maioria dos envolvidos tem noção dos requisitos dos clientes, porém o cliente não faz parte do processo. Uso moderado de tecnologia que aprimora a eficiência do grupo.	3
Gerenciado	Entre 60% e 80%	O processo de desenvolvimento dos projetos não só é caracterizada e entendida, como também quantificada, medida, e razoavelmente bem controlada. Ferramentas são utilizadas no controle e gerenciamento dos processos. O trabalho é realizado pela equipe de desenvolvimento de projetos e conflitos são pontuais. O cliente é envolvido em todo o processo. Utilização apropriada da tecnologia disponível e ferramentas computacionais.	4
Otimizado	Acima de 80%	Um alto nível de controle é utilizado para o desenvolvimento dos processos do projeto e existe um foco maior em aprimorar o desenvolvimento das operações de maneira significativa e contínua. A performance da equipe é regularmente medida, e a medição da performance é continuamente validada. O cliente faz parte da equipe de desenvolvimento do projeto desde o início e todas as decisões do projeto são fundamentadas nas necessidades dos clientes. Utilização ideal de tecnologia pela equipe de desenvolvimento e também a existência de grupo de trabalho focado em tecnologia.	5

Source: Translated and adapted from Khalfan, 2001

PRESENTATION OF RESULTS

CHARACTERIZATION OF COMPANIES

The companies surveyed should operate in Curitiba, according to section 1.2 of the survey. Chart 4 shows the place of headquarters, the cities in which it has services performed and also the area of operation. Table 16 summarizes the characteristics of the companies according to the items location, area of operation and construction models executed, which should be met so that they could be part of the body of data.

TABLE 4 Situation of enterprises

Empresa	Sede	Local	Unifamiliar	Multifamiliar	Comercial	Industrial	Reformas	Outros
1	SÃO JOSÉ DOS PINHAIS	CTBA, MAFRA, SÃO JOSÉ DOS PINHAIS E FAZENDA RIO GRANDE	X	X			X	
2	CURITIBA	PARANÁ E SANTA CATARINA	X	X	X	X		
3	CURITIBA	CURITIBA	X	X	X	X	X	LAUDOS
4	SÃO JOSÉ DOS PINHAIS	CURITIBA, REGIÃO METROPOLITANA E SANTA CATARINA	X	X	X		X	
5	CURITIBA	CURITIBA, VIDEIRA E RONDONÓPOLIS	X		X			INTERIORES
6	CURITIBA	CURITIBA E REGIÃO METROPOLITANA	X	X	X		X	
7	CURITIBA	CURITIBA E REGIÃO METROPOLITANA	X		X		X	
8	CURITIBA	PARANÁ E MINAS GERAIS						ORÇAMENTOS
9	CURITIBA	CURITIBA E SÃO JOSÉ DOS PINHAIS		X				

Source: The Author (2017)

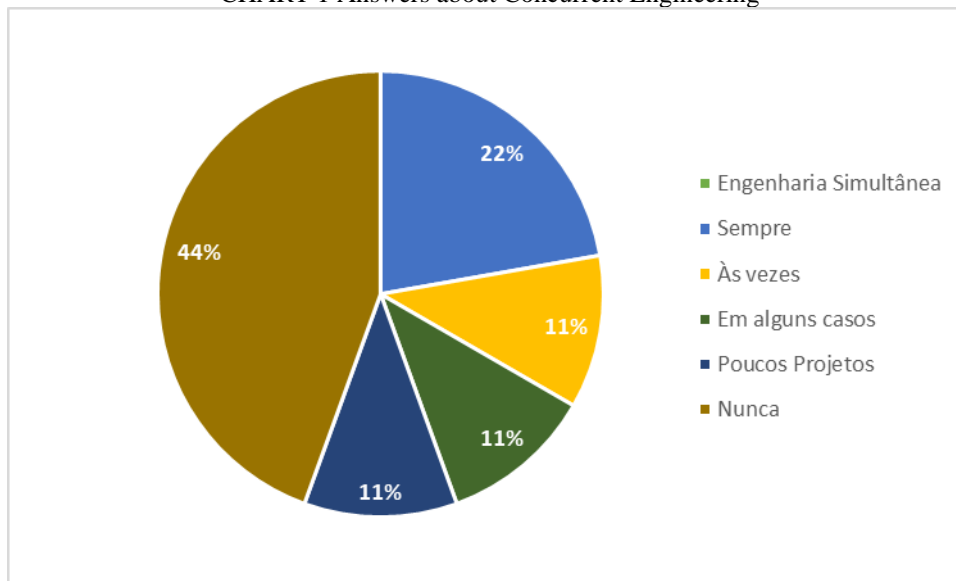
BUSINESS MATURITY ANALYSIS

Continuing with the interview script, the next step was directed to the 77 questions about the company's maturity based on the five main objectives of Simultaneous Engineering, distributed within the four items in the BEACON analysis, already described in Chapter 4 of this research.

The first question was directed to the interviewees' knowledge about Simultaneous Engineering. After a brief explanation on the subject, the interviewee should answer whether he acts in accordance with the principles of Simultaneous Engineering, or if the projects do not have this focus. It can vary within the Likert scale, from 1 to 5, being 5 always and 1 never.

Of the nine companies interviewed, four answered that they had never worked within these principles, and that the fulfillment of these requirements, if they happened, would be purely coincidental. Two companies responded that they believed they would always work with these principles, as shown in Chart 1.

CHART 1 Answers about Concurrent Engineering



Source: The Author (2017)

This first approach serves as an analysis to understand how integrated and collaborative small businesses are, even without formal knowledge of the techniques and tools. The answers to the other questions should prove or not this distancing of companies in relation to the concepts of Simultaneous Engineering.

Chart 5 shows that of the 9 companies that were interviewed, only one had a characterized performance. The other respondents have a maturity at the managed level.

QAUDRO 5 Maturity Analysis of the Interviewed Companies

	Clientes	Colaboração	Eficiência	Variações	Custos	MAT. ES	Processos	Pessoas	Projetos	Tecnologia	BEACON	GERAL
1	73,33%	81,33%	69,33%	73,33%	77,33%	74,93%	76,00%	66,67%	89,33%	70,40%	75,60%	75,27% Gerenciado
2	65,33%	78,67%	58,67%	41,33%	73,33%	63,47%	65,00%	60,00%	80,00%	54,40%	64,85%	64,16% Gerenciado
3	70,67%	76,00%	77,33%	24,00%	88,00%	67,20%	61,00%	73,33%	69,33%	67,20%	67,72%	67,46% Gerenciado
4	74,67%	76,00%	50,67%	70,67%	88,00%	72,00%	68,00%	56,00%	70,67%	85,60%	70,07%	71,03% Gerenciado
5	56,00%	65,33%	58,67%	64,00%	69,33%	62,67%	51,00%	68,00%	64,00%	68,00%	62,75%	62,71% Gerenciado
6	76,00%	76,00%	54,67%	72,00%	92,00%	74,13%	51,00%	46,67%	92,00%	98,40%	72,02%	73,08% Gerenciado
7	57,33%	80,00%	80,00%	66,67%	70,67%	70,93%	79,00%	81,33%	78,67%	53,60%	73,15%	72,04% Gerenciado
8	76,00%	94,67%	54,67%	64,00%	89,33%	75,73%	69,00%	88,00%	77,33%	72,80%	76,78%	76,26% Gerenciado
9	52,00%	45,33%	46,67%	52,00%	56,00%	50,40%	47,00%	46,67%	77,33%	39,20%	52,55%	51,48% Caracterizado
GERAL	65,99%	75,76%	61,07%	60,23%	77,11%	68,03%	62,30%	64,93%	76,93%	69,46%	68,41%	68,22% Gerenciado

Source: The Author (2017)

The maturity analysis in relation to the objectives of simultaneous engineering indicates that the interviewed companies have a greater vocation for collaboration between teams and also with the control of costs and deadlines. On the other hand, maintaining production efficiency, aligning designers and execution teams, in addition to controlling project variations and non-conformities in the works, are items that, even at a managed level, are not the main objectives.

In order to understand the aspects that most influence each of the objectives of Simultaneous Engineering, the answers were transposed according to the aspects of BEACON analysis. In this way, it was possible to verify which element, including processes, people and technology, most affected

the maturity of companies.

Thus, the maturity results of the project item are those that most influence the maturity presented by the companies. At this point, it can be said that companies have in the development of projects their most striking characteristic and, as a result, the objectives of Simultaneous Engineering are positively benefited.

In the first part of the analysis, eight of the nine companies have at least one item that is not at the managed level, but six of the nine companies have at least one item that is at the optimized level. This means that there is still room for development and consequent balance between the various objectives.

Another analysis is related to the level of integration between the systems used, Chart 6, with the BEACON maturity levels of the companies in relation to the use of technological tools in the various activities. This relationship indicates that companies are increasingly using computational tools. However, of the companies interviewed, only one was at a level of integration of the tools that makes it possible to exploit them in the implementation of all the objectives of Simultaneous Engineering.

This analysis opens up the possibility of carrying out studies with more collaborative tools that integrate the various stages of the project development process: Incorporation, Planning, Management and Control of Works.

The last part of the maturity analysis consists of verifying whether the objectives of Concurrent Engineering are aligned with the policies of the interviewed companies. To this end, the companies, when answering the questionnaire, presented the order of priority of the same In relation to these objectives, and depending on the degree of maturity of each one, it is possible to understand if what is done and what is believed is really ready to be achieved.

TABLE 6 Objectives of Concurrent Engineering by Company

OBJETIVOS ENGENHARIA SIMULTÂNEA	Empresa 1			Empresa 2			Empresa 3			Empresa 4			Empresa 5			Empresa 6			Empresa 7			Empresa 8			Empresa 9		
	FAZ	ACREDITA	RESPOSTAS	FAZ	ACREDITA	RESPOSTAS	FAZ	ACREDITA	RESPOSTAS	FAZ	ACREDITA	RESPOSTAS	FAZ	ACREDITA	RESPOSTAS	FAZ	ACREDITA	RESPOSTAS	FAZ	ACREDITA	RESPOSTAS	FAZ	ACREDITA	RESPOSTAS	FAZ	ACREDITA	RESPOSTAS
Entender os requisitos dos clientes e usuários finais	1	1	2	5	4	3	1	1	4	1	1	3	1	2	5	1	1	3	5	1	5	2	2	3	1	1	2
Colaboração entre os participantes do projeto	4	2	1	2	5	1	2	2	3	4	4	2	2	5	2	4	4	2	4	5	1	3	4	1	3	2	5
Efetividade entre equipes e projetos	5	3	2	3	2	4	3	3	2	5	5	5	3	4	4	3	3	5	2	3	1	4	3	5	2	3	4
Reduzir retrabalho e variações dos projetos e também não conformidades na obra	2	5	5	1	3	5	4	4	5	3	3	4	4	1	3	2	2	4	3	4	3	5	1	4	4	4	2
Reduzir tempo e custo dos projetos (Global)	3	4	2	4	1	2	5	5	1	2	2	1	5	3	1	5	5	1	1	2	2	1	5	2	5	5	1

Source: The Author (2017)

The objective of understanding the requirements of customers and end users, according to



seven of the nine interviewees, is or should be the main item for the good development of projects. However, based on the answers presented, it is concluded that none of the companies has this criterion sufficiently developed, in relation to the others, to meet it as a priority.

In other words, although they understand that analyzing these requirements and understanding them is the best way to achieve good results, companies do not have, in their structure, the necessary balance to make this item the most prepared.

It is then possible to understand the reason why the client was cited as responsible for problems at all stages of project development. It is, therefore, one of the needs that any designed system must solve.

On the other hand, the objective of reducing time and costs, which can be understood as a result of the first four, was also mentioned by most companies as the lowest priority, but based on the results, it was possible to identify that companies, in fact, are more prepared for this item.

These two analyses are indications that the companies, through their representatives, have a vision of what should be done, but their formation and the conditions of the market, they encourage them to prepare for objectives that could be a consequence of a better structuring of their processes. This item had the worst results among the companies interviewed.

In addition, the combination of technology with integration, collaboration and simultaneity between those involved in the various activities is one of the aspects to obtain better results in the enterprises.

The results presented by the interviewed companies exceeded expectations, since the companies are small, most of them without the implementation of process control systems, they had their results converging to the management of their activities, some of them almost at an optimized level.

This result may indicate that small companies have collaboration as their main market strategy, since the integration of diversified companies produces a mix of services that reaches various types of enterprises, from renovations to the construction of more elaborate structures.

CONCLUSIONS AND RECOMMENDATIONS

The research was based on an interview protocol that was validated by the pilot case study. In the same study, it can be concluded that some of the questions needed adjustments to obtain results under conditions of analysis in the other interviews.

The first result reveals that most small companies do not feel the need to obtain quality certifications in relation to their processes. This can be understood, according to the authors [Ugwu et al. (2000); Whyte et al. (2002); and Aouad (2010)] due to the lack of long-term planning.

According to these authors, due to the possible fluctuations, these companies do not usually make medium and long-term investments and, therefore, end up using only their own knowledge bases for the development of the companies.

The result of this lack of long-term planning is evidenced in the use of informal processes within companies and, therefore, a lack of self-knowledge regarding their strengths and weaknesses, according to analyses of the characteristics of companies.

This great variation in maturity reflects difficulties in the implementation of Simultaneous Engineering concepts, since companies must initially balance their difficulties to then implement new management concepts.

Another factor that prevents the use of Concurrent Engineering in these companies is the problems with customers. Since this is the main objective of HE, it could not be among the main causes of problems in projects, from their conception to their completion. Admitting that the processes used by companies are not yet sufficiently capable of involving and delivering the needs of customers in the processes is the first step to using the methodology.

Another factor that was also raised by several companies is the relationship with the approvals of projects in public agencies, whether due to bureaucracy or the frequent changes that are made in the legislation, companies continue to face the rules and have difficulties in the development of their projects.

This issue, unlike the survey of customer requirements, is not yet supported by computational tools (except protocol monitoring tools) that provide a more collaborative relationship between the public and private sectors.

Still on the issue of the maturity of the companies, it was possible to understand that there is a relationship between technology and business maturity, since the managerial levels of the companies were strongly influenced at the time when the data related to technology were removed from the analyses.

In architecture firms, a favorable ratio was perceived in relation to the use of technology, which means that these firms are positively influenced by the tools they use, and without them firms tend to lose control over management in all other indexes surveyed.

However, engineering and construction companies showed an inverse relationship, i.e., the technological tools used are influencing management levels downwards, which indicates a low maturity in relation to the use of technology in almost all companies.




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Netflix: Branding strategies on Instagram

 <https://doi.org/10.56238/sevened2024.010-032>

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ABSTRACT

The continuous advancement of the Internet has significantly impacted how companies and their brands engage with their customers and key stakeholders. This has made it essential to focus on innovation in sales strategies and in brand presence, both areas which are constantly changing and adapting. The emergence of social media has, in turn, enabled new dynamics of interaction between people and companies, presenting a host of challenges and new possibilities. With internet-savvy consumers becoming increasingly critical and empowered, organizations aiming to manage their brands to generate positive results have been seeking to utilize these digital platforms to build healthier and more enduring relationships with their audience. In this context, this article presents a case study of Netflix – an American streaming video service company – which seeks to investigate aspects of the company's brand management on its Brazilian profile on the social media platform Instagram, a company owned by Meta (formerly Facebook). To achieve this, bibliographical research on the concepts of Branding, Brand Equity and digital marketing techniques was conducted, followed by analyses focused on both the text and image content of a sample of posts from the "Netflix Brazil" profile on Instagram, as well as their impact and receptivity among the streaming company's followers. These analyses not only helped to understand how the company communicates and positions itself in the digital environment, but also enabled the evaluation of the communication's effectiveness based on interactions with its followers.

Keywords: Branding, Instagram, Netflix, Brand, Relationship Marketing.

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INTRODUCTION

Netflix is a worldwide provider of movies, series and documentaries via *streaming* that draws the attention of the market. The company has strongly expanded its operations across the globe since its digital transformation and in 2022 it was already present in more than 190 countries and had 231 million subscribers. Its revenue is also impressive, in the same year it reached about \$32 billion in revenue according to its annual report (Netflix, 2023).

The streaming services that the company provides compete with free-to-air TV, cable TV, among other options, but have a strong appeal to consumers, as they allow them to individually choose the content they wish and with the possibility of using mobile devices, such as tablets and smartphones (Cavalcanti, 2014, p. 3).

In this streaming segment, Netflix also stands out in the way it manages its brand on Instagram, interacting through effective communication with its audiences, through the generation of relevant content that connects with everyday life. It humanizes your brand on social media in order to get closer to your followers and generate engagement. In this sense, Kreutz and Mas Fernández (2009, p. 8) state that "new technologies are strong allies in building the relationship between the brand and its consumers".

According to Dahl and Hoeffler (2004), the search for innovation is among the main aspirations of people when acquiring new products. For Aaker and Stayman (1992), comparisons that portray significant actions can Simplify the understanding of the message that links the product to the desired brand identity. Thompson and Hamilton (2006) argue that the brand, as a perceptible entity, runs through reality, mirroring consumer perceptions and intrinsically integrating itself into its positioning strategy. Retaining new information becomes easier when there is a connection to prior knowledge and personal relevance. The association of information with emotions increases the chances of its memorization. In this way, familiarity plays an important role in the perception and emotional experience of human beings. Even in the face of contradictions or surprises, it is common for people to compare the familiar with the unfamiliar in order to understand the context (Zaltman, 2003, p. 205).

And this applies to Netflix's actions on social networks, the brand's pages and profiles on social networks usually appropriate some recent event or some reference from the pop world to gain the attention and interaction of its followers. Your form of relationship, in this sense, is focused on innovation by transforming something known to your audience into something new and attractive for your page.

Knowledge and understanding about consumers on social networks is valuable because, although each individual has their own role and cultural identity, in the end they form a whole that represents the union of ideas, values and shared interests (Tomaél; Alcará; Di Chiara, 2005). Netflix's

Branding strategy takes advantage of this knowledge by building and managing its brand through consumer perception on social networks, exploring the individual through its differentiated service and the collective through social networks. Although its main product is a *streaming* platform to watch series, movies and documentaries, Netflix has different media points of contact with its customers through social networks such as Facebook, Instagram and Twitter. These touchpoints help to shape, build loyalty, and build brand bonding.

The brand's approach to its followers occurs because it, by showing itself on social networks in this more natural way, presents a set of human qualities that, consequently, also leave the mark more human and more believable. For Aaker (1997), a set of human qualities related to a brand represents the idea of its personality.

For Blackston (1993, *apud* Leão; Camargo; Cavalcanti, 2014), the brand, by expressing human qualities, takes an active role in this dynamic, different from its former passive posture, then acting as a person would act. In the case of Netflix, the relationship on social media defines how consumers see the brand and the strength it will have in their minds.

Consumers and customers are currently looking for business models and experiences that touch their spiritual side, not just services and products to satisfy their needs. For companies and brands, this means adapting their actions to the values and beliefs of the community, creating ways of interacting with people according to specific contexts and acting locally, even if they are in an increasingly globalized world (Kotler; Kartajaya; Setiawan, 2010).

In this context, this article aims to analyze Netflix's *Branding* strategies on its Brazilian profile on the social network Instagram (@netflixbrasil). Thus, by examining the interaction between Netflix Brazil and its followers on Instagram, this research aims to provide insights into the Branding strategies adopted by the company and how they influence the perception of the target audience. As a result, this case study aims to contribute to the broader understanding of the role of social media in building and maintaining brands in an ever-evolving digital landscape.

BRANDING AND DIGITAL BRANDING

Brands are a company's most valuable assets and they have been around since the dawn of trade. They emerged centuries ago with the aim of differentiating the manufacturer of a particular product or service from another, regardless of its location or country of origin. According to Pinho (1996, p. 14), the *American Marketing Association* defines a brand as "a name, term, sign, symbol or design, or a combination thereof, which is intended to identify the goods and services of a seller or group of sellers and to differentiate them from those of competitors." Therefore, trademarks are a way of aggregating and associating differences to products and services and thus giving a competitive advantage to the manufacturer or company.

In the current market scenario, it is important for strong brands to have a digital presence as a *branding strategy*. This term can be defined as a process of brand management that aims at its long-term success, that is, it is an organizational process that helps in the construction of brands and their strengths (Scharf; Silva, 2014). According to Keller, Sonnier and Ainsle (2011, *apud* Leão; Camargo; Cavalcanti, 2014), in recent decades, brands have become increasingly prominent as a criterion in the complex dynamics of consumer choice. Therefore, in order to optimize their image in the markets in which they operate and to establish lasting relationships with their customers and consumers, organizations began to pay greater attention to their brands and their management strategies.

One of the ways for a brand to be present digitally (*Digital Branding*) is through social networks through a profile on the platforms that best suit the company's goals and purposes. However, it's not enough to be present and post content without a strategy. It is necessary to build a positive relationship with the users who follow the brand on these profiles, speaking the consumer's own language. Larger and more significant than any advertising campaign, this dialogue between company (or brand) and its customers builds brand loyalty (Mckenna, 1998, p. 48). This form of relationship between brand and consumer is what scholars define as relationship marketing.

The digital environment of social networks enables the exchange of experiences between users and consumers. And although they have less strength when alone, in social networks consumers gain strength through the collective, being stronger than any company. In this environment, they can both enhance and tarnish a brand's reputation. Advances in the digital field have had a major impact on the way companies deliver value and how that value is perceived by consumers. Too often, "today's consumers consider the value propositions of brands to be irrelevant and disposable" (Kotler; Kartajaya; Setiawan, 2017, p. 148). Social media has significantly changed the dynamics imposed by traditional media. If before there was no possibility of choice when consuming the content of these media, such as radio and TV, today consumers have access to a wide volume of on-demand content generated by other users. This feature has made social media more reliable and attractive from the perspective of those who consume it.

The choice of Instagram for this article is due to the fact that this social network has great relevance in the digital scenario. With a large number of active users and profiles, this social network, owned by Facebook, has been showing rapid growth since its emergence in October 2010 (in its first month alone the network gained one million users). In June 2018, the company reached the milestone of 1 billion followers worldwide. Of this total, Brazil represents 50 million active accounts (Thomé, 2019).

Therefore, as a consequence, many companies have been integrating the Instagram experience into their business recently, as the platform assists them in promoting and publicizing their products and services (Bevins, 2014). Therefore, Instagram, as a digital *branding* tool, provides new ways to

share a brand's story over the Internet.

Social networks such as Instagram are becoming increasingly attractive to companies that want to create campaigns in specific niches and with distinct consumption characteristics, but which are easily identifiable by the public at the same time (Azevedo; Ferreira, 2015, p. 135). Instagram enters this process, enabling a better understanding of the market through the approximation and involvement between brands and consumers. It has provided an environment where both brands and consumers are encouraged to share their stories (Gensler; Völckner; Liu-Thompkins; Wiertz, 2013). It has become a useful and effective communication and marketing tool for businesses to showcase products and services. Through a visual platform, it allowed a greater and convenient interaction between companies and consumers (Huey; Yazdanifard, 2014), making the brand's message clearer. Instead of just listening to what consumers are saying about your brand by monitoring their profiles, on Instagram companies can also actively influence the content their followers will share about them (Gensler; Völckner; Liu-Thompkins; Wiertz, 2013).

METHODOLOGY

The present article makes use, at first, of bibliographic research and theoretical survey which, according to Lakatos and Marconi (2007, p. 71), "is to put the researcher in direct contact with everything that has been written, said or filmed on a given subject, including conferences followed by debates that have been transcribed in some way, whether published or recorded."

In a second moment, a case study was carried out from the collection of data from the actions and content of a sample of ten posts by Netflix Brazil on the company's Instagram profile that go from May 21, 2019 to June 1, 2019. For the study, the qualitative descriptive and quantitative descriptive methods were used to analyze its content and the reactions of followers in relation to the company's branding and communication strategies.

Direct observation was also used to monitor and analyze the company's forms of interaction on Instagram and its content. For Castro, Ferreira and Gonzalez (2013), content analysis allows an objective, systematic and quantitative description of elements contained in texts, media and messages. Depending on the approach used, these elements can be expressions, words, or phrases. In the case of Netflix, the content of the posts and interactions with users and followers of the @netflixbrasil profile on Instagram were analyzed.

For the analysis of the level of effectiveness of posts, the research also presented quantitative characteristics through the calculation of engagement rates, which measure the level of interaction of users with a post, profile or a social media page. According to Rauen (2015, p. 231), quantitative research "consists of some level of systematic translation of intrinsic characteristics of facts or phenomena to be investigated into numerical variables". For Knechtel (2014, p.106), qualitative-

quantitative research "interprets quantitative information through numerical symbols and qualitative data through observation, participatory interaction and interpretation of the subjects' discourse (semantics)". In the case of this article, the calculation of engagement rates was done by taking into account the number of likes (also known as "likes") and comments on the posts together with the number of followers of the profile.

Regarding the formula for calculating the engagement rate, as the area still lacks more in-depth academic studies on the subject, the article proposed an adaptation of the engagement formula for Facebook presented by Valvasori (*apud* PILLAT, 2017) and the social media monitoring site Hootsuite. They proposed measuring the engagement rate of a post on Facebook using the total number of interactions (sum of likes, comments and shares) and dividing it by the total number of fans of the page and then multiplying it by 100, as shown in chart 1.

Table 1: Valvasori engagement rate formula.

$$\frac{\text{CURTIDAS + COMENTÁRIOS + COMPARTILHAMENTOS}}{\text{TOTAL DE FÃS DA PÁGINA}} \times 100 = \text{TAXA DE ENGAJAMENTO}$$

Source: Brazilian Journal of Marketing, Opinion and Media (São Paulo, 2017).

On Instagram, the number of shares of a post is only visible to the account administrator, in this case, Netflix Brazil. As the researcher did not have access to such information, the adapted formula removed the number of shares from the calculation. The adapted formula itself is not innovative, as it is disseminated and used by websites of national and international companies specialized in digital marketing and social networks, such as mLabs, Post and Pin, Later, Plann and Hootsuite. Therefore, the proposed formula in this survey for the engagement rate on Instagram was as follows:

Chart 2: Engagement rate formula used in the survey.

$$\frac{\text{CURTIDAS + COMENTÁRIOS}}{\text{TOTAL DE SEGUIDORES DO PERFIL}} \times 100 = \text{TAXA DE ENGAJAMENTO}$$

Source: the authors.

Finally, to find out if the level of engagement of the posts was acceptable or not, the research used as a parameter the average engagement rates presented by the digital marketing expert, Michael Leander (2018), for Facebook together with the average rate released by the annual report of the company Jumper Media (2019), specialized in Instagram. The average was as follows.

Table 3: Average engagement rates.

<ul style="list-style-type: none"> • acima de 1,2% = boa • de 0,6% a 1,2% = média • abaixo de 0,6% = provavelmente significa que o perfil precisa realinhar sua mensagem para atender às expectativas do seu público

Fonte: Instagram Engagement Rate Benchmarks Report (Jumper Media, 2019).

Therefore, from the data and information collected through the posts, the present research analyzed their content in text and image and calculated their respective engagement rates followed by their level of effectiveness according to the average engagement rates presented in this methodology.

RESULTS

ANALYSIS OF NETFLIX BRAZIL'S INSTAGRAM POSTS

The profile posts selected for analysis range from May 21, 2019 to June 1, 2019. In this 12-day interval, Netflix Brazil carried out a total of 12 posts, 10 static (images without movement) and 2 video, resulting in an average frequency of 1 post per day. To facilitate the analysis and reading of the research, the 10 static posts were analyzed.

In the post in figure 1, the Netflix Brazil profile makes a reference to the expression "expectation vs. reality", which is popular on social networks (especially in memes). The montage was used to promote the company's self-produced series "The Society." It is composed of two frames of the program of equal prominence and that dialogue with its plot, where a group of teenagers is transported to a parallel city in which their parents disappeared, causing them to have to deal with challenges to survive. Netflix took care to use the colors red and white, which refer to its logo and its visual identity, in the art of the text that accompanies the image. The post is complemented with a caption that gives suggestions about the *plot* or plot of the series. Making use of a common expression in young communication, the brand approaches this particular audience with the aim of promoting and arousing curiosity about the series.

In figure 2 we see a post referencing Grey's Anatomy, a well-known ABC series written by screenwriter Shonda Rhimes. The reference to a series not belonging to the Netflix catalog was due to the announcement that the series would be renewed by the ABC network for two more years, thus guaranteeing its 17th season. The news was taken advantage of by Netflix Brazil to promote one of the series in its catalog, "Lucifer", which was produced and broadcast by FOX, but which, after its cancellation, had its production rights bought by Netflix.

In the publication's image, the character Lucifer holds up an auction sign with the number 69, making a clear allusion to a sexual position. The use of the number also makes a satire of the number of seasons that the series "Grey's Anatomy" has, which accounts for almost two decades of the show.

The satirization in relation to the sexual position dialogues with the tone of the series, which lavishes sensual and nude scenes. The sensualization comes out of the show's episodes and continues through the publication's communication. After all, the plot of the series has Lucifer, the Devil himself, as its protagonist, and the image that one has collectively of the Devil and hell flirts with the idea of lust. It can also be seen that the text contained in the image features the colors of Netflix's visual identity, red and black.

In the caption that accompanies the post, *Netflix's brand persona* continues the satire by stating that the number brings him luck. In addition, it can be noticed that the profile bothered to interact with one of the comments of one of its followers. In the comment, the follower uses the number that appears in the post to make a reference to the number of characters who died in the series "Grey's Anatomy". Netflix Brazil takes advantage of the opportunity and does not "lose the joke" by tagging the user and replying "I'm going there to cry and I'll be right back".

In the analyzed publication, it can be seen that the company's communication strategy is not afraid to transform external information into content in its favor, even if it means promoting competitor products.

In the post in figure 3, Netflix Brazil created a challenge with the objective of promoting seven titles available in its catalog and, at the same time, interacting directly with its audience, in this case, its followers. The proposed challenge is simple and makes use of emojis, a current and complementary mode of digital communication composed of figures, symbols and drawings. Therefore, the image of the post features seven lines with combinations of emojis that represent the titles of the seven series available on its website. To find out the names of such titles, followers are encouraged to decipher the code contained in the emoji combinations. It's a simple feature, but it has a high response rate, as it generated 3,088 comments. It is worth noting that Netflix maintains its concern about using colors of its visual identity in the text contained in the image of the post.

In one of the comments made on the post, it can be seen that Netflix's profile recognizes the user who got the names of the seven titles right, showing that the company interacts strategically with its followers.

Figure 1: Post about the series "The Society".



Source: Netflix Brazil profile on Instagram.

Figure 2: Post about the series "Grey's Anatomy" and "Lucifer".



Source: Netflix Brazil profile on Instagram.

Figure 3: Emoji challenge post referencing content from the Netflix catalog.



Source: Netflix Brazil profile on Instagram.

One of Netflix's communication strategies is to recycle its own content and turn it into input for posts on its social networks. This can be seen in figures 4 to 8, a sequence of five images from the recently released "Dilemma" series, produced by Netflix itself. In the series, the character Anne, played by actress Renée Zellweger, displays refined and impeccable clothing. The Netflix Brazil profile takes advantage of this detail and behaves like a spectator, inviting followers to enjoy the character's costume. Therefore, five sequential images were posted where Anne appears with imposing postures and strong expressions that dialogue with her clothes.

In the text that accompanies the publication, Netflix Brazil praises the "looks" and comments that it does not have adequate clothing to be in the series. This comment makes room for followers to also join in the "fun", as can be seen in the comments in figure 9. It is possible to notice that the conversation develops from followers who tag other followers in the post through the use of the "@" symbol preceding the user's name. Such an action generates spontaneous interaction and engagement for the post, thus making it relevant according to Instagram's algorithms, which decide how long a post will continue to appear in users' feeds.

Figure 4: Sequential post about the "Dilemma" series.



Source: Netflix Profile

Figure 5: Sequential post about the "Dilemma" series.



Source: Netflix Profile

Figure 6: Sequential post about the "Dilemma" series.



Source: Netflix Brazil profile on Instagram.

Figure 7: Sequential post about the "Dilemma" series.



Source: Netflix Profile

Figure 8: Sequential post about the "Dilemma" series.



Source: Netflix Profile

Figure 9: Comments from followers on the post about the "Dilemma" series.



Source: Netflix Brazil profile on Instagram.

In figure 10, based on the *brand's audio branding*, Netflix Brazil "plays" with the sound of its own opening vignette (which can be heard when you press play on any *streaming content*) making use of the onomatopoeia "Tu-dummmmm". The hair-raising in the image below is a representation of the goosebumps and excitement caused by the sound of onomatopoeia. The message conveyed with this post is that watching Netflix content causes a sense of pleasure and euphoria in its subscribers, which, therefore, consequently, it brings the brand and its customers closer by referring to the experience provided by the service.

It is worth noting that one of the comments on the post is from the Instagram profile of the French Netflix, which "plays" with another onomatopoeia, the expression "TOU DOUM", in an attempt to correct the sound that the vignette makes. The expression posted by the French profile clearly makes an adaptation based on the linguistic characteristics of the sound of the French language. In response, the Brazilian profile doesn't "miss the joke" and responds with "Ah, pronto" and "Ah bientôt", which translated into Portuguese would be something like "Bye" or "See you soon". From this fun interaction it can be said that both profiles maintain a unity with regard to the sarcastic tone that Netflix, as a brand, maintains on its social networks.

The publication of figure 11 is divided into three frames of equal proportion with the text "Don't Stop Believin'", a notorious song from the musical series "Glee". The frames show scenes with the iconic actors who became known for their roles on the show. The very name of the song provokes the viewer to "Don't Stop Believing" (translation to Portuguese of the name of the song), since the publication aims to inform that all seasons of the series will be available in the Netflix catalog.

In the text that accompanies the publication, the *profile's brand persona* asks if your neighbors will be prepared for the show that will take place in your living room, which dialogues with the series, which has in its episodes re-recordings of famous songs. The text also has the name of the series accompanied by a *hashtag* (#GLEE), which allows its followers to be notified about the publication. Finally, it can be said that Netflix Brazil maintains its concern with using the colors of the brand's visual identity through the colors of the characters' clothes that are in the images, a way to reinforce the brand in front of its customers and followers.

The image in figure 12 shows a scene from the famous 90's series, "Um Maluco no Pedaco", with actors Alfonso Ribeiro and Will Smith, becoming the latter internationally known through the program. The text accompanying the post makes a satire of DJ Jazzy Jeff & The Fresh Prince, which is played in the opening of the series and which few understood or knew how to sing because it is a rap sung at a fast pace. The text can also be understood as a reference to the exhibition of the series on the open television channel SBT, which cut the opening song of the program. By making such associations, Netflix Brazil, in addition to announcing that all seasons will be available in its catalog, works with the feelings and memories of those who followed the series in the 90s.

Figure 10: Post about the sound of Netflix's opening vignette.



Source: Netflix Brazil profile on Instagram.

Figure 11: Post about the series "Glee".



Source: Netflix Brazil profile on Instagram.

Figure 12: Post about the series "A Madman in the Block".



Source: Netflix Brazil profile on Instagram.

The post in figure 13 presents a striking image of the character Beth Boland, played by actress Christina Hendricks, in the series "Good Girls". In the image, the character points a gun at someone who cannot be seen in a tone of menace and desperation. In the text that comes in the image itself, it is the phrase "When someone talks bad about Good Girls in front of me:". The combination of the scene with the text creates a comedic and dramatic tone at the same time. And this same tone is seen in the series, which tells the story (with elements of humor) of three anti-heroines who enter the world of crime when their lives put them in a time of financial crisis. The combination also has an ironic sense, since the name of the series when translated into the Portuguese, "Good Girls", contradicts the scene with a threatening tone.

Complementing this combination, there is the text that accompanies the post, which, in addition to announcing that the second season is now available on Netflix, emphasizes the extreme measure that Netflix Brazil, as a fan, can take if someone speaks ill of its series. It is also possible to notice that the name "Good Girls" comes in red, one of the colors of Netflix's visual identity.

In the comments contained in figure 14, Netflix Brazil responds to one of its followers about its expectations regarding the love involvement between two other characters, Annie and Rio. Such action shows that the company's profile, in addition to knowing well the details of the plots of its products, also follows the comments of its followers and takes advantage of the opportunities it has to interact and generate engagement in its posts.

Figure 13: Post about the "Good Girls" series.



Source: Netflix Brazil profile on Instagram.

Figure 14: Comments on the post about the series "Good Girls".



Source: Netflix Brazil profile on Instagram.

Throughout the analysis of Netflix Brazil's publications, it was possible to notice that one of its predominant strategies is the use of its profile to announce the titles that will be available in its catalog. In the content of figures 15 to 19, this strategy is maintained. Composed of a combination of five images, the publication presents frames from the productions that will be made available in June. One can see images with well-known actors such as Miley Cyrus, Jennifer Aniston and Adam Sandler, accompanied by the names of the series and films in which they act, as well as the respective premiere dates of each production.

Reinforcing the visual identity of its brand, Netflix Brazil makes use of the colors red and white in the texts inserted in the images, in addition to giving preference to the use of frames where

the characters wear red clothes. Taking advantage of the commemorative date of São João, which takes place in June, the profile refers to the festivity in the text that accompanies the publication by using the words "quenta", "paçoquinha" and "quermesse". Such use demonstrates that one of the communication strategies of the profile on social networks is to make references to seasonalities and commemorative dates in Brazil when producing its publications and, thus, connecting with its followers. In the comments, it is possible to observe followers tagging others through the "@" symbol, thus generating more interactions on the posts.

Figure 15: Sequential post about "June Premieres".



Source: Netflix Brazil profile on Instagram.

Figure 16: Sequential post about "June Premieres".



Source: Netflix Brazil profile on Instagram.

Figure 17: Sequential post about "June Premieres".



Source: Netflix Brazil profile on Instagram.

Figure 18: Sequential post about "June Premieres".



Source: Netflix Brazil profile on Instagram.

Figure 19: Sequential post about "June Premieres".



Source: Netflix Brazil profile on Instagram.

In figure 20, the last post analyzed, Netflix Brazil brings the announcement of the third season of the Spanish series "La Casa de Papel", which had the production rights bought by the streaming service company after the end of the second season. The post features the characters on the lawn of a football stadium positioned as a team of players and wearing the red uniform that marked the previous seasons of the series. The character known as "Professor", mastermind of the audacious plan to invade the Spanish Mint, is highlighted in the image for being positioned as the group's coach and for being the only one who is not in uniform, wearing his classic suit, which in turn gives him an

appearance of intellectuality and leadership. The predominant red color of the uniforms, in turn, strengthens the visual identity of the Netflix brand in a natural and convenient way.

In the text that accompanies the post, the association with football could not be more direct. The phrase "With a team like this I would play any game", implies that the characters are prepared for the challenges they will face in the new season. The text also makes use of the *hashtag* #LCDP3, initials of the name of the series, which notifies followers and fans of the series about the publication of the post, thus generating more visits and increasing the likelihood of interaction and engagement. Netflix Brazil's decision to associate the post with football was due to the 2019 Copa América, which takes place between June and July, which once again reinforces its strategy of taking advantage of seasonality and commemorative dates in the production of its posts.

Figure 20: Post about the series "La Casa de Papel".



Source: Netflix Brazil profile on Instagram.

CALCULATING THE ENGAGEMENT RATE OF NETFLIX BRAZIL'S POSTS ON INSTAGRAM

The engagement rate of the ten Instagram posts analyzed was calculated using the formula proposed in the "Methodology" chapter. Therefore, the number of likes and comments (variable numbers) of each post individually was added and divided by the total number of followers of the profile (12,175,582), then the number found was multiplied by 100. Following the order in which the posts were analyzed, the engagement rates found can be seen in the following table.

Table 1: Calculation of the engagement rate of the analyzed posts.

Post No.	Post Date	Content	Engagement Rate Calculation	Engagement Rate
1	21/05/19	Série "The Society"	$(71.554 + 2.801 / 12.175.582) \times 100 = 0,61\%$	0,61%
2	23/05/19	"Grey's Anatomy" and "Lucifer" series	$(218.287 + 4.906 / 12.175.582) \times 100 = 1,83\%$	1,83%
3	24/05/19	Emoji Challenge	$(97.027 + 3.088 / 12.175.582) \times 100 = 0,82\%$	0,82%
4	24/05/19	"Dilemma" series	$(105.001 + 2.765 / 12.175.582) \times 100 = 0,88\%$	0,88%
5	26/05/19	Netflix Opening	$(521.455 + 7.334 / 12.175.582) \times 100 = 4,34\%$	4,34%
6	28/05/19	"Glee"	$(196.043 + 12.894 / 12.175.582) \times 100 = 1,71\%$	1,71%
7	29/08/19	"A Madman on the Block" series	$(807.741 + 39.285 / 12.175.582) \times 100 = 6,95\%$	6,95%
8	31/05/19	"Good Girls" series	$(124.242 + 4.169 / 12.175.582) \times 100 = 1,05\%$	1,05%
9	01/06/19	June Premieres	$(333.832 + 11.237 / 12.175.582) \times 100 = 2,83\%$	2,83%
10	01/06/19	Series "La Casa de Papel"	$(504.236 + 9.918 / 12.175.582) \times 100 = 4,22\%$	4,22%

Source: the authors.

According to the results obtained, it can be noted that the engagement rates range from 0.61% to 6.95%. Following the average engagement rates presented by Michael Leander and Jumper Media's 2019 annual report, the ranking of the posts was as shown in the following table.

Table 2: Ranking of analyzed posts according to engagement rate.

Post n°	Content	Engagement Rate	Classification
7	"A Madman on the Block" series	6,95%	BOA
5	Netflix Opening	4,34%	BOA
10	Series "La Casa de Papel"	4,22%	BOA
9	June Premieres	2,83%	BOA
2	"Grey's Anatomy" and "Lucifer" series	1,83%	BOA
6	"Glee"	1,71%	BOA
8	"Good Girls" series	1,05%	AVERAGE
4	"Dilemma" series	0,88%	AVERAGE
3	Emoji Challenge	0,82%	AVERAGE
1	Série "The Society"	0,61%	AVERAGE

Source: the authors.

Looking at Table 2, of the ten Netflix Brazil posts that were analyzed, six have engagement rates classified as "Good" and four classified as "Average", and none classified below 0.6.

Of all the posts analyzed, the one from the "Um Maluco no Pedaco" series was the one that had the highest engagement rate, with 6.95%, well above the average engagement rate of 1.2%, which is considered "Good". This percentage is due to the large number of interactions that the publication obtained: 807,741 likes and 39,285 comments. It can be said that this high level of engagement is due to the strong emotional appeal that the series has in Brazil.

On the other hand, the post with the lowest engagement rate was about the series produced by Netflix itself, "The Society". Its engagement rate was 0.61%, classified as "Average" but very close to being below the classification. The post's lower engagement rate was the result of fewer interactions when compared to other posts: 71,554 likes and 2,801 comments. One of the possible reasons for this result is the fact that the series is a recent product in the catalog and therefore still has a lower appeal among followers.

From the analysis, it could also be observed that Netflix Brazil followers interact more with posts through likes, with comments in second place. This is something recurrent on Instagram and social networks as a whole, since liking a post is the simplest and fastest action of interacting with a post.

FINAL THOUGHTS

From the research carried out, it was possible to observe that Netflix Brazil's Branding strategies on Instagram are focused on generating value for the brand (*Brand Equity*) and



identification by its followers on the social network. The contents of your posts are produced with the aim of informing and maintaining a positive relationship with the profile's followers. In a fun and playful way, the publications inform about updates, releases and premieres of series, movies and documentaries that are or will be available in the Netflix catalog in Brazil.

The profile humanizes the brand through a fun, relaxed language. The female *brand persona* embodied by the profile is concerned with maintaining a young and cool tone, and the posture of someone who is connected with what happens in Brazil and in the world. From this tone and attitude, the company relates by creating content and posts that announce and generate interest in the films, series and documentaries in its catalog, regardless of whether they are new or old.

When it comes to the use of visual and textual elements, Netflix Brazil creates a fun and friendly experience for the brand's fans and followers. It could be seen that the company makes strong use of its brand in a visual way, Maintaining a unity and using elements of your logo's color palette in images and texts, which allows for quick brand identification.

It was observed that their posts encourage the participation of users and followers, making them comment, like and share the advertised materials, in addition to tagging other users in the posts, making the reach and engagement even greater. In a world where media increasingly converge through a collaborative and participatory culture, social networks such as Instagram make it possible for brands like Netflix to create a digital environment where companies and consumers interact and exchange rich and beneficial experiences for both sides in a natural and spontaneous way.

Making use of communication that speaks the language of consumers and content that connects with everyday life, Netflix does a strong job of brand management and relationship with its followers. By making references and associations to characters, products from the catalog, commemorative dates, seasonalities and current themes, the company's posts on Instagram become unique and engaging.

Through the emotional connection that followers have through the themes and content of the posts, Netflix Brazil was able to create publications with a high level of engagement, which could be seen in the results obtained in the engagement rates of the posts analyzed. It can be said, therefore, that the company has been right in its *Instagram Branding* strategy. This is reflected in the number of followers the profile has and the amount of likes and comments your posts get.

The results of the research, unfortunately, are limited to what is publicly exposed and the number of posts analyzed. It is worth noting that Instagram recently allowed companies to hide the number of likes on their posts, which impacts the engagement rate formula proposed in this research.

Future research on Netflix's Branding on platforms other than Instagram, such as Facebook and Twitter, and having access to more data for analysis, may contribute to a deeper understanding of the impacts and receptivity of the company's brand management strategies on social networks. The



study of multiple social networks will enable researchers to work with more evidence and draw more accurate, detailed conclusions and *insights* with a higher level of complexity.

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Spirituality and psychology: Converging themes

 <https://doi.org/10.56238/sevened2024.010-033>

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ABSTRACT

The theme of spirituality as an object of study and as a component of human life was recognized as relevant to health, be it physical and/or mental. Even though it is a relevant topic, there is a gap in the knowledge of the spirituality of psychology professionals in Brazil and its impact on research and clinical practice. This research aims to analyze the scientific productions about psychology and its relationship with the themes of spirituality. This is a qualitative research through the integrative literature review, the search was carried out on the Portal of Periodicals (CAPES) and the Brazilian Digital Library of Theses and Dissertations (BDTD) using the descriptors spirituality, psychology and psychological practices, where 9 works were selected, including theses and dissertations, published between the periods of 2012 to 2020. The results were classified according to: objective, methodology and results. Three themes were identified: religiosity and spirituality; professional training and clinical practice. Of the works analyzed, there were 3 theses and 6 dissertations and in relation to the methodology, the two quantitative researches present surveys carried out with psychologists, two works were conducted within specific theoretical approaches: Brazilian gestalt-therapists and cognitive-behavioral therapy. Qualitative research was carried out through interviews with 24 clinical psychologists and 2 students in the process of training. Two studies were integrative reviews and one literature review of national and international articles and TCCs. Regarding the objectives of the research analyzed, the general objectives are related to religiosity and spirituality in the context of clinical practices. The understanding of the concepts of religiosity, spirituality and psychology is the focus of 04 works. The theoretical currents that underlie the research are linked to the objectives of three works, being respectively Gestalt, Cognitive-Behavioral Therapy, Logotherapy/existential psychology, and Analytical Psychology. Psychologists' personal perspective on the topic and its repercussions are addressed in a thesis, while the patients' perspective is explored in a dissertation. It is concluded that it is essential for psychology professionals to take an individualized approach when dealing with spiritual issues. Everyone has their own beliefs and values in this regard, and it is important to respect and consider them during the therapeutic process.

Keywords: Psychology, Spirituality, Psychological practice.

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INTRODUCTION

The theme of spirituality as an object of study and as a component of human life has accompanied man throughout history. Its influences encompass the individual's interpersonal, sociocultural and intrapsychic relationships, expressed in beliefs, values, emotions and behaviors (GERONASSO; MORE, 2015).

In 2013, the Federal Council of Psychology (CFP) published a position on psychology, religion and spirituality and the importance of psychologists integrating these aspects of human life into their work. In this text, the secularity of the State and of the profession is recognized, and emphasizes the notoriety of religion and spirituality in Brazil, taking up the legacies of ancient peoples. In addition, according to this document, it is identified that both religion and spirituality serve as means of understanding the human being, considering their influences on the "maintenance and development of psychosocial health", becoming the basis for a healthy subjectivation process (CONSELHO FEDERAL DE PSICOLOGIA, 2013, p.3).

Objectivity and subjectivity are considered inherent to health work, considering that the object that constitutes it are human beings whose technical interventions are always permeated by interpersonal relationships (SILVA, 2020). Also according to this author, it is in this sense that spirituality is approached to draw attention to the dimension of this theme, since it gives hope for better days.

To understand the theme of spirituality, it is necessary to distinguish it from religion, since they are sometimes equated and even understood as synonyms. Thus, it is worth mentioning that the concept of religion refers to the institutional and doctrinal aspect of a certain form of religious experience. It is defined by certain beliefs and rites referring to the transcendent and understood as means that offer salvation (BOFF, 2006).

Koenig (2012) defines religion as beliefs, practices and rituals that are related to something of the transcendent order – here the name of God or any other entity of different religious denominations can be entered. In addition, the author points out that religions have specific beliefs about life after death and constitute rules for living in a society.

Silva *et al.* (2014) defines spirituality as a belief system that encompasses subjective elements that transmit vitality and meaning to events of human life, which has been embedded in humanity since before its creation. For the authors, it can mobilize Extremely positive energies and initiatives, with potential in the search for meaning, influencing the quality of life.

With regard to spirituality, according to Catré (2016), it is a controversial and wide-ranging subject, which accompanies the history of humanity and is immersed in prejudices and controversies. And in this sense, it is constructed in socio-cultural and historical contexts, structuring and attributing

meaning to values, behaviors, human experiences, and sometimes materializes in the practice of a specific religious creed (PINTO, 2007).

These characteristics of spirituality lead to a growing academic interest in researching this phenomenon due to its implications for people's well-being and quality of life, although it is still little discussed. The relationship between health and religiosity/spirituality has become a promising field of study, at the same time controversial and challenging (MOREIRA-ALMEIDA, 2007). According to Rocha and Monteiro (2017), the concept of spirituality is little addressed in academic discussions and psychotherapeutic practices, even though it is a fundamental component for the comprehensive health care model, which considers the interrelationship of physical, emotional, mental, social, professional, and spiritual well-being. The same authors call attention to the fact that paradigmatic flexibility translates the transformation that the biopsychosocial concept is undergoing. Gradually, it is becoming a "spiritual biopsychosocial" concept, which urgently needs to be incorporated into the psychotherapeutic setting. (ROCHA; MONTEIRO, 2017).

Therefore, from this perspective, Farris (2005) emphasizes that both psychology and spirituality, despite their differences, which use different concepts to describe similar processes of construction and creation of meaning, are not incompatible.

RESEARCH PROBLEM

How is Brazilian scientific production presented in theses and dissertations on psychology and its relationship with spirituality?

SUPPORTING

By observing spirituality in the context of psychology, we infer that this theme is little discussed in this context. As it is considered a new and expanding area of activity, There is a lack of literature on the topics in question (PERES *et al* , 2007; LOUSADA, 2017), enabling the elaboration of a project with the objective of analyzing scientific productions about psychology and its relationship with spirituality.

The choice of the theme arose from the authors' interest in the subject, taking into account the fact that it is little addressed during academic training and because it is a theme that not all approaches to Psychology find consonance in their theoretical constructs and interventions. Regarding this aspect, Freitas (2014) and Geronasso and Moré (2015) report that issues such as religiosity and spirituality in Psychology training have been presented in a timid way, which implies not preparing professionals to deal with the subject, considering that many newly graduated psychologists report that these issues are frequent, but show insecurity to address them for fear of incurring ethical problems (FREITAS, 2014).

For the students, this research is an opportunity to deepen their studies, to understand how spirituality for the psychologist, as a facilitator of the therapeutic process, can recognize this dimension as part of the psychotherapeutic relationship and work on the spiritual dimension of the individual regardless of the religious option. It will benefit not only the academic environment, but also Psychology with regard to the possibility of expanding knowledge about spirituality in the various approaches, practical and clinical contexts and because it is a recurrent theme in our culture, not only in the field of religion, but also at the level of human searches.

With the experience and interaction of this research, we intend to contribute to the training of academics as researchers, and to the construction of our professional identity. We intend to favor suggestions for future studies that provide relationships between the writings on spirituality in the context of psychology by affirming the importance of spirituality in the exercise of the profession. Finally, through its publication it will add a means of disseminating the subject, making it more accessible and popular.

OBJECTIVES

General Objective

To analyze the scientific productions about psychology and its relationship with the themes of spirituality.

Specific Objectives

- To map the scientific productions that address psychology and its relations with the theme of spirituality;
- Characterize the productions in relation to authors, publication period, topics addressed and results;
- Identify the relationship established between psychology and spirituality.

THEORETICAL BACKGROUND

SPIRITUALITY

Spirituality accompanies man throughout history. As a component of human life, its influence is not restricted to the sociocultural sphere, but also appears in the constitution of the individual's subjectivity, expressed in beliefs, values, emotions and behaviors related to it. (GERONASSO; MORE, 2015).

According to Oliveira and Junges (2012), spirituality is related to the experience of contact with what transcends the ordinary aspects of life. These authors refer to the understanding of spirituality and religiosity as a singular experience of encounter with oneself, with other human

beings, with the cosmos and with the transcendent (OLIVEIRA; JUNGES, 2012). Volcon *et al* (2003) understand spirituality as a set of all emotions and convictions of a non-material nature, assuming that there is more to living than can be fully perceived and understood.

For Costa (2010), even if spirituality and religiosity are related, they are not the same. While spirituality is universal, available to all, it is not restricted to specific religious beliefs. Religiosity, on the other hand, involves a system of beliefs and doctrines that is shared by a group that has its own behavioral, moral and social characteristics.

When talking about spirituality, Mano (2010) states that:

Spirituality as a phenomenon of intimacy, of relationship with the transcendent, in which there is a daily, voluntary and pleasurable search for self-knowledge and knowledge of the other. This knowledge leads the individual to an awareness of himself, of his competences and limitations (MANO, 2010, p. 15).

Mano (2010) suggests that spirituality precedes religion, and may or may not include a belief in some holiness and/or involvement with religious practices. Its definition is related to the spirit, to an internal need, a search for an understanding of life and of oneself, justifying, based on spiritual experiences, an entire existence (MANO, 2010).

According to Moreira-Almeida and Koenig (2006), spiritual and religious beliefs and practices are strongly based on personal searches to understand the meaning of life, the relationship with the sacred and the transcendent. The authors state that they can influence how people interpret traumatic events and deal with them, promoting resilient perceptions and behaviors such as positive learning from experience, support for overcoming psychological pain, and self-confidence in dealing with adversity. (MOREIRA-ALMEIDA and KOENIG, 2006).

In a treatise on the natural-scientific attitude and the spiritual scientific attitude, the science of the spirit and the science of the mind, the mathematician and philosopher Edmund Husserl, one of the founders of the Phenomenology, states that "the science of the spirit has to do with the spirit, and there is a distinction, in the first place, between the science of nature in the strict sense and the science of the spirit: on the one hand is the science of psychic things, and on the other the sciences of men as persons [...]" (HUSSERL, 2012, p. 304). This distinction must be present from the beginning of any form of theoretical knowledge, since the semantic distinction already indicates to us that the human being can go beyond his strictly natural determination, the one that materially can be seen, and yet, being the possessor of the dimension of the spirit, the one that the natural eyes cannot visualize, only feel. In this sense, it seems important to expand the psychic aspects to the spiritual dimension, thinking about the possibility of a "Psychology of the spirit", considering spirituality, as observed so far, essentially linked to a search for the meaning and purpose of existence. (MANO, 2010).



RELATIONSHIP BETWEEN PSYCHOLOGY AND SPIRITUALITY

According to Melo (2015), for a long period, science and spirituality were seen as distinct and opposite areas. Currently, rationalist and mechanistic conceptions still predominate in the field of science that tend to devalue what cannot be fully measured, predicted or controlled by technology and reason. It is emphasized, however, that in contrast, there are theoretical lines that seek to promote a more adequate understanding of these phenomena, contributing to effective means of analyzing and studying them (FLECK *et al*, 2003).

The spiritual dimension, in many moments, is treated as a taboo subject in undergraduate Psychology. It is a topic little discussed by students and teachers, and it represents an element of paramount importance in future therapeutic interventions, in view of its effectiveness in caring for the subjectivity of the client who seeks help from a psychologist. (SCORSOLINI-COMMIN, 2015).

Regarding spirituality in psychology approaches, Cavalheiro (2010) states that in behaviorism and psychoanalysis, spirituality is negatively emphasized, while in aspects of humanism, existentialism, the current cognitive behavioral approach and transpersonal psychology it is understood as determinant and positive aspects in the psychological structure. ((CAVALHEIRO, 2010).

In this same perspective, Cavalheiro and Falcke (2014) conducted a research with psychologists trained in different theoretical approaches on their relationship with Spiritual Well-Being. Through the results obtained, the authors ponder that the personal experiences of psychologists with spirituality influence the choices of theoretical approaches, and the opposite is also true. Thus, the participants who presented the highest index of Spiritual Well-Being, to the detriment of other approaches, were from the theoretical perspectives: Humanism, Gestalt therapy, Systemic, Jungian and Phenomenological-Existential, all of which occurred in the approaches that most open space to talk about spirituality (CAVALHEIRO; FALCKE, 2014).

Oliveira and Junges (2012) point out the relevance of perceiving that spirituality offers important resources to face inevitable stressful situations, in a direct interrelationship with the mental health of individuals.

METHODOLOGY

NATURE OF THE RESEARCH

This is a qualitative research, which aimed to analyze the scientific productions about psychology and its relationship with the theme of spirituality. To carry out this study, the integrative review method was chosen, which, according to Souza, Silva and Carvalho (2010), makes it possible to obtain a consistent overview in relation to the thematic complexity in question. This type of review incorporates a wide range of purposes, such as defining concepts, reviewing theories and evidence,

and analyzing methodological problems of a specific topic. Still on this approach, Botelho, Cunha and Macedo (2011) state that:

"(...) The integrative review method can be incorporated into research carried out in other areas of knowledge, in addition to the areas of health and education, because it makes visible the capacity for systematization of scientific knowledge and so that the researcher can get closer to the problem he or she wishes to assess, outlining an overview of his or her scientific production to know the evolution of the theme over time and, With this, visualize possible research opportunities. (BOTELHO, CUNHA, MACEDO, 2011, p. 133)".

The steps related to the integrative review followed in this study referred to: establishment of the guiding question; selection and acquisition of studies (inclusion and exclusion criteria), evaluation of pre-selected studies, discussion of results, and presentation of the integrative review. According to Souza, Silva and Carvalho (2010), the integrative review is one of the most comprehensive methodologies among the types of review, as it associates different studies and data, providing a broader view of the topic raised.

DATA PRODUCTION

The theme of this study focuses on the relationship between Psychology and Spirituality, with the following guiding question: How does scientific production in theses and dissertations approach psychology and its relationship with spirituality? To answer this question, we conducted a search in the following databases: the Brazilian Digital Library of Theses and Dissertations (BDTD), which encompasses the information systems of theses and dissertations of teaching and research institutions in Brazil, and the Catalog of Theses and Dissertations (CAPES) website.

In the analysis of the inclusion and exclusion criteria, the sample consisted only of theses and dissertations with authorization for dissemination, using the following descriptors: Psychology, Spirituality and Psychological Practices.

The survey took place between September and December 2022. For data collection, a critical analysis of the included studies was performed, using combinations of descriptors to assist in the definition of the best possible evidence and critically analyzing the data obtained by the research. A publication period between 2012 and 2022 was determined, because there are few publications in the field. Thus, 78 studies were found, 47 in BDTD and 31 in CAPES.

As inclusion criteria, studies published in Portuguese and studies that deal specifically with the themes of psychology and spirituality were defined. As exclusion criteria, we defined works that do not dialogue with the themes in question, do not have authorized disclosure, unavailable access in full, and present convergence errors. For the data analysis procedures, the abstract, the objective and the results were read in order to select the studies that best met the needs of this research.

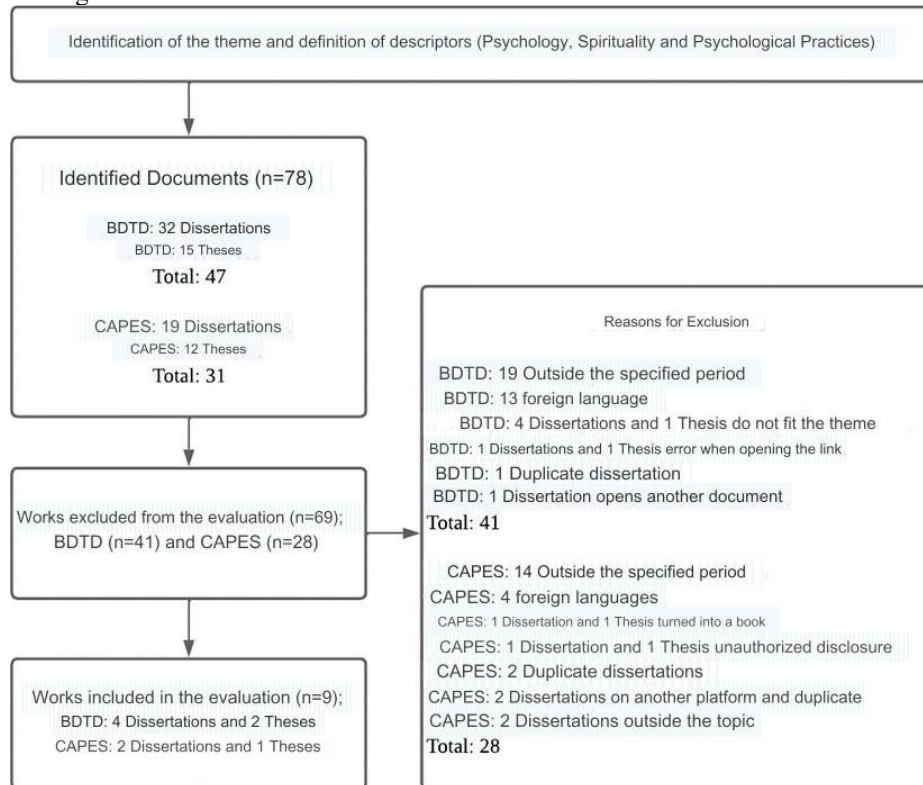
In the BDTD database, 47 documents were found, including theses and dissertations, after cross-referencing the descriptors. Of these, 19 were eliminated for being outside the established publication period, and 13 documents were excluded for being in foreign languages, resulting in 15 papers selected for reading. Of the 15 selected documents, 4 dissertations and 1 thesis were excluded because they did not fit the proposed theme. In addition, 1 thesis and 1 dissertation had an error when opening the link, 1 dissertation was duplicated, and 1 dissertation opened another document, resulting in 6 papers (2 theses and 4 dissertations) remaining.

In the CAPES database, 31 works were found, including theses and dissertations, after cross-referencing the descriptors. Of these, 14 were eliminated for being outside the period determined for the inclusion criteria, and 4 for being in a foreign language, resulting in 13 works selected for reading. Of the 13 selected documents, 1 thesis and 1 dissertation were excluded because they had become a book, 1 thesis and 1 dissertation were excluded because they did not have authorized disclosure, 2 dissertations were excluded because they were duplicates, and 2 dissertations were excluded because they were already included in the other platform and were already the object of research of this work, resulting in 5 remaining works.

Of the 5 works (1 thesis and 4 dissertations), 2 dissertations were eliminated because they were not in accordance with the theme addressed, when observed in more detail, resulting in 3 works (1 thesis and 2 dissertations).

The analysis of the data extracted from the studies was carried out based on the study category "Psychology and its relationship with spirituality", taking into account the view of each selected author. The sample of this integrative review totaled 9 works, including theses and dissertations, published between 2012 and 2020, according to the central theme presented. This information is presented in the flowchart in Figure 1.

Figure 1: Flowchart of the inclusion and exclusion criteria of the studies found



Source: Authors, 2023

The material selected for analysis will be coded with the initials of the work modality in numeral sequence, being D1 - D6 and T1 - T3.

RESULTS AND DISCUSSIONS

SAMPLE CHARACTERIZATION

As mentioned in the methodology, 9 studies published in Brazil were analyzed, 3 theses and 6 dissertations, about psychology and its relationship with spirituality, the databases used to obtain the results were BDTD and CAPES. Chart 1 presents the information of the research found, indicating the platforms, types of studies, authors and years.

Chart 1: Characterization of the selected studies

No.	PLATFORM	THESES/DISSERTATION	TITLE	AUTHOR	YEAR	METHOD
T1	BDTD	Thesis Program Post-graduation in Psychology UFJF	Religiosity/Spirituality ⁴ in a national sample of Brazilian psychologists: profile and implications in practice professional	Pedrita Reis Vargas Paulino	2019	Qualitative-quantitative research.
D1	BDTD	Dissertation Program Post-graduation in Psychology UFPR	Gestalt Perspectives on Spirituality/Religiosity	Lázaro Castro Silva Nascimento	2015	Qualitative research
D2	BDTD	Interdisciplinary Studies Dissertation About UFBA University	Spirituality, Religion, and Psychology: An Integrative Review in the Journals Brazilian Psychology Courses	Jéssica Plácido Silva	2017	Integrative review
D3	BDTD	Dissertation Graduate Studies Program in Psychology: Clinical Psychology PUC - SP	The religiosity and spirituality of students in the psychologist training course	Terezinha Carmen Gandelman	2013	Qualitative research
D4	BDTD	Dissertation Program Post-Graduation in Psychology UFTM	Religiosity/Spirituality (R/E) in clinical psychological practice: psychotherapists	Vivian Fukumasu da Cunha	2017	Qualitative research
T2	BDTD	Thesis Graduate Studies Program in Education: Educational Psychology PUC-SP	Spirituality in the work of authors of psychology, health and education	Márcia Gouvêa Lousada	2017	Integrative review
T3	CAPES	Thesis Program Post-graduation in, Clinical Psychology UNICAP	Religiosity, Spirituality and Psychotherapy in the Academic Training of the Psychologist	Ananda Kenney da Cunha Nascimento	2017	Qualitative research
D5	CAPES	Dissertation Graduate Program in Psychology UFRJ	Cognitive Behavioral Therapists in the face of religiosity/spirituality in the psychotherapeutic context	Diana Soledade do Lago Camera	2020	Quantitative research

⁴ The works that do not make the distinction between Religiosity and Spirituality present the concepts as Religiosity/Spirituality and this form that the authors put was maintained in the text when there was reference to their work.

D6	CAPES	Dissertation Graduate Program in UFU Psychology	The constructs religiosity, spirituality and mental health in the light of Behavioural Therapies	Juliana Assunção da Silva	2012	Literature review
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Source: Author, 2023.

The publication period of these papers ranges from 2012 to 2020, with a higher concentration in 2017, with 4 papers. Most of the studies were developed in the Southeast region, with 6 studies, one in the Northeast and one in the South. Regarding the methodology, the two quantitative studies present surveys carried out with psychologists. T1 conducted a national survey with 4300 psychologists, and two studies were conducted within specific theoretical approaches. D1 had the participation of 198 Brazilian gestalt therapists, while D5 involved 205 cognitive-behavioral therapists. Qualitative research was carried out through interviews with 24 clinical psychologists (D4) and 2 students in the process of training (T3). Two studies were integrative reviews (D2 and T2), and D6 conducted a literature review of national and international articles and TCCs.

Regarding the objectives of the research analyzed, the general objectives of T1, D1, D4, T3 and D5 are related to religiosity and spirituality in the context of clinical practices. The understanding of the concepts of religiosity, spirituality and psychology is the focus of the works D2, D3, D6 and T2. The theoretical currents that underlie the research are linked to the objectives of D1, D6 and T3, being respectively Gestalt, Cognitive-Behavioral Therapy and Logotherapy/existential psychology and Analytical Psychology. The psychologists' personal perspective on the topic and its repercussions are addressed on T1, while the patients' perspective is explored on D5.

A grouping of the results was carried out based on a thematic analysis, resulting in 2 categories: relationship between religiosity/spirituality, and training and clinical practice. These categories are presented in the table below.

Theme	Thesis/Dissertation
Relationship between religiosity and spirituality	D1 D2 D5 D6 T2 T3
Training	D2 D3 D4 D5 D6 T1 T2 T3
Clinical practice	D1 D3 D4 D6 T1 T3

RELATIONSHIP BETWEEN RELIGIOSITY AND SPIRITUALITY

In Nascimento's (2017) work, the interviewees defined religion as a socially shared belief and system of ideas. This system is composed of several concepts, doctrines, beliefs, among others. Religiosity, on the other hand, encompasses religion as ideas systematized by social groups and concerns personal beliefs. Spirituality, on the other hand, may or may not be related to religious belief, but it is focused on the search for meaning in life.

Nascimento (2015) presents in his research the discussion on the theme of spirituality and religiosity in Gestalt therapy. The author conducted interviews with 198 psychologists on the subject of spirituality and found a great understanding on the part of the interviewees, which encompassed transcendental and immaterial aspects, understanding spirituality as part of human existence in general. However, the author also described the participants' difficulty in conceptually differentiating between spiritual and religious practices, which is partly due to the lack of an approach to the subject in the training of psychologists. In this sense, the author emphasizes the importance of a more specific approach to the subject and the realization of studies in this direction for theoretical questions and reflection on gestalt practice.

In turn, Lousada (2017) seeks to understand the concept of spirituality in literature. The author points out that, although the theme is presented in a beneficial and useful way, none of the authors analyzed adopts a single definition, and it can always be associated with the improvement of self-concept, autonomy, health and quality of life. The author also highlights the difficulty of professionals in determining which place spirituality should occupy, as well as a more complex and broader conception of the human being, considering it as an inherent and constructive aspect of the subject.

The researched literary sources understand spirituality as an object of study in psychology, as they recognize its impact on people's lives. The articles highlight the importance of spirituality for a more human formation and believe that it is a foundation of educational practice, capable of assisting in the task of forming a human being (LOUSADA, 2017).

The results described by Silva (2017) showed, in general, an association between religiosity, spirituality, and mental health, highlighting specific relationships between mental disorders (such as mood disorder and alcohol use and abuse), and these relationships, in most cases, are pointed out as positive and predictors of health. In addition, the publications raise points about religious coping and its relationship with clinical conditions and stressful events, showing that, in most cases, religiosity presented benefits in stress management.

Although the present research focuses on the relationship between spirituality and psychology, this specificity appears only in 2 studies (D1, T2), in the others spirituality is related to religiosity or was not differentiated, always being presented in the R/E relationship.

The complexity of the theme was made explicit by the various positions presented, but it allowed the look at the theme to be given from a perspective that was not only individual of a certain theorist or small group, but that investigated a significant portion of the Brazilian gestalt community. (D1, p. 64,65).

“[...] Both in the area of psychology and in the area of health, difficulties were detected in forming a single and tangible concept about spirituality, since the multiplicity of uses that the word allows, makes difficult the task of "grasping" it, of "apprehending" it, of forming a unique and tangible concept about it". (D5., p. 171).

Nascimento (2017) and Câmara (2020) point out that religiosity involves cultural contexts mediated by institutions for its practice. The differentiation between the semantic fields of religion and religiosity is highlighted by a research,

[...] In the semantic field of 'religion', we identify the presence of religious symbols, linked to the totality of being, in religious myths, in representations of a sacred character, in rites and ceremonies. In the semantic field of 'religiosity', the symbolisms were shown to be related to the rituals of religious institutions, linked to intrinsic and extrinsic beliefs. (S3, p. 178).

[...] the sphere of religiosity refers to a social context, an adherence to the beliefs and practices of a religion, church, or institution (D5., p. 161).

Nascimento (2017) points out that according to Frankl and Jung there are approximations between religion and spirituality,

[...] Religiosity, that is, the experience of an institutionalized practice of a religion, is not mandatory for man to experience spirituality, but it promotes spiritual health; Religion is a significant and favorable possibility for man with regard to the attribution of meaning to his experiences of suffering; And the religious man is the one who, when he becomes aware of his ontological condition of transcendence, takes responsibility for his choices and approaches the wholeness of the being and, therefore, the integration of human dimensions for the sake of health. (T3., p. 177).

Nascimento (2015) points out that spirituality and religiosity have been increasingly sought to understand life, pointing out that the participants of his research defined spirituality as a "*biopsychosociospiritual factor* of the human being that composes our experiences, thus bringing an understanding of spirituality as a human dimension." (D1, p. 61) A similar result was found by Câmara (2020).

From the sphere of spirituality, understandings of the search for meaning, of unity, of connection and interconnection, of sacred character, of transcendence [...] that oppose materiality and promote the liberation of the immediate, the concrete, the here-now [...] a final group of forces, which comes out of the person and establishes a connection with something greater and more durable, such as the future, the divine, the universe. It is understood as something more individual, a personal relationship with something considered superior, sacred, divine [...] Despite having specific practical exercises, spirituality generally does not appear linked to an instituted form of religiosity [...] since many do not consider religion important in their lives, but declare that they believe in something sacred and live their spirituality in a non-religious way. (D5., p. 160).



This relationship of religiosity and spirituality, as a relationship and not equality, is also present in the literature of the area, and Boff (2006) and Costa (2010) point out the need to dismember them so that we can expand research in the area, a factor also pointed out in the analyzed works. This, according to the research analyzed, will allow the insertion of non-religious approaches in therapeutic treatments, but that incorporate experiences of consciousness.

TRAINING

Gandelman (2013) exposes the practice of religiosity/spirituality of psychology students through interviews with two students. For the interviewees, religiosity/spirituality was part of the process of choosing the profession and they had to deal with it internally for their personal development, seeking to understand psychology to understand the human being. The interviewees affirm that they separate the profession from the religious/spiritual practice well, without one interfering with the other. However, they report the lack of approach to the subject in their academic training and see psychology and religiosity/spirituality as conflicting, without knowing how to discuss these themes and clarify their divergences, possible approximations and distances.

Cunha (2017) mentions that the absence of the theme of spirituality in the training of psychologists generates both professional and personal difficulties, which hinders a practical approach. It is understood that there are several factors that influence the psychotherapist's personal and professional values, such as childhood and family experiences, culture, education, political affiliations, and approach to action and clinical care.

Nascimento (2017) aims to understand the relationship between religiosity/spirituality and psychotherapeutic practice in the academic training of psychologists in the state of Pernambuco. The logotherapy approach stands out, which is characterized by the exploration of the human experience based on the motivation for freedom and the meaning of life. Logotherapy seeks to find meaning in people and deal with suffering, guilt, and death. This approach presents a structured therapeutic method, with specific goals, procedures, and techniques for each patient who experiences some type of existential suffering.

Based on the statements of health professionals, it is evident that there is a need for training that is more focused on religiosity/spirituality.

In the professionals' statements, the need for training on the subject is very clear, in terms of the word "evidence". By searching for evidence for the use of R/E, they bring to the fore the commitment to offering a scientifically proven practice. (D4, p. 72).

Due to inexperience, lack of opportunity to deal with the subject during academic training and difficulty in relating religious and spiritual experiences in their training, the interviewees experience the separation of Psychology from the religious and spiritual dimensions as conflicting, and not being able to make an articulation between these dimensions, in the sense of discussing them and clarifying their dissonances. possible approximations and distances. (D3., p.70)tag.

However, the lack of preparation of future psychologists to deal with this dimension leads to the separation between Psychology and religiosity/spirituality, preventing the articulation and understanding of the dissonances and approximations between them.

[...] religiosity, spirituality and health in the practice of health professionals, pointing out that professionals need training more directed to training to manage the themes of religiosity and spirituality in their work contexts. (T3., p.174).

Other articles presented spirituality in relation to the training of health professionals, showing that it is a growing theme in the scientific environment and paying attention to the need for preparatory courses that allow professionals to experiment before offering them to patients; observed that these professionals have been including spirituality in their lives; and, finally, they believe in the growing importance of the theme for the health area. (D5., p. 171).

[...] A new look at professional training is needed, which contemplates the importance of debating religious and spiritual issues capable of guiding the conduct of future psychologists and reducing their doubts and conflicts in psychological care, focusing on the bio-psycho-social-cultural-spiritual development of patients. (D3. p.70,71).

The selected researchers emphasized that spirituality is being inserted in the areas of education and health, pointing to the importance of preparing professionals to conduct the theme in their professional environments, emphasizing the inclusion of the theme in the training of psychologists, physicians and health professionals. (D5., p. 167).

The need for more research in the area of spirituality is also mentioned, as mentioned by authors D2, D5 and T2. It is noted that:

[...] most of the authors who have published articles on R/E are not systematic researchers, or that the authors who systematically study the subject are not publishing in Brazilian journals of Psychology, but in journals of other categories or international [...] (D2, p. 30).

[...] To the proposals for the use of spirituality, the researchers suggest a new area called "Psychology of Spirituality" that would encompass the need to expand research that conceptualizes, differentiates and relates its components. (D5., p. 167).

[...] Regarding the academic activities in psychology that the respondents had performed and that made some mention of R/E, only 23 (8.7%) therapists participated in studies that addressed the theme. It was also possible to observe that most of the participants had already studied the subject on their own (183/69.6%) and had already gone to academic events related to the theme (123/46.8%). (D5, p. 85)

As for the theoretical frameworks used in psychology, it is identified that Logotherapy, Cognitive-Behavioral Therapy and Psychodrama are pointed out as influential in the context of religiosity and spirituality.

The theoretical frameworks that increase the chance of considering religiosity/spirituality issues "often or always" relevant were: Cognitive-Behavioral (38%), Eclectic (118%) and others (53%). What decreases the chance of the "often or always" relevant R/E questions was Behavioral (43%). With the exception of the theoretical references Cognitive and Psychodrama, the others increase the chance of asking "often" or "always" about religiosity/spirituality: Behavioral (103%), Cognitive-behavioral (228%), Eclectic (148%), Gestalt (137%), Psychoanalysis (44%) and others (51%). (T1., p. 92).



However, it is important to highlight that the behavioral and cognitive theoretical frameworks have a lower tendency to consider these issues as frequently or always relevant.

Regarding the theoretical frameworks in psychology as predictors of training in religiosity/spirituality, R/E approach and personal belief with the exception of the behavioral and cognitive theoretical framework, the others increase the chance of having training: Cognitive Behavioral (49%), Eclectic (153%), Gestalt (71%), Psychoanalysis (26%), Psychodrama (226%) and others (97%). (T1, p. 92).

This information highlights the importance of deepening the discussion and knowledge about spirituality in professional training and in the practice of psychology, as well as the need to encourage systematic research in this area.

The approach to spirituality within psychology varies according to different theoretical currents. According to Cavalheiro (2010), behaviorism and psychoanalysis tend to emphasize spirituality in a negative way, while aspects of humanism, existentialist, cognitive-behavioral approach and transpersonal psychology understand it as a determining and positive aspect in the psychological structure. (GENTLEMAN, 2010).

However, the spiritual dimension, in many moments, is treated as a taboo subject in Psychology graduation. It is a topic that is little discussed by students and teachers, and it represents an element of paramount importance in future therapeutic interventions, in view of its effectiveness in caring for the subjectivity of the client who seeks help from a psychologist. (SCORSOLINI-COMMIN, 2015).

PSYCHOLOGICAL PRACTICE AND SPIRITUALITY

In Paulino (2019), it showed that 62% of respondents believe that religiosity/spirituality (R/E) is beneficial for mental health. However, 65% of respondents do not consider R/E relevant to their patients' treatments. The author suggests that this divergence occurs due to the lack of specific training on how to deal clinically with this issue, as stated by the interviewees. The author also states that training and practice increase belief in the benefits of R/E for mental health, resulting in an increase in patients' questions on the subject, which he considers relevant.

Gandelman (2013) explores the practice of religiosity of psychology students through interviews with two students. For the interviewees, religiosity/spirituality was part of the process of choosing the profession, and they needed to work internally on this issue for their personal development, seeking to understand psychology as a way of understanding the human being. The interviewees affirm that they clearly separate the profession from the practice of religiosity/spirituality and see psychology and R/E as conflicting, without knowing how to discuss the subject and clarify their differences, possible approximations and distances.

In the work of Cunha (2017), we seek to understand religiosity/spirituality in the clinical context of psychotherapy professionals and how these professionals perceive, consider and incorporate these aspects in their clinical practices and in their lives. The author also describes the difficulty faced due to the lack of approach to the subject during graduation. The data obtained in its analysis are based on a sample of 24 respondents, divided into 2 studies. Study 1 aims to know the professional reality of psychotherapists in relation to their clinical experiences and the dimension of religiosity/spirituality (R/E). The author points out that R/H manifests itself both as an important resource for intervention and as an obstacle to the development of certain conditions, which suggests the need for greater dialogue between them.

Based on the participants' answers, it was possible to identify that R/H is important in people's lives and is present in the psychotherapeutic relationship, even if indirectly. For the professionals interviewed, it is a relevant dimension in people's lives, but it is not necessarily important in their own lives. They frequently employ an argument from authority to recognize their importance from a scientific standpoint. The reports show that R/E helps in moments of greater tension, gives meaning and organizes the lives of most people, helps in the follow-up of psychotherapy and reveals that some people need religion more than others. However, there are several conflicts between patients and religion, especially when life practices are not in accordance with religious rules, as in the case of sexuality, which generates conflict (CUNHA, 2017).

In study 2 by Cunha (2017), the author aims to know how psychotherapists experience R/E in their personal lives and how this dimension relates to work in clinical psychology. It was found that most psychotherapists have some form of religious/spiritual belief or experience that permeates their relationship with psychotherapy, indicating an interest in including this theme in the discussions, even if it goes against their beliefs.

Nascimento (2017) interviewed three professionals and three interns to evaluate the theme of R/E, dividing it into four categories: personal information; religious symbolism; religiosity/spirituality and self-knowledge in the interviewees' experiences on the subject (teaching and psychotherapeutic practice, relationship between religiosity and/or spirituality and psychopathology, work and supervision space, and positions of psychology councils on the subject); and the experiences of the students/trainees in the academic training, the faith of the psychotherapist and the interventions of the psychotherapist in the face of this theme.

Based on the experience of the interviewees, the teaching experience adds to the situation of science and helps to get out of scientism. Students, on the other hand, are more focused on issues related to religion and religiosity. In practice, there is a need for the psychotherapist to be aware of the interferences of its contents and highlights the importance of the discipline of psychopathology and the debates that relate mental disorders to social and culture.

Camera (2020) analyzed the perception of cognitive-behavioral therapists in relation to the religiosity and spirituality of their patients during the therapeutic process. Their work was carried out with 263 participants and found the clinical experiences, where the methods most used by professionals for treatment were mindfulness-based cognitive therapy, acceptance and commitment therapy, dialectical behavioral therapy, compassion-focused therapy and metacognitive therapy.

The first part of the questionnaire addressed the participants' opinion on the importance of attributing and investigating the influence of R/E on some aspects of treatment, classifying it as very important in the belief system (40.7%), in the well-being (40.7%), in the quality of life (37.3%) and in coping with adversities (39.5%). The results described by Câmara (2020) show that R/H is more linked to the psychotherapist's relationship with religion/spirituality than to their professional training. He adds the need for more initiatives in the context of undergraduate, graduate, research, among others, that can better train professionals in the area to address the subject.

Silva (2017) presents the results of the Brazilian panorama on the relations between religion, spirituality and psychology. He analyzed a general collection of 182 articles and 10 articles in more depth. Its results reveal a critical analysis indicating that the published studies do not demonstrate a practical relationship between the psychologist's profession and R/E. Although many authors point out these practices as positive, most point them out as negative.

Based on Silva's (2017) literature review, the method of coping with problems is presented, in which both religion/spirituality and psychology help the person to overcome and relieve symptoms. However, the practice of coping through R/E is not approved by psychologists in general. The author describes three styles used by people to deal with difficult situations: self-directed, delegating, and collaborative. In the former, the individual takes responsibility for his or her problems; in the second, he expects everything from God without acting; in the third, they work together. In any case, the person seeks meaning, control, spiritual comfort, contact with God and people, and transformation of life.

The articles analyzed in the research indicated several points of view, which are described as follows: religious belief seems to have associations with personality factors; Specific religious orientations show that certain beliefs can contribute to the occurrence of mental illness; The influence of religious aspects on the healing and treatment of diseases throughout history is described; Religions are capable of affecting specific brain structures and resulting in psychiatric symptoms. In general, the articles presented positive and negative points of coping (Lousada, 2017).

The analyzed studies reveal the importance of religiosity/spirituality in the psychotherapeutic context:

[...] Most of the professionals stated that they think that religiosity/spirituality helps patients to cope with the disease and suffering (sometimes 35.5%, often or always 56.9%), as well as

leading the patient to a state of positive and hopeful thinking (sometimes 37.6%, often or always 55.8%). (T1, p. 79).

For most of the interviewees (n = 14), R/H is a subject of professional interest because it is manifested and, in most cases, important for their patients [...] (D4, p. 71).

These aspects highlight the need for professionals to be prepared to address and understand the religious/spiritual dimension in clinical practice, aiming to offer comprehensive care that is sensitive to the needs of individuals seeking psychological support.

All interviewees recognize that issues related to R/E appear in the patients' discourses, but they are not always configured as a demand to be addressed [...] (D4, p. 64).

This indicates that religion and spirituality are themes that emerge and permeate the clinical context. However, although relevant, these therapeutic proposals still lack sufficient study material to be considered more effective than conventional mental health treatments.

[...] As for clinical practices, reflections are presented on the role of these cognitions and their impact on treatments when they are addressed directly or indirectly by mental health professionals. At this point, some therapeutic possibilities are described that are already proposed to incorporate these variables, in addition to demonstrating results obtained from them. Although these proposals are relevant, they do not present sufficient study material to consider them more effective than conventional mental health treatments. [...] (D6, p. 93, 94).

Despite this, it is important to note that spirituality has emerged during psychotherapeutic consultations in a significant percentage of cases.

[..] The theme of spirituality having already emerged during psychotherapeutic care, we found a total of 89% of affirmative answers, which is a confirmation of the importance of studies such as this one in which the interface between spirituality/religiosity and psychological clinic are discussed. (D1, p. 57).

Since R/H is a subject that arises and permeates the clinical context, either by the investigation of professionals or even spontaneously from patients, some professionals use R/E as a resource or therapeutic strategy to guide interventions, when necessary. (D4, p. 36).

Thus, the citations point to the frequent presence of religiosity/spirituality in the clinical context, the need for an appropriate therapeutic approach, and the recognition of the importance of these issues by both professionals and patients. However, they also highlight the lack of substantial scientific development in this area and the need for more research and specific studies to support therapeutic interventions related to religiosity/spirituality.

It is considered that the unanimous recognition of the importance of R/E among the interviewees conveys a message that psychotherapy is a space to talk about everything, enabling these professionals to deal with religious/spiritual feelings and behaviors, which does not necessarily mean having the skills and knowledge to do so. (D4, p. 30).

[...] There are also demands that religious/spiritual issues be discussed and psychotherapeutic focused, which does not inhibit professionals from working on the subject, even if, for the most part, training has been considered deficient in relation to the subject. (D4., p 29).

[...] The influence of the interviewees' religiosity and spirituality on their clinical practices causes insecurities in the students when they are faced with religious and spiritual issues. (D3., p.70)

The specific scientific production on the relationship between religiosity/spirituality and mental health is described as quite restricted.

[...] The articles, all published in a little more than a decade, tend to discuss 94 relationships between psychological variables from various theoretical foundations without exploring more deeply the relationships with religiosity/spirituality. In other words, the specific production in this area is quite restricted. Journals specialized in the publication of studies in this field present few studies that relate religiosity, spirituality and mental health and most of them do not deal with the therapies themselves, being more focused on the evaluations of religious cognitions and mental health [...] (D6, p. 93, 94).

Cavalheiro and Falcke (2014) conducted a research with psychologists trained in different theoretical approaches on the relationship between these and Spiritual Well-Being. Through the results obtained, the authors ponder that the personal experiences of psychologists with spirituality influence the choices of theoretical approaches, and the opposite is also true. Thus, the participants who presented the highest index of Spiritual Well-Being, to the detriment of other approaches, were from the theoretical perspectives: Humanism, Gestalt therapy, Systemic, Jungian and Phenomenological-Existential, all of which occurred in the approaches that most open space to talk about spirituality.

FINAL THOUGHTS

It was possible to identify, from the studies carried out, the relationship between the practice of psychology and spirituality as a complex theme. Most authors describe the lack of approach to the subject, especially in undergraduate courses, which makes it difficult to deal with it efficiently.

The subject demonstrates the need for more studies focused on the area, as there are several understandings about psychology and spirituality, there is no distinction between religiosity and spirituality, and authors who point out this need since spirituality is a belief system that encompasses subjective elements that give meaning to events in people's lives. The studies indicate that although most psychologists have religious affiliation, they themselves seek to know more about the subject, leaving aside their beliefs to perform treatments with patients.

The theoretical currents that underlie the research are linked to the objectives of three works, being respectively Gestalt, Cognitive-Behavioral Therapy, Logotherapy/existential psychology and Analytical Psychology. Several treatment techniques are cited by the authors, such as mindfulness-based cognitive therapy, acceptance and commitment therapy, dialectical behavior therapy,



compassion-focused therapy, and metacognitive therapy. Logotherapy seeks to explore the human motivation for freedom and meaning in life, seeking to find meaning in people and dealing with suffering, guilt, and death.

Each person is unique in their religious and spiritual experience, and it is essential for psychology professionals to take an individualized approach when dealing with religious and spiritual issues. For many people, spirituality is a significant source of emotional support, meaning, and purpose. This means acknowledging and respecting each patient's beliefs, values, and spiritual practices, tailoring treatment according to their specific needs. They should not impose their own beliefs on patients, nor should they devalue or belittle their religious and spiritual perspectives.

In relation to the objective of the work, which was to analyze the scientific productions about psychology and its relationship with the themes of spirituality, it was achieved, identifying still scarce Brazilian production in the area and the indistinction between the concepts of religiosity and spirituality. It is suggested that further studies be carried out in the area, especially in relation to how the theme has been treated in the training of psychologists, its presence in the curricula and the content addressed.

As future psychologists, this work contributed, opening a margin for new searches and research on the contents of spirituality, religiosity and what these themes can add to psychology, because as a subject of such a complex subject, and so important for academic life and beyond, the continuity of this theme is of paramount importance.

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Exploring the potential of augmented reality in astronomy teaching: An experience report with elementary school teachers and physics undergraduate students

 <https://doi.org/10.56238/sevned2024.010-034>

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ABSTRACT

Despite the great fascination that the study of the cosmos can arouse, it can become somewhat vague and difficult to understand. This article is an experience report of the use of Augmented Reality (AR) in the study of astronomy, addressing elementary school teachers and also students of the physics degree course. AR is an innovative tool and its use allows a closer approach to reality, making the study more engaging and immersive, enabling the exploration of astronomical concepts from a new perspective. The methodology employed includes the use of augmented reality artifacts as a means of astronomical observation and exploration, using mobile devices connected to the internet network. In addition, a qualitative questionnaire was applied in order to collect the participants' perceptions. This contributes to discussions about the use and potential of AR in the educational sphere, thus promoting new approaches to the teaching of complex and often abstract concepts.

Keywords: Astronomy, Augmented Reality, Education, Science Teaching, Innovation.

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INTRODUCTION

Astronomy is considered the oldest of the sciences, a source of knowledge and a questioner of the emergence of other knowledge, it studies the formation and evolution of the universe. As a discipline that investigates celestial bodies and cosmic phenomena, it faces several challenges in relation to the approach of these concepts, which often proves to be quite complex to students. As reported by LANGHI and NARDI 2010 "Astronomy Education can take place in several areas, such as formal, informal, non-formal education and in activities called science popularization". The search for tools that help and also enrich the experience of education has led educators and researchers to search for new technologies and teaching methods. According to VALLEJO, 2007 "Contemporary society lives in the so-called Information Society, a society based on the use of New Information and Communication Technologies (ICTs) and the management of large amounts of information".

In complex studies such as the astronomy segment, the possibility of using an innovative solution arises, Augmented Reality has proven to be a promising tool, making the exploration of the universe a more interactive and engaging experience for students. According to ARAÚJO 2009, "this technology allows, from the projection of non-existent objects or phenomena, a greater interaction between the student and the exposed content, enabling a better understanding of what was previously only in the imagination, without, however, requiring a broad knowledge of the technology on the part of the student".

In order to transform the way students interact with the study of astronomy, AR can bring greater immersion and a more tangible understanding of cosmic phenomena, being able to bring reality closer to the abstract, making it easier for students to understand.

This article presents an experience report of the application of Augmented Reality in astronomy education, both with school teachers and with students of the physics degree course. The aim is to investigate how the incorporation of AR can enhance the learning process, stimulate curiosity and enable future educators to impart astronomical knowledge in an engaging way, enhance participants' understanding of astronomical phenomena, as well as investigate the benefits and challenges of this technology.

Throughout this work, we write about the practical activities carried out during the application of AR, as well as the perceptions, opinions and reactions of the participants to the use of this tool. The verification of the results will allow us to explore the pedagogical benefits and the effectiveness of this application in the context of astronomy education. Finally, we highlight the conclusions reached with this experience, consider the implications, highlighting the opportunities that this tool can offer in the contemporary educational environment.

By sharing these experiences and reflections, we aspire to contribute to the discussion on the possibilities of pushing technology to make astronomy not only accessible but also instigate a passion



for the subject, providing educators and students with a new perspective on the cosmos and inspiring future scientific explorations.

PURPOSE AND RESEARCH QUESTIONS

This study aims to find out what are the potentials of AR in the sphere of education and how it is welcomed by the user. Therefore, we investigate how augmented reality can contribute to the process of learning and understanding in the field of astronomy.

The following research questions were addressed using a Likert rating scale:

1. To what extent has Augmented Reality made or will make the class more interesting and interactive?
2. Does Augmented Reality contribute to the understanding of astronomical concepts during class?
3. How would you rate the interface and usability of Augmented Reality devices used in the classroom?
4. Based on experience with Augmented Reality, do you consider the technology to be a valuable tool for teaching in general?

METHODOLOGY

BACKGROUND

In Brazil, the teaching of Astronomy is within the framework of Natural Sciences and follows the National Curriculum Parameters (PCN), it is offered in the 3rd and 4th cycles of elementary school, which is equivalent to 6th, 7th, 8th and 9th grades. Chart 1 summarizes the core contents of Astronomy for the 3rd (6th and 7th grade) and 4th (8th and 9th grade) cycles of Elementary School.

Table 1: Astronomy contents proposed for the 3rd and 4th cycles of Elementary School by the National Curriculum Parameters

Astronomy Contents (PCN)	
3rd Cycle	4th Cycle
<ul style="list-style-type: none"> - Length of the day at different times of the year; - Rise and sunset of the Sun, Moon and stars; recognize the cyclical nature of these events and associate them with cycles of living beings and the calendar; - Conception of the Universe: information about comets, planets and satellites and other stars of the Solar System; - Constitution of the Earth and the existing conditions for the presence of life; - Valuing the knowledge of ancient peoples to explain celestial phenomena. 	<ul style="list-style-type: none"> - Identification of celestial bodies, constellations, planets apparent in the sky during a certain period of the year and the distance they are from us; - Gravitational attraction of the Earth; - Seasons; - Geocentric and heliocentric theories; - Structuring of the Earth; Position of the Earth.

Source: Adapted from Brazil (1998).



With regard to the study of Astronomy in Higher Education Courses, it follows the Pedagogical Project of the Course (PPC). Chart 2 summarizes the Astronomy content of the Physics Degree Course that was the object of this study.

Table 2: Contents of the U.C Fundamentals of Astronomy and Astrophysics proposed for the 4th semester of the Physics Degree Course according to the PPC.

Fundamentals of Astronomy and Astrophysics Content
4th Semester
- Astronomical scales.- Apparent movements of the stars. - Astronomical coordinates and time measurements. - Seasons and eclipses. - Planetary motion.- Determination of distances. - History of Astronomy.- Development of geocentric and heliocentric systems.- Kepler's laws and Newton's Universal Gravitation. - Radiation theory concepts. - Stellar spectres. - Stellar structure and energy sources. - Stellar formation and evolution. - HR diagram. Milky Way. Galaxies and the Universe. -Cosmology. - Current concepts

Source: PPC Degree in Physics (2013).

The study was carried out with two distinct classes: *Class 1* composed of elementary school teachers and *Class 2* formed by students of the Physics Degree Course, both with previous knowledge in Astronomy. Each experimental session lasted approximately 90 minutes, during which participants explored the theme of Astronomy through AR Cards, using mobile devices. Part of the process was recorded and later transformed into a video made available on the Youtube platform (GIÁCOMO ANTÔNIO ALTHOFF BOLAN- 2023).

"Augmented reality serves to complement the real world with virtual (computer-generated) components, making real physical objects and virtual objects coexist in the same space of the real world" AZUMA, 2001. Also according to AZUMA 2001, "an augmented reality system must have three properties: combining real and virtual objects in the real environment; be interactive in real time and align real and virtual objects with each other, putting them on the same plane." "Thus, we can say that augmented reality is a complementary system to the real world, adding virtual components, such as sounds, images and videos to real objects, enriching the user's experience with that environment and/or real object through technological tools, such as tablets and smartphones" KIRNER, 2011.

The Augmented Reality Cards focusing on the theme of Astronomy is a tool developed by the Laboratory of Computational Technologies of the Federal University of Santa Catarina, it allows the student to explore the cosmos in an interactive way. Each card has its own peculiarities to be explored, stimulating the curiosity of the user who, through a mobile device, will access three-dimensional images. With the cards it will be possible to immerse yourself in the visualization of the core of each planet, understand its particularities, observe the movement of the solar system, get to know space stations and unveil countless curiosities about the universe.



PARTICIPANTS

In all, 31 members participated in the experiment, divided into two groups. Class 1 composed of 10 elementary school teachers (mean age 39 years). Class 2 consisted of 21 students of the Physics Degree Course (average age 25 years, excluding one 61-year-old participant, who was not considered in the calculation).

While participants were familiar with digital technology in everyday life, many had no prior knowledge of augmented reality concepts nor knowledge of the differences between virtual reality, mixed reality, and augmented reality. Faced with this gap, we have made a brief explanation to introduce these concepts, followed by a practical demonstration of the application of the AR Card. All those involved in the study participated voluntarily with authorization for image use and research.

DATA COLLECTION

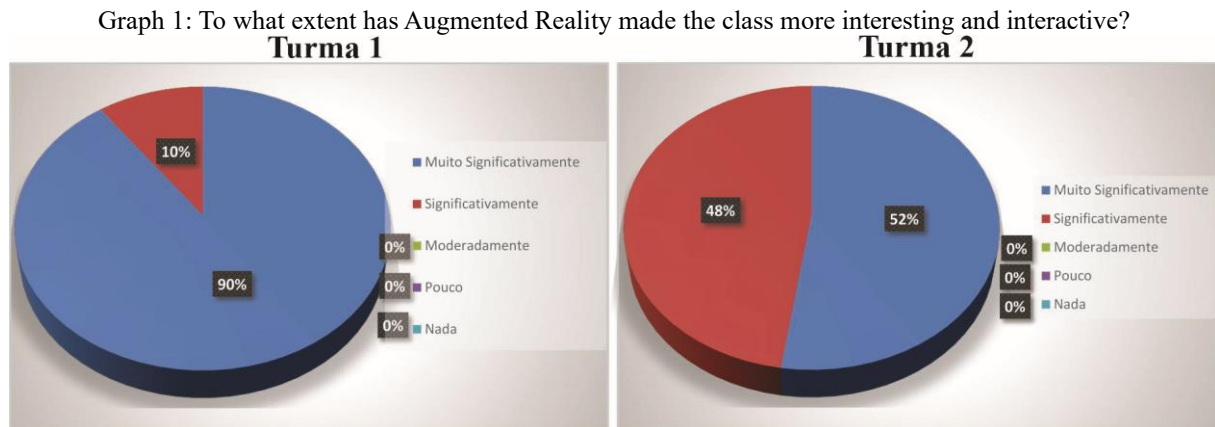
After the delivery of the Augmented Reality cards, a period of time was dedicated for the participants to experience and take advantage of all the possibilities offered by the material. In this process, the involvement of the participants was noticed, who made a point of recording their findings and showed considerable enthusiasm with the new tool. Even though they have a certain affinity with the proposed theme - astronomy - those involved highlighted the richness of the experience provided by Augmented Reality. A culminating moment of the R.A. workshop was the use of the *quiz* proposed on the cards, which by recommendation we asked to leave this activity for the end, after having explored all the material, at this point everyone was able to apply the knowledge in an interactive way. followed by the application of a brief questionnaire consisting of four questions using the Likert rating scale. In *Appendix 1* we will find the model of the questionnaire applied in both classes. This interactive element not only reinforces the concepts covered, but also enriches the engagement, allowing participants to test and broaden their understanding.

To obtain data about the experience, participants were asked to complete a questionnaire consisting of four questions, covering aspects of their experience with augmented reality. The questionnaire, based on the Likert rating scale, offered a valuable opportunity to capture nuances in participants' perceptions, thus enriching data collection.

For a better understanding of the methodological approach and the participants' responses, see *Appendix 1*, which includes the questionnaire model applied in both classes. This appendix provides a detailed overview of the issues that have guided the evaluation and reflection on Augmented Reality experiences in astronomy education.

ANALYSIS OF RESULTS

The analysis of the results was conducted in a segmented way by class, since we wanted to observe separately the perception of teachers and undergraduate students, the latter future teachers. The sequence presented below reveals graphs that highlight the percentage distribution of responses obtained for each question.



Graph 1 shows that in the first question, *Class 1* answered in its vast majority, that Augmented Reality gave the classes greater interest and interactivity *Very Significantly*, alternative *A* by 90% of the interviewees. However, in *Class 2*, this rate is 52%. Also in this question, 10% of *Class 1* say that the R.A. made the class more interesting and interactive *Significantly*, alternative *B*, while *Class 2* chose this answer in 48% of the cases. Alternatives *C* - Moderate, *D* - Little and *E* - Nothing were not selected in any of the classes.

The analysis of the results of this question revealed a remarkable difference in cognition between *Class 1*, formed by elementary school teachers, and *Class 2*, by undergraduate students in physics. In *Class 1*, the response was very positive, with 90% of the participants indicating alternative *A* that augmented reality brought a *Very Significant increase* in the interest and interactivity of the classes, indicating the capacity for strong receptivity to this innovative approach. In addition, the fact that 10% of *Turma 1* participants chose alternative *B* – *significantly*, suggests that, even among them, augmented reality has a markedly positive effect, albeit perhaps in a reduced way.

In *Class 2*, where future teachers were present, the rate of 52% for alternative *A* - *Very Significant* showed that a smaller percentage of students noticed the same interest and interactivity than in *Class 1*. At the same time, 48% of responses to alternative *B*-*Significantly* indicated that a significant portion of group 2 also recognized the positive impact of augmented reality, albeit to a lesser extent, compared to group 1. The absence of responses to alternatives *C*-*Moderate*, *D*-*Little*,

and *E-Nothing*, in both classes suggests that most participants noticed improvement in classes through the use of augmented reality.

Chart 2: Does Augmented Reality contribute to the understanding of astronomical concepts during class?
Turma 1 **Turma 2**



In question number 2, where it is questioned whether Augmented Reality contributed to the understanding of astronomical concepts during class, we observe through Graph 2, that subtleties arise between the two classes involved. *Class 1* expressed great appreciation regarding the understanding of astronomical concepts, with 100% of the answers to alternative *A* - Yes, in a clear and relevant way. This suggests that the class understands that this technological tool has notorious efficacy in fostering a more effective and complete assimilation of the topics addressed. On the other hand, in *Class 2*, 67% of the participants also opted for alternative *A*, evaluating Augmented Reality as an aid in understanding the concepts. This response may represent the ability of these future teachers to recognize the positive impact of technology on the absorption of concepts, as they prepare to act as facilitators of learning. In the same question, 33% of *Class 2* chose alternative *B* - Yes, but partially. This choice may indicate that, despite acknowledging the contribution of Augmented Reality, some students identified limitations in its application, perhaps observing that the tool did not cover all particularities of the content. Alternatives *C*- Didn't make a difference, *D* - I'm not sure, and *E* - Didn't contribute, were not selected by any of the classes. This suggests that the general consensus is that Augmented Reality has indeed influenced the understanding of astronomical concepts, despite the differences in nuances of perception among participants.

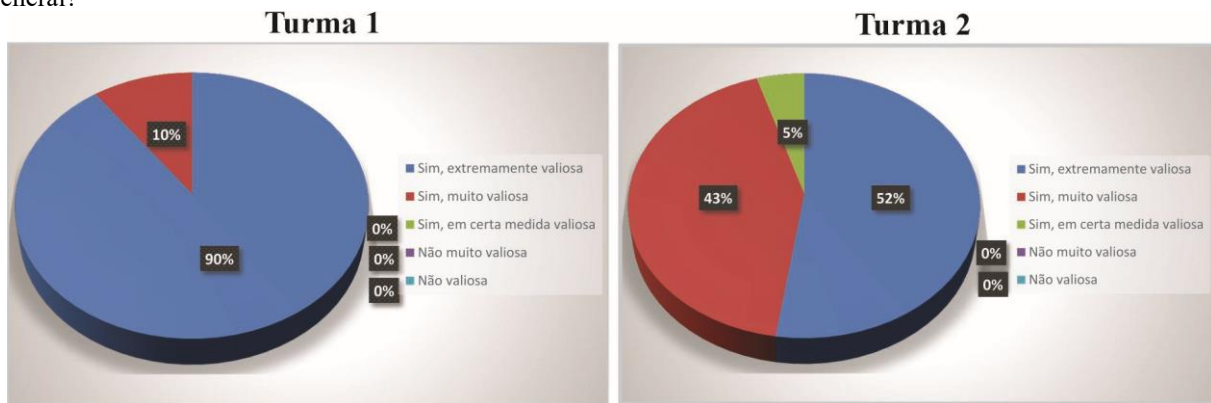
The difference between the responses of the two groups may be related to the different perspectives and experience levels of the participants. The fact that *Class 1* teachers consider the impact to be more apparent may be influenced by their teaching methods and their perception of students' needs.

Graph 3: How would you rate the interface and usability of Augmented Reality devices used in the classroom?



In the third question, we observed through Graph 3 that the teachers of *Class 1* opted 100% for alternative *A*, Classifying the interface and usability of Augmented Reality devices - Very easy to use and intuitive, demonstrating a high degree of satisfaction with the usability of the tool. This suggests that these participants felt comfortable with the technology, and that the educational institution where the experiment took place had an adequate technological infrastructure and effective internet connectivity. With the students of *Class 2*, we had 60% of the participants also choosing alternative *A*, demonstrating a relevant degree of accessibility and ease of use of the technology. In addition, 25% opted for alternative *B* - Easy to use, but with some difficulties, demonstrating that, despite having a mostly positive experience, some specific obstacles or challenges are encountered when using the device. We noticed that 15% of the students in *Class 2* chose alternative *C* - Acceptable, but it could be better. This response indicates the possibility of improvement, and that even if the perception has been positive, there is room for improvement. None of the participants chose alternative *D* - Difficult to use and unintuitive and the alternative *E* - Very difficult to use. Demonstrating that even when faced with specific challenges, none of the participants found the technology inherently difficult or inaccessible. The analysis of these results highlights the importance of preparing technology for the educational environment, as this is still the biggest limiting factor in the context of the adoption of new technological tools. In addition, it demonstrates that although most have positive experiences with the ability to use AR, the existence of varied responses suggests that continuous adjustments can be made to improve the user experience and integrate this technology into an educational context.

Chart 4: Based on your experience with Augmented Reality, do you consider the technology a valuable tool for teaching in general?



We can see in Graph 4 that *Class 1* considered AR technology to be a valuable tool for teaching in general. In this class, 90% of the teachers opted for alternative A - Yes, extremely valuable, denoting a consensus regarding the contribution of the AR in the teaching process. In addition, 10% of this same class considered alternative B-Yes to be very valuable, which emphasizes the positive perception of the tool.

In *Class 2*, a similar trend is evident, but with some nuances. Alternative A - Yes, extremely valuable, an option of 52% of students, reflects a strong acceptance of Augmented Reality as a pedagogical tool. In addition, 43% of the participants in *Class 2* chose alternative B - Yes, very valuable, significantly sharing the opinion that technology is beneficial for the learning process. However, 5% of the students chose alternative C - Yes, to some extent valuable, which suggests that the participants see potential in AR applied in the classroom, but also perceive limitations, which demonstrates that the technology can be improved. Options D - Not Very Valuable and Option E - Not Valuable was not selected by any participants. This shows in a consensual way that Augmented Reality is a technology of great value both in the opinion of teachers and future teachers.

The presence of some variation in responses may have been affected by previous levels of exposure to different technologies, individual expectations, and level of familiarity with innovative pedagogies. These results indicate that AR has the potential to enrich and enhance educational experiences, thus promoting greater engagement and understanding in the classroom.

DISCUSSIONS AND CONCLUSIONS

This research explored the perceptions and experiences of Elementary School teachers and Physics students about the use of Augmented Reality as a teaching tool in Astronomy. The results show many important things about how technology can help in education.

To begin with, it is notable that Augmented Reality has been well received by participants as a means of increasing interest and interactivity in astronomy classes. This finding indicates that technology can attract students' attention and improve the learning process by offering an innovative



and effective way to teach. The answers are mostly positive, and it proves that Augmented Reality can help and increase student engagement.

The results obtained with both classes, but especially with *Class 2*, show that an adequate technological infrastructure is necessary for a successful implementation of Augmented Reality in schools. Participants' emphasis on ease of use and ease of use of devices underscores that having an effective internet connection and high-quality devices are essential to optimizing the experience for students and teachers. It is noted that the perception of the effectiveness of Augmented Reality may vary according to the experience and needs of the participants, as demonstrated by the divergences in the answers between the classes. The Physics Degree students, while knowing that technology is useful for teaching, noted the details of the applications and possible improvements, despite the overall flexibility of the technology as a benefit to teaching. This indicates that teachers' knowledge of technology helps is extremely important for the success and applicability of the tool.

It is important to highlight that the class formed by teachers observed several forms of applicability of the material, not only in the classroom, but as a tool that can be taken home and explored with the family, applying individual or team work. They also raised the possibilities that R.A. can offer in various subjects and disciplines, such as mathematics, bilingual education, history, geography, animal world, in fact the perception is that there are no limits to the topics that can be addressed with the use of this technology.

This study provided useful information on how Augmented Reality can be used in education, particularly in astronomy education. Participants' perceptions show how Augmented Reality can increase student participation, interactivity, and understanding. The predominance of positive evaluations shows that technology can improve pedagogical strategies, even if there is variation in responses.

The reality that a technological infrastructure plays an important role in the effective use of Augmented Reality shows that investments in this area must be made to maximize the use of this educational tool, as this proves to be one of the barriers to be overcome. In addition, the variety of responses among classes indicates that technology training is important to enable more efficient and comprehensive integration into educational curricula.

Finally, we believe we have achieved the objective initially proposed, since in this study it was demonstrated that Augmented Reality has the potential to change the way of working in the classroom, as it can make learning more interactive, fun and effective. However, in order to successfully achieve this potential, it is necessary to consider not only the technology of the tool in question, but also the teacher's need and the technological infrastructure available. Teachers, technologists and educational managers must work together to create a favorable environment for the



use of Augmented Reality as an educational tool that can effectively contribute to the educational process.

THANKS

We would like to thank Professor Eliane Pozzebon, and Labtec of the Federal University of Santa Catarina for their valuable work in the creation and development of R.A. in schools, as well as for the support that made this study possible. Special thanks also to the teachers and students who participated in this experiment.

This research did not receive any specific grants from public, commercial, or non-profit funding agencies.



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APPENDIX 1:

FEDERAL UNIVERSITY OF SANTA CATARINA CAMPUS ARARANGUÁ GRADUATE PROGRAM IN INFORMATION AND COMMUNICATION TECHNOLOGIES

Age of the interviewee: _____


1. To what extent has Augmented Reality made the class more interesting and interactive?
 - a) Very significantly
 - b) Significantly
 - c) Moderately
 - d) Little
 - e) Nothing

2. Did Augmented Reality contribute to the understanding of astronomical concepts during class?
 - a) Yes, clearly and relevantly
 - b) Yes, but only partially
 - c) It made no difference
 - d) I'm not sure
 - e) Didn't contribute

3. How would you rate the interface and usability of Augmented Reality devices used in the classroom?
 - a) Very easy to use and intuitive
 - b) Easy to use, but some difficulties
 - c) Acceptable, but could be better
 - d) Difficult to use and unintuitive
 - e) Very difficult to use

4. Based on experience with augmented reality, do you consider the technology to be a valuable tool for teaching in general?
 - a) Yes, extremely valuable
 - b) Yes, very valuable
 - c) Yes, to some extent valuable
 - d) Not very valuable
 - e) Not valuable

Transforming Civil Construction: Environmental seal as a mark of sustainable commitment

 <https://doi.org/10.56238/sevened2024.010-035>

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ABSTRACT

Sustainable Civil Construction, also referred to as green construction or green construction, seeks environmental certification as evidence of efficient evaluation in its process. Allied to this purpose, environmental certification seals play a crucial role. This article aims to present a compilation of information and considerations from several authors regarding the certificates available and most used in Brazil, to assist those who seek to validate their civil construction works with sustainable requirements. The origins and main characteristics of each seal are described. As a result, a table was developed that synthesizes information about each seal regarding the date of appearance, origin, responsible entity, categories and evaluation criteria, classification levels, among other aspects. Thus, this document offers, in a consolidated way, valuable information for decision-making in relation to the choice of certification, providing ease for those seeking certification and encouraging new research in the field.

Keywords: Sustainable Construction, Environmental Seal, Environmental Certification, Categories or Evaluation Criteria.

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INTRODUCTION

In the 2000s, there was talk and discussion about sustainable constructions and certification systems for sustainable enterprises (Environmental Seal), with the emergence of terms such as: ecological constructions, green constructions and buildings with environmental certification (TECHIO; GATES; COSTA, 2016). These construction models are considered as another form of *greenwashing* (false disclosure of sustainability, "green makeup" or "greenwashing") in the construction sector, and have had a direct impact on the definition that most people make about sustainability and, consequently, reverberate in the attitudes and actions of the consumer.

The credible environmental certification process should give builders of sustainable buildings the recognition and incentive to mitigate environmental impacts, and reduce the use of natural resources, which aims to encourage change, with a focus on the sustainability of the construction sector. They attest that the enterprise has a good environmental performance, making it known that the space has systems for saving resources and reusing materials, developing with environmental awareness (CONTO ET AL., 2017),

Environmental certification systems seek solutions and construction methods capable of reducing the impact on the environment caused by civil construction, "in addition to energy efficiency, quality of internal environments and user well-being, during the life cycle of a building" (PELLIZZETTI, 2017). Pellizzetti (2017) further states that:

Obtaining environmental certification for homes assures the owner that their investment was used as planned, meaning lower risks, better energy and water efficiency of the installed systems, reduction of operating costs, quality of internal environments and well-being of the user during the life cycle of the house (PELLIZZETTI, 2017, p. 37).

In order to implement the constructive sustainability currently recognized, several evaluation methodologies have been developed over time in order to implement the *Green Building*. The first building environmental assessment system was launched in 1990 in England. The so-called *Building Research Establishment Environmental Assessment Method* (BREEAM) and had an initial focus on new office buildings under construction. This model has been gradually expanded, and has been integrated with other certifications available in China and Pakistan, for example. In Brazil, the Green Building Councils make up the global network (WorldGBC), which develops and manages certification tools around the world (GBCBR, 2023 COSTA; CARVALHO; ALVES, 2021).

To obtain the certification (ecological seal), the construction process is subjected to strict criteria and constant evaluations, which guarantees consumers a safe source of information, with a high degree of credibility, bringing benefits to all parties involved (VALENTINI; FALCÃO, 2015). For the Entrepreneur, the certification promotes a significant increase in the speed of sales or leasing, asset stability, association of the company's image with environmental concern and improvement in

the relationship with environmental agencies and communities. For the Buyer, the benefits can be direct water and energy savings, lower condominium costs - energy, water, conservation and maintenance, better comfort, health and aesthetic conditions, and greater equity value over time. For Sustainability, the benefits are numerous, such as lower water and energy consumption, reduction of greenhouse gas emissions, reduction of environmental pollution, better health conditions of buildings, better use of local infrastructure, less polluting potential in areas surrounding the construction work, better working conditions and reduction of waste production (VALENTINI; FALCÃO, 2015, p.5/6).

For Albuquerque, Alves and Machado (2018), certifications are tools that guide the authenticity of buildings as recognized as sustainable. According to the evaluative capacity of each seal, there is responsibility and commitment to validate results, within extensive lists known as *checklists*.

It seeks to bring here considerations from several authors about the types of sustainable civil construction certifications available and most used in Brazil.

METHODOLOGY

This is a bibliographic research, and a search was carried out for articles, dissertations, theses, which exposed data on the importance of the use of sustainability seals in civil construction.

The literature review, according to Noronha and Ferreira (2000), is characterized by selecting works of greater interest, comparing and merging the main focuses on the subject; gathering recent works for the current interpretation of the case studied. Revision jobs are defined as:

studies that analyze the bibliographic production in a given thematic area, within a period of time, providing an overview or a report of the state-of-the-art on a specific topic, evidencing new ideas, methods, and sub-themes that have received greater or lesser emphasis in the selected literature (NORONHA; FERREIRA, 2000, p. 191).

It was based on a larger work in which we sought to know sustainable materials and/or construction techniques in Brazil. We searched the Capes Periodicals Portal, which hosts the main and well-known databases, such as: ACM Digital Library; Library, Information Science & Technology Abstracts; Nature; Oxford Journals; Science (AAAS) and Scopus scientific papers using the words: "sustainable civil construction models"; "sustainable construction" and "materials"; "types" and "sustainable construction"; "Sustainable Civil Construction" and "Methods"; "sustainable civil construction" and "techniques or materials"; "sustainable modes of civil construction"; "sustainable civil construction"; "materials" and "sustainable construction"; "Materials and construction building". In the end, we searched for "certifications and sustainable civil construction".

From the publications found, we selected those that, in some way, dealt with the application of seals in civil construction.

The main aspects of each seal were reported and the information was condensed into a table that can serve as a guide for the choice of the seal to be applied in a given civil construction with sustainable materials or techniques.

DEVELOPMENT

The main characteristics of each seal or certification that aims to characterize a civil construction as sustainable are presented here. The following are the most significant considerations of researchers who are a reference in this area about the main seals or certifications used in Brazil:

BUILDING RESEARCH ESTABLISHMENT ENVIRONMENTAL ASSESSMENT METHOD (BREEAM)

Created in 1990, the Environmental Assessment Method of Constructive Research (Building Research Establishment Environmental Assessment Method - BREEAM) was the first certification system. It was developed by the Building Research Establishment (BRE) in 1992. It is the leading and most widely used building environmental assessment tool in the UK, recognised as an internationally pioneering labelling.

According to Calixto (2016); Dagostin and Jorge (2022); Lemos (2017) and Coelho and Cruz (2017) would be the most widespread construction sustainability assessment system in the world. The document establishes good practices in the conception, design, construction, and operation of sustainable buildings, covering ten (10) categories, according to Table 1, and 15 criteria according to Costa, Carvalho, and Alves (2021). The evaluated items can be classified into six levels: unclassified, approved, good, very good, excellent, excellent (COELHO, 2017). Also, according to Summerson, Atkins, and Harrie (2023), this classification can be quantified on a scale of 0 to 100. Table 2 comparatively presents the two forms of classification mentioned. In both forms of evaluation, the classification is obtained by the sum of the percentages in each category of analysis. It is the most comprehensive seal and the one with the greatest depth of quality in the criteria related to environmental impacts (COSTA; CARVALHO; ALVES, 2021).

Table 1 – Categories evaluated by the BREEAM Seal

CATEGORIES
Water or water consumption
Waste or waste or residue management
Energy or energy consumption
Construction Management or Management
Innovation
Materials
Pollution or contamination
Health & Wellness or Health & Comfort
Transport
Land use or land use (ecology) or land use

Source: the authors, based on Lemos; Calixto and others

Table 2: Classification of categorized items for sustainability assessment in civil construction.

COELHO, 2017	Atkins e Harrie, 2023
Unrated	> 10 = not classified
Approved	10 < 25 = acceptable
Good	25 < 40 = approved
Very good	40 < 55 = good
very good	55 < 70 = very good
Excelente	70 < 85 = excellent
	85 = out of the ordinary.

Source: the authors with data from Coelho (2017) and Atkins; Harrie (2023)

According to Dagostim and Jorge (2022), BREEAM is the certification considered to be one of the most advantageous in terms of costs and international recognition. In English law, it defines tax benefits to the owner of the property, according to the points obtained when the building is classified. According to Calixto (2016), there are 13 variants, depending on the typology of the buildings, namely: single- or multi-family dwellings; eco-friendly homes; office buildings; commercial spaces; health units; schools; industries and manufacturing units; Courts; prisons; community centres and leisure facilities; data centers; buildings of diversified uses; buildings with adaptations to other countries.

The cost to obtain BREEAM certification corresponds, on average, to 1,100 pounds sterling, approximately R\$7,000.00 at the current exchange rate. However, there is the possibility of reducing this fee the more projects are registered on the platform. If, for example, up to 100 buildings enter the same process, it would be 20 pounds sterling per unit (~R\$130.00) (DAGOSTIN; JORGE, 2022).

Figure 1 shows examples of emblems or logos representing this seal. The variations of the seal image shown in Figure 1 have the same meaning (they do not represent different classifications), and are used according to the user's selection.

Figure 1 – BREEAM Seal Emblems (logos)



Source: <https://www.google.com/search?q=logo+do+selo+breeam>

LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN (LEED)

The sustainable seal "Leadership in Energy and Environmental Design" (LEED) emerged in Washington D.C., in the United States in 1998 and was developed by the non-governmental organization United States Green Building Council (USGBC), created in 1993, which is responsible for the documentary analysis of environmental sustainability practices, issuing the seal. It is one of the most recognized systems in the world, present in more than 160 countries (COAST; CARVALHO; ALVES, 2021; PELLIZETTI, 2017). This seal tends to prioritize performance through the application of systems that depend exclusively on technological products (ALBUQUERQUE; ALVES; MACHADO, 2018). It is evaluated the performance of the building, over the life of the building (CALIXTO, 2016).

The criteria that attest to the sustainability of the construction are: location and transportation; sustainable space; efficiency in the use of water, energy and atmosphere, materials and resources; indoor environmental quality; innovation and processes; regional priority credits (GBCBR, 2023; HERZER FERREIRA (2016); LIMA; RIOS, 2019; NUNES, 2018).

According to Calixto (2016), the system is based on points, when certain prerequisites are met. There are 5 main categories and 2 secondary categories evaluated as shown in Table 3, with 69 criteria according to Costa, Carvalho and Alves (2021).

Table 3: categories evaluated by the LEED sustainable seal and their respective scores.

Main Categories	Punctuation
Sustainable Locations	26 points
Water Efficiency	10 points
Energy me atmosphere	35 points
Materials & Resources	14 points
Indoor environmental quality	15 points
SUM	100 points
Secondary categories	Punctuation
Innovation in design	6 points
Regional priority	4 points
SUM	10 points

Source: the authors with data from Calixto (2016)

It is a method with a simple structure, with ease of understanding and adaptation. The Certification is valid for 5 years. It has 9 variants, depending on the type of buildings.

It is necessary to obtain at least 40, 50, 60 and 80 points to achieve the respective classifications of: Certified, Silver, Gold and Platinum; 110 being the maximum score that can be obtained. To grant the certification, an analysis is made based on the documents provided by the consultant, architect or owner, preferably before the beginning of the work, and through monitoring and photographic record during the execution, proving compliance with the criteria (COSTA; CARVALHO; ALVES, 2021).

The level of certification is defined by the final score as described in Table 4 (HERZER; FERREIRA, 2016; LARA, 2021; LIMA. RIOS, 2019; PELLIZZETTI, 2017).

Table 4: LEED Scores

Stitches	Levels
40 to 49 months	Certificate
50 to 59	Silver
60 to 79 months	Gold
Over 80	Platinum

Source: the authors

According to NUNES 2018, LEED-certified buildings "use less water, energy and resources, generate less waste and promote the well-being of the occupant during their construction, operation and maintenance". The LEED seal offers economic, social, and environmental benefits. Economic, such as reduction of operating costs, appreciation of the property, modernization, less obsolescence of the building. Social related to the improvement of the safety and health of workers and occupants, social inclusion, professional training and awareness of workers and users, increase in employee productivity, increase in user satisfaction and well-being, stimulation of public policies for sustainable construction. Environmental, such as rational use and reduction of natural resources, reduction of water and energy consumption, mitigation of the effects of climate change, use of materials and technologies with low environmental impact, reduction, treatment and reuse of construction waste (GBCBR, 2023).

LEED had its first adaptation to the Brazilian reality in 2014, with the GBC Casa certification. In 2016, Brazil "maintained the 5th position in the world ranking of LEED projects, with 380 certified projects and a total of 1,156 registrations, behind the United States, China, the United Arab Emirates and India" (PELLIZZETTI, 2017, p. 37). With the certification in Brazil, the buildings present savings in the value of the condominium of up to 30% by reducing energy and water and the cost of maintenance and renovations. A 20% increase in sales value is expected after 20 years of use (HERZER; FERREIRA, 2016; LARA, 2021; LIMA; RIOS, 2019; PELLIZZETTI, 2017).

According to the UGREEN website, the cost, in dollars, to obtain LEED certification follows certain steps, such as: a) registration fee ranging from \$1,200.00 to \$2,750.00 for new projects and from \$900.00 to \$1,750.00 for existing buildings; b) certification fee ranging from \$2,500 to

\$22,000.00 for new projects and from \$1,750.00 to \$15,000.00 for existing buildings; c) consulting fees ranging from \$10,000 to \$30,000; d) testing and verification fees, ranging from \$1,000 to \$10,000, plus additional costs (<https://www.ugreen.com.br/quanto-custa-a-certificacao-leed-um-guia-para-empresas-de-construcao/>).

Some emblems or logos representative of this seal can be seen in Figures 2 and 3. Figure 2 refers to the LEED image presentation badges. Figure 3 shows the emblems according to the classification obtained by the points achieved.

Figure 2 – LEED seal emblems (logos)



Fonte: <https://www.google.com/search?q=logo+do+selo+leed>

Figure 3 – LEED seal badges according to the classification obtained by levels: (a) certificate; (b) silver; (c) gold and (d) platinum.



Source: Lima and Rios (2019)

HIGH ENVIRONMENTAL QUALITY (AQUA)

Created and launched in Brazil in 2008, by the Venzolini Foundation (created, maintained and managed by the professors of the Department of Production Engineering at USP), based on the French HQE system, it is thus an international certification adapted to the Brazilian reality in terms of climate, culture, technical standards and legislation. It is a construction project management process, applied to buildings yet to be built or also to reconstruction or rehabilitation projects. Certificates are awarded for each specific phase of the project: program, design, implementation, operation or deconstruction. The evaluation is made by two standards: management system and enterprise (commitment of the entrepreneur, planned implementation and operation, monitoring and analysis of the entire management process) and environmental quality of the building (in the EcoConstruction groups, which covers matters, processes and systems and environmental impact;

Management; which comprises energy, water and waste management and maintenance); Comfort, which includes hydrothermic, acoustic, visual and olfactory; and Health, including sanitation, air and water quality) (CALIXTO, 2016; GOMES; MARTIN; MARINO; FERNANDES, 2016; LARA, 2021; VANZOLINI FOUNDATION, 2023; HERZER; FERREIRA, 2016; LEMOS, 2017).

The 14 evaluation categories are listed in Table 5. According to Costa, Carvalho and Alves (2021), there are 210 criteria, 110 of which are mandatory.

Table 5 – Evaluation categories of the AQUA Seal

EVALUATION CATEGORIES	EVALUATION CATEGORIES
Low environmental impact construction site	Energy management
Acústic Comfort	Waste management from the use and operation of the building
Hygrothermal comfort	Maintenance (permanence of environmental performance)
Olfactory comfort	Sanitary water quality
Visual comfort	Sanitary air quality
Integrated choice of products, systems and construction processes	Sanitary quality of environments
Water management	Relationship of the building with its surroundings

Source: the authors, based on Lemos (2017)

According to Gomes, Moraes, Marino and Fernandes (2016) and Herzer and Ferreira (2016), the AQUA certification is granted by the Vanzolini Foundation, which is the Brazilian technical reference for sustainable constructions. In the criteria for certification, it is necessary to define the environmental profile of the project in relation to the Environmental Quality for the Project (QAE). Environmental concerns are expressed in 14 performance categories, defining which level of performance is intended to be achieved: Good, Superior or Excellent, or Base Level, Good Practices Level and Best Practices Level, and at least three categories must be classified as Excellent (Best Practices), four categories as Superior (Good Practices) and seven at the Good level (Base Level). The evaluation criteria are based on: optimization of construction site waste management; reduction of inconveniences caused by the construction site; reduction of pollution and resource consumption on the construction site; construction of social aspects on the construction site.

According to Lemos (2017), the advantages of the AGUA system for the user would be: savings in water and energy consumption; lower condominium expenses; better conditions of comfort and health; higher equity value; awareness of their contribution to sustainable development.

According to Nunes (2018), the AQUA certification process requires the adoption of an Enterprise Management System (SGE) and makes the evaluation in phases that are: Pre-project, Project and Execution. It seeks the implementation of a healthy and comfortable building, with the most controlled environmental and economic impacts possible, with good energy and water performance. And the costs, according to Rodrigues (2020), for projects with up to 1,500 m² would

be R\$17,500.00 and above 1,500 m², an increase of R\$1,609.00/m². According to Sugahara, Nuns and Cruz (2021), they would start from 31,022.00.

Figure 4 illustrates some of the logos of this label, which vary according to the demands of the users.

Figure 4 – Emblems (logos) of the AQUA seal



Fonte: <https://www.google.com/search?q=logo+do+selo+aqua>

BLUE HOUSE BOX

Provided by CEF (Caixa Econômica Federal) for housing development projects and was prepared by a technical team from Caixa, with the support of multidisciplinary professors from the state and federal universities USP, Unicamp and UFSC (NUNES, 2018). The Casa Azul Caixa seal was created in 2009, and updated in 2020 with the objective of financing initiatives that will stimulate the adoption of quality urban and architectural solutions, rationally using natural resources, raising awareness among entrepreneurs and residents (COSTA; CARVALHO; ALVES, 2021).

This seal, aimed at the housing program, is evaluated in the design phase, with six categories and 53 criteria, 19 of which are mandatory, classified according to the score. (COSTA; CARVALHO; ALVES, 2021; ALVES; FRANAÇA; SANTOS, 2017; NERI, 2015; COELHO; CRUZ, 2017; NUNES, 2018; LARA, 2021; SUGAHARA AND RODRIGUES, 2019). Also Blue Box Seal Guide V019, (2023). The categories, scoring positions, and criteria can be seen in Tables 6 and 7.

Table 6 – Blue Box Seal scoring categories and positions

Categories (six)	Scoring (four positions)
1 – Urban quality	50 points = Bronze/Crystal (mandatory criteria)
2 – Design and comfort	60 points = Silver/Topaz (required + 6)
3 – Energy efficiency	80 points = Gold/Sapphire (required + 12)
4 – Conservation of material resources	100 points = Diamond (required and more than 12)
5 – Water management	
6 – Social Practices	

Source: the authors

Table 7 – The 53 evaluation criteria of the Blue Box Seal

Mandatory criteria (19)	Optional criteria (34)
Quality of the surroundings – infrastructure Quality of the surroundings – impacts Landscaping Selective collection site Leisure, social and sports facilities Thermal performance – seals Thermal performance – orientation to the sun and winds Energy-saving light bulbs – private areas Energy-saving devices – common areas Individualized measurement – gas Quality of materials and components Reusable shapes and struts Construction and demolition waste (CDW) management Individualized measurement – water Economizer devices – discharge system Permeable areas CDW management education Environmental education of employees Orientation to residents	Improvements to the surroundings Recovery of degraded areas Real estate rehabilitation Design Flexibility Relationship with the neighbourhood Alternative transport solution Natural lighting of common areas Ventilation and natural lighting of bathrooms Suitability to the physical conditions of the terrain Solar Heating System Gas heating systems Efficient Elevators Efficient home appliances Alternative energy sources Modular coordination Industrialized or prefabricated components Optimized batching concrete Blast furnace cement and pozzolanic Paving with CDW Ease of maintenance of the façade Planted or certified wood Saved Devices- Aerators Economizer devices – flow regulator register Rainwater harvesting Stormwater retention Stormwater infiltration Employee personal development Professional training of employees Inclusion of local workers Participation of the community in the design of the project Environmental education of residents Training for enterprise management Actions to mitigate social risks Actions to generate employment and income

Source: the authors based on the Cashier Guide

It applies to all types of housing projects submitted to CEF, including those of Social Interest Housing - HIS, and must comply with pre-established quality rules for the indication of an opinion of compliance or not of them. Caixa would charge R\$ 328.00 as a fee for the analysis of the project (SUGAHARA; FRENCH; CRUZ, 2021).

The certification was developed for the national reality, with a proposal for environmental improvement, at a very affordable cost. It offers face-to-face inspections, from the purchase of the land to construction, raising awareness among entrepreneurs and residents about the concept of sustainable constructions. It is accessible to construction companies, public authorities, housing companies through HIS with access to population housing for those with a family income of up to three minimum wages. It focuses on energy efficiency and rational use of energy (LARA, 2021).

According to Lemos (2017, p. 93), "the CASA AZUL seal

It is an instrument for the socio-environmental classification of housing projects, which seeks to recognize those that adopt more efficient solutions applied to the construction, use, occupation

and maintenance of buildings, with the objective of encouraging the rational use of natural resources and improving the quality of housing and its surroundings.

Emblems or logos resembling this seal, of a general nature in Figures 5a and 5b and according to classification by levels, can be seen in Figure 5c.

Figure 5 – Emblems (logos) of the Casa Azul seal: a,b = general character; c = categorized by score levels.



Fonte: <https://www.google.com/search?q=logo+do+selo+casaazul>

COMPREHENSIVE ASSESSMENT SYSTEM FOR BUILT ENVIRONMENT EFFICIENCY (CASBEE)

The Japanese CASBEE label, "comprehensive evaluation system for the efficiency of the built environment", has a greater dependence on architecture, following complements in management, technology and legislation (ALBUQUERQUE; ALVES; MACHADO, 2018). It evaluates and measures the environmental performance of buildings and the built environment. It was developed in 2001, with the collaboration of Academia, Industry and national and local governments in Japan, under the responsibility of the Japan Sustainable Building Consortium (JSBC). It is adapted for: house construction, building construction, urban (urban development) and city management (LEMOS, 2017).

It has four evaluation instruments: the design, new constructions, existing buildings and renovations. It evaluates the environmental quality and performance of the building and decreases environmental loads. The score results from the final grade of the building's classification in five possible levels.

According to Neri (2015) and Bastos and Rebello (2016), the categories and evaluation criteria are those shown in Table 8.

Table 8 – the categories and evaluation criteria of the CASBEE Seal

Evaluation Categories	Evaluation Criteria
Indoor environment Quality of services Outdoor environment within the building lot Energy Resources Materials	Environmental quality and building performance . Comfort and health of the user . Functionality, Durability . Plant and animal preservation . landscape, cultural features, etc Reduction of environmental loads . Energy efficiency . Water Saving . Greywater use . Rainwater use . Recycling Materials . impacts on the neighbourhood (air pollution, noise, vibrations, etc)

Source: the authors, based on Neri (2015) and Bastos and Rebello (2016)

Evaluations are classified into five grades: Poor (C), Fairly Poor (B-), Good (B+), Very Good (A), and Excellent (S) (LIBRELOTTO, BANDINI, 2022). The emblem of this seal can be seen in Figure 6.

Figure 6 – Emblem (logo) of the CASBEE seal



Fonte: <https://www.city.yaizu.Ig.jp/g06-003/casbee/index.html>

EXCELLENCE IN DESIGN FOR GREATER EFFICIENCIES (EDGE)

EDGE "excellence in design for greater efficiency", forged in 2014 by the International Finance Corporation, also has certifications in Brazil. It aims to assist in the choice of technical solutions in the initial phase of the project to reduce operating expenses and environmental impact. It certifies projects that have a reduction in energy and water consumption and that use materials with low built-in energy. There are six types of buildings evaluated, new or rehabilitated: residential, hospitality, commercial, offices, hospital and educational. It has three categories of analysis, in the design phase or after construction, with up to 63 criteria varying according to the type of building. It does not use a scoring system. It evaluates whether the energy and water consumed for the operation of the building and the energy embodied in the manufacture of materials is lower than the consumption in the base project, of at least 20%. There are certifications: "EDGE Certified" for level 1 (20%), "EDGE Advanced" for level 2 (40%) and "Zero Carbon" for level 3 (100%). In residential buildings, there are 40 evaluation criteria (COSTA; CARVALHO; ALVES, 2021).

The costs to obtain this seal, according to UGREEN's website (2024), consist of: a fixed registration fee of US\$300; certification fee: US\$0.22 per m²; project audit fee US\$4,000.00 and construction audit fee US\$4,000.00. Some of its forms of representation are seen in Figure 7.

Figure 7 – EDGE seal emblem (logo)



Fonte: <https://www.google.com/search?q=logo+do+selo+edge>

SISTEMA GREEN BUILDING CHALLENGE (GBC)

It emerged from BEPAC (Building Environmental Performance Assessment Criterion), a Canadian system. In our language it would be "Green Building Challenge". It was developed by an international consortium, with the participation of more than 20 countries, including Brazilian researchers, to evaluate the environmental performance of buildings. It does not provide a performance certification; Its evaluation is based on a comparison of benchmark performances. It not only checks aspects of environmental sustainability, but also economic ones. The assessment comprises mandatory topics (resource use, environmental loads, and indoor air quality); optional topics (quality of services, economic aspects, and management) (LEMOS, 2017).

In 2012, GBC Brasil (Green Building Council Brasil) created a certification oriented to the reality of the Brazilian single-family residential sector, upper middle class, GBC Brasil Casa. In 2017, it adapted the parameters to meet the needs of multifamily residential buildings, creating GBC Brasil Condominiums. The certifications aim at sustainable construction, such as site layout and selection, water savings, energy efficiency, renewable energies, choice and management of materials, internal environmental quality, social requirements, innovation and regional specificities. The certifications follow the same criteria as LEED, with the evaluation categories being slightly different: deployment, efficient use of water, energy and atmosphere, materials and resources, internal environmental quality, social requirements, innovation, regional credits (NUNES, 2018). The following are the topics of the categories evaluated, as shown in Table 9.

Table 9 - Evaluation Topics or Categories

Lemos (2017)	Nunes (2018) – GBC Brazil
Mandatory <ul style="list-style-type: none"> • Resource Usage • Environmental loads • Indoor air quality Optional <ul style="list-style-type: none"> • Quality of services • Economic aspects • Management in pre-occupancy 	Efficient use of water, energy and atmosphere Materials & Resources Indoor Environmental Quality Social Requirements Innovation Project and regional credits

Source: the authors, based on Lemos (2017) and Nunes (2018)

To obtain this certificate for single-family housing, the fees (registration, project and audit) in 2020 varied according to the total built area, ranging from R\$5,590.00 to R\$15,060.00

(https://www.gbcbrasil.org.br/wp-content/uploads/2019/06/Tabela-de-Custos-da-Certificac%CC%A7a%CC%83o-GBC-Brasil-Casa-e-Condomi%CC%81nio_-2020.pdf)

Its emblem can be seen in Figure 8, depending on the type of building.

Figure 8 – GBC Seal Emblem (logo)



Source: <https://www.gbcbrasil.org.br/docs/casa.pdf>

PROCEL EDIFICA

Seal launched in November 2014, a program of Eletrobrás, which aims to develop activities to disseminate and stimulate concepts of energy efficiency in buildings, and to support the feasibility of the Energy Efficiency Law – Law 10.295/2001 (BRASIL, 2001). Eletrobrás coordinates in six different areas: "Human Training", "Technologies", "Dissemination", "Regulatory Subsidies", "Housing and Energy Efficiency" and "Support – Marketing and Financing" (LEMOS, 2017).

For Sugahara, Freitas and Cruz (2019), it is an instrument of the Brazilian government, coordinated by the Ministry of Mines and Energy and executed by Eletrobrás to identify buildings with better energy efficiency ratings in a given category, encouraging the acquisition and use of more efficient properties. The evaluation is done by equations and tables or comparative simulation. The categories evaluated are: wrapping, lighting, air conditioning and bonuses. Its benefits would be: better quality of life for the user, savings in energy and water consumption, efficiency of the building in the envelope systems, lighting and air conditioning.

The costs to obtain this seal, according to Sugahara, Nuns and Cruz (2021), would range from R\$11,000.00 to R\$22,000.00 in projects between 500m² and 1500 m². Emblems or logos that identify it can be seen in Figure 9.

Figure 9 – Emblems (logos) of the PROCEL EDIFICA seal



Fonte: <https://www.google.com/search?q=logo+do+selo+proceledifica>

SUSTAIN X

It is a sustainability label according to the International Organization for Standardization - ISO 14.024:2004. Established in 2007. It analyzes all the essential attributes of sustainability, such as: healthiness, quality, environmental responsibility, social responsibility, responsible communication (COSTA ET AL., 2021).

A seal developed by the Sustentax Group, it allows the identification and attestation of the environmental quality of the services of construction companies, in the commitment to environmentally correct practices, social responsibility and economic practices that avoid waste and increase productivity. The main evaluation criteria are: healthiness, quality, social responsibility, environmental responsibility, economy, safety, communication with the consumer and legal-tax regularization. To obtain the seal, one must go through 3 phases: Initial feasibility analysis; Product analysis (contract signing, documentation, technical guidance, evaluation of results, adequacy of processes, evaluation under SustentaX criteria); Seal Awarding (COELHO; CRUZ, 2017; COSTA ET. AL., 2021). Its visual representation can be seen in Figure 10.

Figure 10 – Emblem (logo) of the SUSTENTA X Seal



Fonte: <https://www.google.com/search?q=logo+do+selo+sustentax>

GERMAN SUSTAINABLE DEVELOPMENT COUNCIL (DGNB)

Created in 2007 in Germany, the Deutsche Gesellschaft für Nachhaltiges Bauen (DGNB), "German Society for Sustainable Constructions", certifies both public and commercial and

residential buildings in construction or renovation. There is a gold, silver and bronze classification (SILVA; SARDEIRO, 2017)

The quality label for sustainable construction of the German Society for Sustainable Construction (DGNB) is new in Brazil, and is divided into gold, silver or bronze categories. The certification validates buildings that are built ecologically, with resource savings, economic efficiency and focused on user comfort (NERI, 2015; GONÇALVES, 2020).

The categories or evaluation criteria, according to Gonçalves (2020) and Coelho and Cruz (2017), are listed in Table 10 and the emblem of this seal can be seen in Figure 11.

Table 10 – Categories and criteria for the Evaluation of the DGNB Seal

Categories	Categories
Ecology or Environmental Quality <ul style="list-style-type: none"> • Construction Life Cycle Assessment • Impact on the local environment • Sustainable resource extraction (land use) • Potable water demand and wastewater volume Economic Quality or Economy <ul style="list-style-type: none"> • Life Cycle Cost • Flexibility and adaptability • Commercial viability Sociocultural and Functional Quality <ul style="list-style-type: none"> • Thermal comfort • Indoor air quality • Acústic Comfort • Visual comfort • User Control <ul style="list-style-type: none"> • Quality of indoor and outdoor spaces <ul style="list-style-type: none"> • Safety & Security • Design & Urban Quality 	Technical Quality <ul style="list-style-type: none"> • Fire safety • Acoustic insulation • Thermal quality of the structure <ul style="list-style-type: none"> • Use and integration of construction technology <ul style="list-style-type: none"> • Easy to clean, recover and recycle • Emission Control / Mobility Quality of the site <ul style="list-style-type: none"> • Local environment • Social conditions and public image • Access to transport • Access to services Process Quality <ul style="list-style-type: none"> • Understanding and technical quality of the project <ul style="list-style-type: none"> • Sustainability aspects in the initial phase • Documentation for sustainable management • Environmental impact construction (construction site) <ul style="list-style-type: none"> • Supervision of the quality of the works <ul style="list-style-type: none"> • Systematic commission • User communication • Compatible planning (design and architecture)

Source: the authors, based on Gonçalves (2020) and Ceolho and Cruz (2017).

Figure 11 – DGNB seal emblem (logo)



Fonte: <https://www.google.com/search?q=logo+do+selo+dbng>

SUSTAINABLE SOCIAL HOUSING INITIATIVE (SUSHI)

The SUSHI - Sustainable Social Housing Initiative is a project developed by the United Nations Environment Programme (UNEP/UNEP) with support from the European Union for the

study of sustainable construction practices in the world, and focuses on social housing (HIS) in two developing countries: Thailand and Brazil (COELHO; CRUZ, 2017).

The SUSHI Project aims to conceptualize social housing and its interaction with the urban environment, efficiency in energy use and water consumption, which is durable, comfortable, healthy, easy to maintain, economical in expenses. (NERI, 2015; RABBIT; CRUZ, 2017).

This project is led by the Brazilian Council for Sustainable Construction – CBCS, created in 2007, which brings together institutions with experience in Social Interest Housing – HIS, involving energy efficiency, thermal comfort and rational use of water (COELHO; CRUZ, 2017). The emblem can be seen in Figure 12.

Figure 12 – Emblem (logo) of the SUSHI seal



Source: <http://www.construirsustentavel.com.br/green-building/selos>

SEALS AT THE MUNICIPAL LEVEL, SUCH AS:

Sustainable BH Seal

The Environmental Sustainability Certification Program of the Municipality of Belo Horizonte is a public policy initiated by the City of Belo Horizonte, through the Municipal Secretariat for the Environment and the Executive Committee of the 2014 World Cup, and resulting from discussions in the Municipal Committee on Climate Change and Eco-Efficiency - CMMCE.

The certification is intended for public and private, residential, commercial and/or industrial enterprises that adopt measures that contribute to the reduction of water and energy consumption, atmospheric emissions and solid waste generation, as well as recycling and reuse of the waste generated (NERI, 2015; PREFEITURA DE BELO HORIZONTE, 2022).

Once the certification program has been updated and reformulated, enterprises can receive Bronze (100 points), Silver (125 points), Gold (150 points) and Diamond (175 points) seals, and can also have "green credit" that offers discounts on Active Debt. The evaluation criteria are: permeability and vegetation; energy; water, mobility and waste (PREFEITURA DE BELO HORIZONTE, 2022). Its emblem can be seen in Figure 13.

Figure 13 – Emblem (logo) of the BH Sustainable seal



Source: <http://www.construirsustentavel.com.br/green-building/selos>

Green Factor

Seal used by the city of Fortaleza (CE), with three categories of certification (LIMA; RIOS, 2019). The criteria are inserted in the sustainable city factor, healthy environmental factor, energy factor, water factor, materials and waste factor, social factor. It has four levels of certification: bronze, silver, gold, and diamond, as provided for in the manual (PREFEITURA FORTALEZA, 2023). To obtain the rank levels (bronze, silver, gold, or diamond), the applicant needs to meet certain criteria.

Figure 14 shows the seal emblem and logos according to the classification categories, and Table 11 shows how to obtain this classification.

Figure 14 - Green Factor Seal Emblem and Logo of the Certification Categories



Source: Lima and Rios (2019, p. 14).

Table 11 – Fulfillment of criteria for classification.

Classification level	Number of criteria met	Total Criteria
Bronze	12 required	12
Silver	12 required + 6 optional	18
Gold	12 required + 10 optional	22
Diamond	12 mandatory + 20 optional	32

Source: the authors based in Lima and Rios (2019).

RESULTS

From the information of each seal, presented here, we tried to build a table (Chart 1) where each seal is presented and its information regarding the date of appearance or use, the origin, the responsible entity, the categories or evaluation criteria, the classification levels, how it can be obtained. In some cases, if the seal is adapted to Brazil or originated in Brazil, its validity and the costs to obtain it. It is believed to be relevant information for those who seek, at a glance, to locate a certification process that is best suited to their project.

Table 1 – Brief information on the main seals of sustainable construction

STAMP	OF TA	PROCE DENCIA	RESPON ENTITY SHAD	CATEGORIE S CRITERIA EVALUATI ON	NIVEIS DE CLASSIF	HOW OB-HAVE	VALIDA TES FROM CERTIF	COSTS
BREEAM	1990 1992	UK	Building Research Establishment (BRE)	10 categories 15 criteria	No level Approved Good Very good Very good Excellent	Site to BREEAM	Build existent: 1 year Nova: There is no validity	£ 1.100
LEED	1998 2014	USA	U.S. Green Building Council	5 categories Main 2 Secondary categories 69 criteria	Silver Certificate Gold Platinum	LEED website	Build existent: 5 years Nova: There is no validity	Rates Add US\$13.650 the US\$64.750
AQUA	2008	Brazil HQE France	Vanzolini Foundation	14 categories 210 criteria, 110 of which are mandatory	Good Superior Excellent Or Base, Good Practices, Best Practices	Portal Vanzolini	Opera tion 1 year Too Certif: There is no validity	Projects up to 1500m2: R\$17,500.00 (2020) or R\$31.022,00 + R\$1,609.00 or 2,810.00 p/m2
CASA AZUL	2010	Brazil	Caixa Econômica Federal	6 categories 53 criteria (19 obligatory) 34 faculty)	Bronze Silver and Gold	Caixa Econômica Federal	No Speci Located	Fee for project analysis: R\$328,00
CASBEE	2001	Japan	JSBC – (Japan Sustainable Building Consortium)	6 Categories 10 criteria	Poor (C), Quite Poor (B-), Bom (B+), Mto Bom (A) and Excellent (S).	JSBC	No Speci Located	Harmed
EDGE	2014	(IFC) [USA]	Internal Finance Corporation - IFC	3 categories 63 criteria	N1-Certified (20%), N2-Advanced (40%) and N3-Zero Carbon" (100%).	Applies EDGE	No Speci Located	Rates Fixa US\$300 Certification US\$0.22 pm ² , 2 Audit US\$8.000,00

GBC Brazil	2012 2017	Brazil (International Forum)	Green Building Council Brazil	6 Categories 53 LEED-like criteria	Green, Prata, Gold, Platinum.	GBC Brazil	No Specified	For construction Single-family, from R\$5,590.00 to 15,060.00
PROCEL	2014	Brazil	Eletrobrás (Ministry of Education of Mines and Energy)	4 categories	No graduations +efficient -efficient	Electro Brás	It's a Label Tague	R\$11,000.00 to R\$22,000.00 for projects between 500 and 15000 m2
SUPPORT TAX	2007	Brazil	SustentaX – Eng. de Sustentab	8 Criteria	No graduations	Group Sustenta X	No Specified	Harmed
DGNB	2007 2009 2012	German Nha	German Association for Sustainable Construction (DGNB)	6 Categories 33 criteria	Gold silver bronze	DGNB	No Specified	Harmed
SUSHI	2007	Thailand day and Brazil	Brazilian Council for Sustainable Construction (CBCS)	Seal in Housing Social Interest (HIS)	No graduations	CBCS	No Specified	Harmed

Source: the authors

Thus, BREEAM takes into account 10 categories, 15 criteria and has 5 levels of evaluation; LEED works with 7 categories, 69 criteria, with 4 levels of evaluation; AQUA takes into account 14 categories, 210 criteria and 3 levels of evaluation; CASA AZUL, 6 categories, 53 criteria and 3 levels; CASBEE works with 6 categories, 10 criteria and 5 levels of evaluation; EDGE involves 3 categories, 63 criteria, and 3 levels of classification; GBC BRAZIL is concerned with 6 categories, 53 criteria and 4 levels of evaluation; PROCEL deals with 4 categories and only observes the level of energy efficiency; SUSTENTA X evaluates 8 criteria and has no undergraduate degrees; the DGNB takes into account 6 categories, 33 criteria and 3 levels of classification; SUSHI focuses more on social housing and has no classification levels.

Considering the requirements for obtaining any of these certifications (seals), the important thing is that this leads to thinking, reflecting, and trying to work so that more and more buildings really get closer to the standard of sustainability.

It should be noted that there are other labels or evaluation methods: HQE (Haute Qualité Environnementale), French; BEPAC (Building Environmental Performance Assessment Criteria), Canadian; NABERS (National Australian Buildings Environmental Rating System), Australian; SB TOL (Sustainable Buildings Tool), from the principality of Monaco, with Czech, Italian, Spanish, Portuguese, Korean and Canadian versions; LIDERA (Leading for the Environment), Portuguese;



ECO FCT (from the Faculty of Science and Technology), Portuguese and ECO BUILD, Portuguese (CALIXTO 2016).

FINAL THOUGHTS

The bibliographic overview of the information on the environmental assessment seals of sustainable civil constructions in Brazil is important in the sense of providing a panoramic view, in a single document, of the criteria, evaluation systems and other information of each environmental seal, which may be useful to those who, in the planning and/or execution of sustainable constructions, can decide which certification to adopt.

Thus, it is believed that this study brings benefits to science, providing ease of understanding and alignment in subsequent research and to the civil community, in the sense of clarifying the different possibilities of choice, and may eventually be a stimulus for new studies with more information and improvement of the present work.

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Type 2 diabetes mellitus and Alzheimer's disease in the elderly population: A narrative review

 <https://doi.org/10.56238/sevned2024.010-036>

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ABSTRACT

Type 2 diabetes has pathological mechanisms similar to those of Alzheimer's, indicating a correlation between the two conditions. This article aims to present the effects of type 2 diabetes mellitus on the development of Alzheimer's, emphasizing the molecular mechanisms that correlate these two factors. This study is a qualitative narrative review that aims to comprehensively present the topic "type 2 diabetes mellitus and Alzheimer's disease in the elderly population". The search was carried out in the virtual libraries PubMed, VHL and Scielo, using keywords and MeSH terms such as "Type 2 Diabetes", "Alzheimer's Disease" and "Susceptibility to Diseases". The search resulted in 252 articles. After several stages of analysis and selection, 8 relevant articles were chosen to compose the narrative review. The review addresses the relationship between Alzheimer's and type 2 diabetes, exploring risk factors, common molecular mechanisms, and the role of glucose in neural function. The review indicates a link between type 2 diabetes and Alzheimer's in the elderly population, with complex biological mechanisms connecting the two conditions. Future research is encouraged to improve patient care.

Keywords: Type 2 Diabetes Mellitus, Alzheimer's disease, Neural Degeneration.

INTRODUCTION

The world's population has been aging and, according to the United Nations Population Fund, by 2050, there will be an unprecedented number of elderly people than children under 15 years of age (UNFPA, 2012). In this sense, the understanding of diseases such as diabetes mellitus and Alzheimer's, which mainly affect the elderly population, becomes essential for maintaining the health of the old and new generations.

About Alzheimer's disease, it was discovered in 1906 by the German pathologist Alois Alzheimer (ADI, 2023?), and is classified as a neurodegenerative condition of unknown causes that can be genetically expressed (Brasil, 2023).

In this disorder, which has four stages of progression, poorly metabolized proteins accumulate in the brain, causing the death of neurons and affecting areas related to memory processing, such as the hippocampus and the cerebral cortex. In addition, in addition to affecting the storage of information, Alzheimer's causes the loss of functions related to language, reasoning, and abstract thinking (Brasil, 2023).

Worldwide, 55 million elderly people are affected by dementia (ADI, 2020), with Alzheimer's being the most frequent type, corresponding to about 50-75% of cases (ADI, 2023?). In addition, there are estimates that 78 million elderly people will be affected by Alzheimer's by 2030, indicating that the disease will affect an even larger portion of the population in the next decade (ADI, 2020). In this sense, the high statistics on this pathology highlight the need for greater discoveries about this neurodegenerative condition, as well as the incorporation of new preventive actions for this disorder.

In addition, type 2 diabetes mellitus (T2DM) has pathological mechanisms similar to those of Alzheimer's disease, a fact that indicates a correlation between the two conditions (Lima; Moreira and Sakamoto-Hojo, 2021). From this perspective, to aggravate this finding, the extent reached by T2DM in the world population is 537 million people (IDF, 2021).

Thus, recent evidence correlating type 2 diabetes mellitus and the development of Alzheimer's shows promise both in preventing and clarifying the causality of this disease, contributing to an improvement in the global diagnosis currently observed.

Thus, this article aims to present the effects of diabetes mellitus (Lima; Moreira and Sakamoto-Hojo, 2021) for the development of Alzheimer's disease, emphasizing the molecular mechanisms that correlate these two factors, based on recent findings on the relationship between type 2 diabetes mellitus and the onset of dementia in old age.

In this sense, with the dissemination of the impacts of type 2 diabetes mellitus on neurodegenerative conditions, the social environment will be able to have greater autonomy over their health status, in order to achieve a healthy and productive longevity. (WHO, 1986)

OBJECTIVES

GENERAL OBJECTIVE

- To highlight in the literature studies that correlate type 2 diabetes mellitus and Alzheimer's disease.

SPECIFIC OBJECTIVES

- Dissertation on the pathophysiology of type 2 diabetes mellitus and Alzheimer's;
- Describe the risk factors for type 2 diabetes mellitus and Alzheimer's disease;
- Describe the main molecular mechanisms shared between the two conditions;
- Dissertation on the correlation between glucose and neural function.

METHOD

The present study is a narrative review, with a qualitative approach, whose objective is to present, in a comprehensive way, a theme (Cordeiro *et al.*, 2007). This type of review, although it does not present methodological rigor or exhaustion of databases, is of great value for theoretical updating on a given topic, highlighting ideas and knowledge that are little evidenced in current discussions (Noronha and Ferreira, 2000 *apud* Vosgerau and Romanowsk, 2014).

In addition, the virtual libraries used to search for the theme "type 2 diabetes mellitus and Alzheimer's disease in the elderly population" were PubMed, VHL and Scielo. In addition, the selected descriptors were configured as keywords or were removed from the list of MeSH (Medical Subject Headings) terms, widely used in the medical literature. The descriptors and keywords used are detailed in the table below.

Finally, the time frame of the last five years was used and the languages English, Spanish and Portuguese were included. In addition, articles with incomplete text, paid articles, and articles whose objectives differed from the theme proposed in this narrative review were excluded.

Table 1 – Descriptors and keywords used to compose the search strategy.

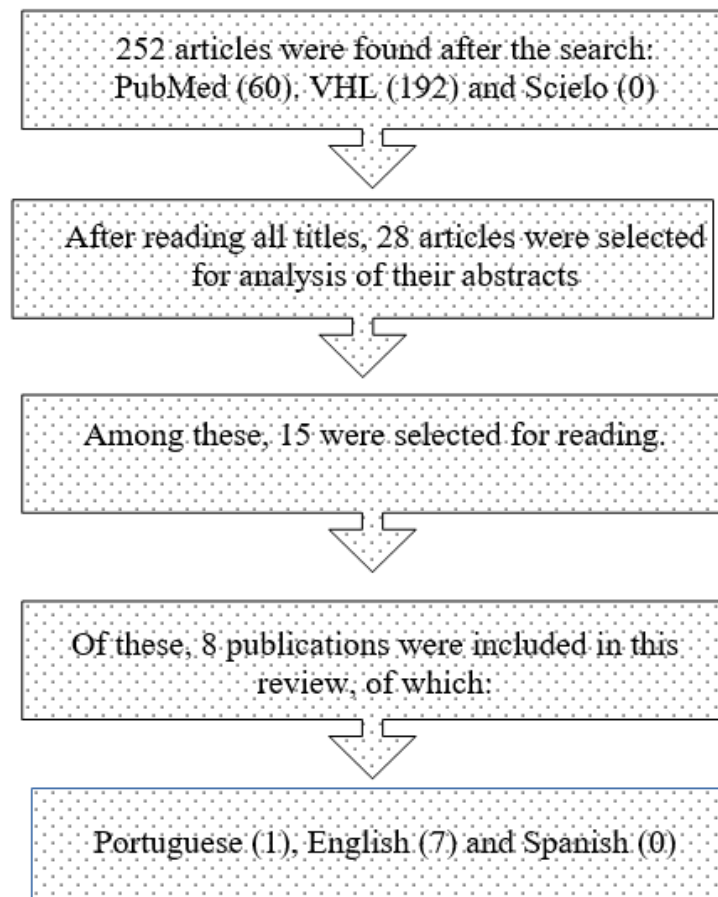
	English subjects and synonyms	Subjects and synonyms in Portuguese	Spanish Subjects and Synonyms
Subject 1	“Diabetes Mellitus, Type 2” “Type 2 Diabetes”	“Diabetes Mellitus Tipo 2” "Type 2 Diabetes"	“Diabetes Mellitus Tipo 2” "Type 2 Diabetes"
Subject 2	“Alzheimer Disease” “Alzheimer Dementia”	"Alzheimer's disease" "Alzheimer's disease"	"Alzheimer's Disease" "Alzheimer's Disease"
Subject 3	Aged Elderly	Old "Elderly Population"	Ancient* Person* Age
Subject 4	“Disease Susceptibility” Diathesis	"Susceptibility to disease" Diathesis	"Susceptibility to disease" Diathesis

Source: Federal University of Santa Catarina, 2023.

RESULTS

The searches resulted in 252 articles. After reading all the titles, 28 articles were selected for the reading of their respective abstracts. At the end of this analysis, 15 publications were selected and read in full, of which 8 were included for the purpose of elaborating this narrative review. These articles were selected for their relevance to the topic and for their methodological qualities, including 7 studies in English and 1 in Portuguese, as described in the flowchart below.

Figure 1 – Flowchart of the stages of selection of articles



Source: Authored by the authors.

Table 2 – Data on the selected articles, including author(s), title, objectives, type of study, and results.

Author(s)	Article Title	Objectives	Type of study	Results
Scheltens, P. <i>et al.</i>	Alzheimer's Disease	Dissertation on the major advances in the field of Alzheimer's disease	Narrative Review	Promising pharmacological treatments for Alzheimer's disease have been identified.
Michailidis, M. <i>et al.</i>	Alzheimer's Disease as Type 3 Diabetes: Common Pathophysiological Mechanisms Between Alzheimer's Disease and Type 2 Diabetes	Discuss the shared correlations between Alzheimer's disease and type 2 diabetes mellitus.	Systematic Review	It has been identified that Alzheimer's disease is a metabolic disease with strong indications of being type 3 diabetes.
Hamzé, P. <i>et al.</i>	Type 2 Diabetes Mellitus and Alzheimer's Disease: Shared Molecular Mechanisms and Potential Common Therapeutic Targets	To describe the main molecular pathways that correlate type 2 diabetes mellitus and Alzheimer's disease, with emphasis on insulin and IGF-1 signaling and some Alzheimer's markers.	Narrative Review	Experimental evidence was identified for the correlation between type 2 diabetes mellitus and Alzheimer's disease.
Barone, E. <i>et al.</i>	The interaction between oxidative stress, brain insulin resistance, and AMPK dysfunction contribute to neurodegeneration in type 2 diabetes and Alzheimer's disease	Provide an overview on the detrimental effects of oxidative stress on insulin signaling and how these changes relate to AMPK dysregulation.	Narrative Review	It has been identified that the described processes are closely linked with the molecular mechanisms of Alzheimer's disease.
Yonamin, C. I. <i>et al.</i>	Glucose transport and utilization in the hippocampus: from neurophysiology to the development of diabetes-related dementia.	To discuss the interaction between diabetes and cognitive dysfunctions, to elucidate the underlying molecular and physiological mechanisms, and to identify possible avenues for therapeutic intervention and future research.	Narrative Review	It identified the complex correlation between diabetes and dementia and the importance of exploring therapeutic interventions to mitigate the effects of diabetes on neurodegeneration.
Shen, Z. <i>et al.</i> , 2022	Metabolic Perspective of Astrocyte Dysfunction in Alzheimer's Disease and Brains With Type 2 Diabetes	To investigate the role of astrocyte dysfunction in Alzheimer's disease and type 2 diabetes mellitus and offer new insights into the comorbid mechanisms of these two diseases.	Narrative Review	It identified that astrocyte dysfunction is involved in the pathophysiological processes of AD and T2DM and discussed the impact of astrocyte dysfunction on various aspects of brain function in these diseases.
Oliveira, K. S. <i>et al.</i>	Assessment of the risk of Alzheimer's disease in the elderly with Diabetes Mellitus	Evaluate The objective of this study was to evaluate the risk of Alzheimer's disease in elderly patients with type 2 diabetes mellitus in Mossoró, Rio Grande do Norte State, Brazil.	Retrospective cohort study	It identified that older adults at higher risk of dementia are users of Glibenclamide, smokers, have a family history of mental disorders and have lower family incomes.

Adachi, Y. et al.	Lower insulin secretion is associated with atrophy of the hippocampal and parahippocampal gyrus in elderly patients with type 2 diabetes mellitus	To evaluate the association between type 2 diabetes and atrophy of the hippocampal and parahippocampal gyrus (HPGA), determining its risk factors.	Cohort study	It identified that abnormalities in insulin secretion have strong correlations with the pathophysiology of Alzheimer's disease.
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Source: Authored by the authors.

DISCUSSION

Alzheimer's disease, the leading cause of dementia in older people, is a neurodegenerative disease whose progress is associated with the loss of neurons, affecting the hippocampus and neocortical areas. This pathology is also characterized by the extracellular aggregation of insoluble fibrils and β -amyloid peptides ($A\beta$) and by the phosphorylation and destabilization of the tau protein, which is associated with microtubules and whose aggregation forms neurofibrillary tangles within neurons. Both lesions ($A\beta$ and tau proteins) accumulate in synaptic and neuronal malfunction, and can generate, in the long term, neurodegeneration through atrophy of specific areas of the brain, especially the cortex and hippocampus. (Hamze *et al.*, 2022)

In addition, evidence indicates that pathophysiological changes in Alzheimer's disease can occur up to 20 to 30 years before the onset of clinical symptoms. Due to the limited information on the early stages of the neurodegenerative process and the fact that the diagnosis of Alzheimer's usually occurs in advanced stages, there is an urgent need to identify the molecular aspects of the disease that begin in the pre-symptomatic phases so that the condition can be detected early. (Barone, E. *et al.*, 2021)

In addition, there are two variants of the disease: the familial form, which manifests itself early, around the age of 50, due to dominant genetic mutations that affect the production of β -amyloid peptide; and the sporadic form, which occurs in more than 95% of cases, usually developing after the age of 65. (Hamze *et al.*, 2022)

In this sense, the sporadic form of Alzheimer's disease is influenced by genetic and environmental risk factors. The most significant are aging and the presence of the ApoE4 allele, which acts on the elimination of amyloid beta peptide (Hamzé *et al.*, 2022). In addition, female gender (Scheltens *et al.*, 2021) and cardiovascular risk factors such as strokes, poorly controlled hypertension, high cholesterol, obesity, and diabetes are considered potential predisposing factors. (Hamze *et al.*, 2022)

On the other hand, diabetes mellitus, the most prevalent metabolic disease, is a condition characterized by chronic hyperglycemia, promoted by insufficient insulin secretion or ineffective

action (Hamzé *et al.*, 2022). In addition, it can lead to increased immune system activity and brain neuroinflammation, a typical feature of Alzheimer's disease, with which it shares several dysfunctions, including faulty insulin signaling, insulin resistance, reduced hippocampal volume, and accelerated cognitive decline. (Oliveira, K. S. *et al.*, 2021)

In addition, diabetes can lead to serious long-term complications, many of which result from diseases that affect small (such as retinopathy and nephropathy) or large blood vessels (such as peripheral arterial disease, cardiac events, and strokes), as well as several other conditions, such as cognitive impairment, depression, and neurodegenerative diseases, most notably, again, Alzheimer's disease. (Hamze *et al.*, 2022)

In this sense, there are two main variants for diabetes mellitus: type 1 diabetes, which accounts for 10% of cases and is caused by the autoimmune destruction of pancreatic β cells, resulting in progressive loss of insulin secretion; and type 2 diabetes, responsible for 90% of cases, which occurs due to insulin resistance in tissues such as the liver, muscle and adipose tissue. In the latter case, β cells attempt to compensate for insulin resistance by increasing in number and secretion, but eventually become depleted and undergo apoptosis, leading to partial insulin deficiency and subsequent hyperglycemia. (Hamze *et al.*, 2022)

In addition, type 2 diabetes mellitus develops from a combination of genetic predispositions and various environmental risk factors. Among them are a sedentary lifestyle, poor diet, stress and exposure to pollutants such as bisphenols, pesticides and air pollution. (Hamze *et al.*, 2022)

In short, type 2 diabetes mellitus is a metabolic disease marked by insulin resistance, resulting in impaired glycemic control. Although certain genetic polymorphisms are associated with the development of type 2 diabetes mellitus, risk factors such as obesity and physical inactivity are considered more relevant to the development of the condition, promoting inflammation and cellular stress, which can lead to systemic insulin resistance (Barone, E. *et al.*, 2021).

With regard to this hormone, insulin has several effects on the body: cognition, modulation of acetylcholine and noradrenaline, expression of genes related to long-term memory, regulation of synapses, formation of dendrites; formation of the postsynaptic junction, proliferation of glial cells; maintenance and functioning of oligodendrocytes, in the regulation of inhibitory synapses through the recruitment of the neurotransmitter GABA (gamma-aminobutyric acid), among other various features. (Hamze *et al.*, 2022)

It was believed that the origin of insulin in the brain was peripheral, however, studies demonstrate the presence of insulin-expressing mRNAs in the organ itself, indicating the production of insulin, independently, by the brain (Michailidis *et al.*, 2022 and Hamzé *et al.*, 2022).

Thus, when the target tissues of this hormone become insensitive to it, a condition called systemic insulin resistance arises, which can affect adipose tissue, liver and muscles. Similarly, this

process is believed to occur in the brain, due to the activation of glial cells, especially astrocytes and microglia, which promote, in the long term, a deleterious inflammation capable of generating progressive neuronal damage. This damage is caused in part by the brain's sensitivity to insulin, which is necessary for glucose transport and metabolism, as well as for the regulation of memory and learning activities in areas such as the hippocampus and cortex. (Michailidis *et al.*, 2022)

From this perspective, the phenotypic mechanism for the development of insulin resistance consists of (1) *up-regulation* (compensatory production) of insulin in order to supply the lower cellular uptake of glucose, a state known as prediabetic, and (2) the maintenance of insulin resistance by increasing glucose production and decreasing endogenous insulin production. (Hamze *et al.*, 2022)

In addition, peripheral insulin resistance can promote neuroinflammation by generating cytotoxic lipids capable of crossing the blood-brain barrier. In this process, microglial cells induced by beta-amyloid are activated, promoting the release of several inflammatory cytokines, such as tumor necrosis factor alpha and interleukin-6, which is also involved in the progression of Alzheimer's. (Michailidis *et al.*, 2022)

In this sense, in Alzheimer's disease, astrocytes, which are fundamental for the regulation of neuronal excitatory-inhibitory balance, synaptic function, learning and memory, can contribute to neuroinflammation and the formation of amyloid plaques. Despite this, astrocytes also have a neuroprotective role by maintaining glutamate homeostasis and promoting neurovascular coupling. (Shen, Z. *et al.*, 2022)

Under a new analysis, cerebrovascular disease can affect cognition in patients with type 2 diabetes mellitus, considering that oxidative stress and chronic hyperglycemia can damage the vascular endothelium, causing atherosclerosis and vascular complications, such as an increased risk of ischemic stroke and cerebral infarctions. In addition, chronic hyperglycemia, described above, can also cause changes in cerebral microvascularization, leading to thickening of the cerebral capillary basement membrane, changes in the integrity of vascular smooth muscle cells, and increased microvascular resistance. These changes can impact circulation and brain function, as well as the rate of elimination of metabolites from the brain. Otherwise, type 2 diabetes mellitus can affect vessel-mediated A β clearance, leading to accumulation of A β in the brain and thus making cerebrovascular disease a common link between T2DM and Alzheimer's disease. (Michailidis *et al.*, 2022)

From another perspective, islet amyloid polypeptide (IAPP), or amylin, is a hormone that is secreted with insulin by pancreatic islet β cells. This hormone has several functions, including inducing satiety, regulating blood sugar, inhibiting glucagon secretion, and slowing gastric emptying. Like insulin, amylin levels are elevated in patients with insulin resistance. (Michailidis *et al.*, 2022)

In this sense, in Alzheimer's patients, the presence of amylin receptors in the brain is observed, as well as the deposition of amylin. In addition, amyloid plaques contain stores of amylin and mixed plaques containing amylin and β -amyloids. Thus, there is an indication that amylin has a relevant function for the formation of more amyloids in the central nervous system, especially in conditions of hyperamylinemia. Thus, amylin binds to neurons, having the same toxicity observed in the pancreas of individuals with type 2 diabetes mellitus, causing intracellular oxidative stress and inflammatory responses. (Michailidis *et al.*, 2022)

This oxidative stress can also be promoted by insulin resistance in T2DM, leading to neurodegeneration in Alzheimer's disease. Thus, oxidative damage occurs when there is an imbalance in favor of very reactive forms of oxygen and nitrogen, resulting in the oxidation of proteins, lipids, and DNA, causing functional damage to mitochondria and inducing genetic mutations in DNA and RNA. In addition, reactive forms of oxygen promote programmed cell death and the production of pro-inflammatory cytokines. In addition, mitochondrial dysfunction and the overproduction of reactive oxygen species play a crucial role in the development of DM2 pathology, considering that, in situations of insulin resistance, there is an increase in the products of oxidative reactions in the blood, adipose tissue, brain, muscles and liver. In addition, the human brain is very sensitive to damage from oxidative stress because, although it constitutes a small fraction of the total body weight, it consumes more than 20% of the body's total oxygen. Thus, low levels of antioxidants, high levels of oxidizing ionic metals, and the presence of polyunsaturated fatty acids in brain cell membranes, which are susceptible to hyperoxidation. They make the brain even more vulnerable to oxidative stress-induced damage. Although it is argued that the presence of β -amyloids precedes oxidative stress, much research indicates that oxidative stress may be a precursor of β -amyloid protein and tau proteins. Finally, oxidative stress and insulin resistance can independently lead to the accumulation of β -amyloid and tau proteins. (Michailidis *et al.*, 2022)

With regard to glucose, according to Yonamini (*et al.*, 2023), their transport across the blood-brain barrier is mediated by specialized glucose transporters.

Also according to Yonamini (*et al.*, 2023), this process involves the blood-brain barrier, a highly selective semipermeable boundary that regulates the passage of substances from the blood to the brain; glucose transporters, particularly the GLUT family of transporters; facilitated diffusion, in which glucose is transported from an area of higher concentration (blood) to an area of lower concentration (brain cells), without requiring energy expenditure; GLUT1, which allows glucose to be transported to the brain, ensuring that an adequate amount of glucose is available for the performance of neuronal functions; and intracellular transport, which occurs when glucose is taken up by neurons and other brain cells through the action of various GLUT transporters, including GLUT3 and GLUT4.

In addition, reduced expression and translocation of the insulin-sensitive glucose transporter GLUT4 in hippocampal neurons lead to neuroglycopenia and eventually cognitive dysfunction, highlighting the impact of altered glucose metabolism on the brain. (Yonamini *et al.*, 2023)

In addition, according to Adachi (*et al.*, 2021), patients with lower insulin secretion capacity tend to have atrophy of the inner portion of the temporal lobe, including the hippocampus, amygdala, and ventral portion of the parahippocampal gyrus. The low concentration of insulin in the blood plasma promotes a low concentration in the cerebrospinal fluid, resulting in abnormalities in insulin signaling and generating excessive synthesis of beta-amyloid and hyperphosphorylated tau proteins, both of which are characteristic of Alzheimer's disease.

FINAL THOUGHTS

Through this narrative review, it was possible to observe a significant relationship between type 2 diabetes mellitus and Alzheimer's disease in the elderly population. The prevalence of both conditions increases with age, and the presence of type 2 diabetes appears to increase the risk of developing Alzheimer's disease.

The biological mechanisms linking these two conditions are complex and involve multiple pathways, including insulin resistance, neuroinflammation, oxidative stress, and amyloid plaque formation. However, there is still much to be discovered about these processes and how they interact with each other.


In summary, this review highlights the importance of an integrated approach in the care of elderly patients with type 2 diabetes. Thus, future research should continue to explore the relationship between these two conditions, with the aim of improving quality of life and health outcomes for the growing elderly population.

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Vaccine efficacy against Covid-19 and its worrying variants

 <https://doi.org/10.56238/sevened2024.010-037>

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ABSTRACT

Objective: To analyze the main COVID-19 vaccines available in Brazil and coverage against VOCs. **Methods:** 199 articles were found in PubMed, VHL and SciElo. The following were researched: Coronavirus, Vaccine, COVID-19, Evolution, Variant, Delta and Omicron. Works published in the period between 2019 and 2023. A total of 07 articles were selected. **Results:** The vaccine release sequence was Coronavac followed by Pfizer, Astrazeneca and Janssen with different mechanisms of action and dose schedules. Regarding VOCs, five were identified: Alpha, Beta, Delta, Gamma and Omicron. **Conclusion:** the pathogenicity of VOCs was increased and vaccine efficacy (IV) decreased. It is noteworthy that VE in the real scenario is affected by public health measures, individual behaviors, access to health services, and vaccine hesitancy, factors not considered in the studies.

Keywords: SARS-CoV-2 variants, Pandemic, Vaccine, Literature review.

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INTRODUCTION

In March 2020, the World Health Organization (WHO) declared a global pandemic due to the high rate of contagion by the COVID-19 virus, demonstrated by the spread of the disease in 223 countries and more than 593 million cases registered in this period of time¹. In this pandemic scenario, it was important to determine public health measures to contain the transmission of the virus and, in addition to social isolation, vaccination was the differential to contain the pandemic. In this sense, research has been directed towards the development of immunizers to combat the virus².

In this sense, since the beginning of the pandemic of the virus that causes COVID-19, several new variants have emerged, due to adaptive mutations in the viral genome that have drastically altered its ability to evade the immune system. As a result, all progress in the development of vaccines is compromised, as the vaccine efficacy achieved has been shown to be reduced in the face of genomic variations. Thus, the variants that present greater transmissibility and greater virulence were called Variants of Concern (VOCs), which, at the time of this study, have been cataloged as Alpha, Beta, Gamma, Delta and Omicron, according to the different changes in the structure of the *Spike protein* and its receptors¹.

Thus, the objective of this study is to analyze the main COVID-19 vaccines available in Brazil, as well as the coverage of the recombinant strains of the initial virus so that it can serve as a reference for health professionals or the community.

METHODS

SEARCH STRATEGY

A systematic search was carried out in the PubMed, VHL and SciELO databases for the publication of original data that answered the guiding question regarding the combination approach between the vaccines, the analysis of the interval between doses and showed the evolution in the immunization process. This systematic review was not registered and a protocol was not prepared. The following search terms were used: Coronavirus, Vaccine, COVID-19, Evolution, Variant, Delta and Omicron. The searches included works published in the period between 2019 and 2023. The reference lists of the retrieved articles were also examined for additional relevant data.

INCLUSION AND EXCLUSION CRITERIA

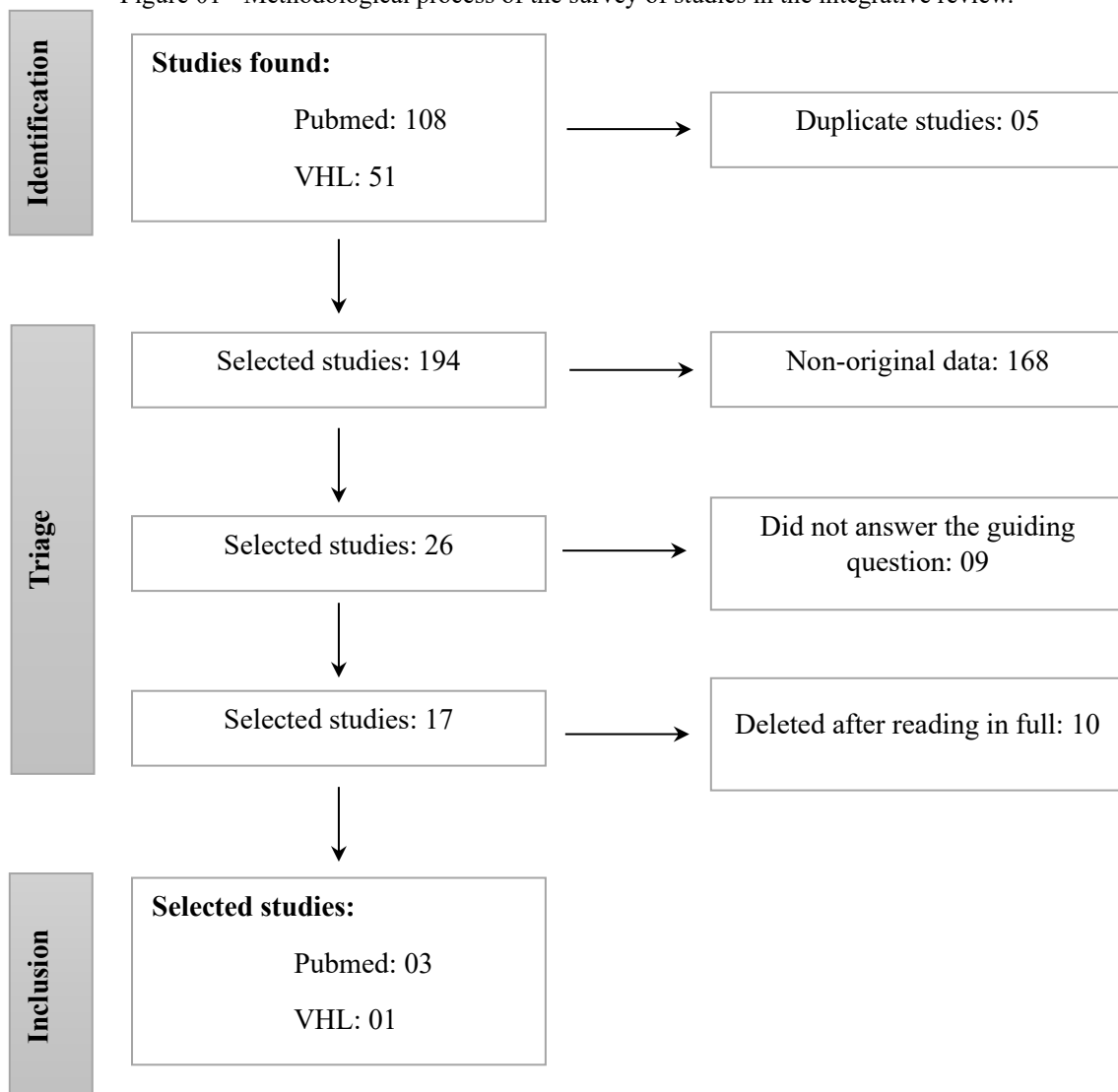
Inclusion criteria consisted of: (1) human studies; (2) original data; (3) that addressed at least one of the COVID-19 vaccines. Studies were excluded if (1) they were not in Portuguese or English; (2) if the studies did not present original data; (3) unpublished texts, such as theses and dissertations.

CHOICE OF DATA AND SEARCH RESULTS

The search of the database using the descriptors mentioned above selected 199 studies. Five of these were duplicates and have been removed. Thus, of the 194 studies, 168 were not original data and belonged to review studies. Nine studies did not meet the guiding question of this study.

After this selection, 17 studies remained for the full text to be read. Finally, a total of seven articles met the inclusion and exclusion criteria, and full-text versions were used to extract data and include them in this review. The overall research strategy is outlined in Figure 01. Vaccine leaflets were used as technical references.

Figure 01 - Methodological process of the survey of studies in the integrative review.



Source: Diagram adapted from the Prisma model.

RESULTS

After reading and applying the inclusion and exclusion criteria, 07 articles were selected, all published between 2021 and 2023, five articles in English and two in Portuguese, as described in chart 01.

Authors	General Objective	Main results
Zamai L, Rocchi MBL (2021) ²	To provide arguments of the involvement of anti-vector immunity and SARS-CoV-2 variants in the efficacy of the ChAdOx1 nCoV-19 vaccine.	This meta-analysis of 135 studies suggests that there is increased transmissibility of emerging SARS-CoV-2 variants of concern where there is prolonged close contact. Full vaccination reduced susceptibility and infectivity, but more for Alpha than for Delta and Omicron.
Aleem Aa, Akbar Samad Ab, Waqar S (2022) ¹	Describe the clinical manifestations and latest treatments in the management of COVID-19, as well as summarize the available vaccines and their effectiveness against the new variants.	It shows the date of emergence of the Variants of Concern (VOCs), as well as the Vaccine Efficacy of the immunizers BNT162b2, mRNA-1273, Ad26.COV2.S and NVX-CoV2373 against the mutations of the wild virus. In addition, it shows that mixing vaccine types increased antibodies and neutralizing responses to most major commercially available vaccines.
Madewell et al (2022) ⁷	To assess how reported household SARs have changed over time and whether SARs are altered by viral variant and case, index case, and contact vaccination status.	The results suggest that emerging SARS-CoV-2 variants of concern have higher transmissibility. Full vaccination was associated with reductions in susceptibility and infectivity, particularly for Alpha compared to Delta and Omicron. It highlights the challenges of developing effective vaccines concomitantly with viral evolution.
Shao et al (2022) ⁶	Systematically assess Vaccine Efficacy (VE) in the real-world setting against each clinical outcome caused by the Variants of Concern (VOCs).	Full vaccination showed high EV against the Alpha variant, moderate EV against Beta, Gamma and Delta, high EV against severe disease caused by Delta, low to moderate EV against Omicron. Booster vaccination has substantially increased EV against Delta and Omicron variants.
Maciel et al (2022) ⁸	To evaluate the interval between doses of SARS-CoV-2 vaccines; interchangeability between vaccines; vaccination in adolescents and the need for better evidence.	Evidence indicates that such mixed or combined regimens of different COVID-19 vaccines can trigger immune responses even stronger and more robust than two doses of a single vaccine.
Orellana (2022) ⁹	OBJECTIVE: To evaluate vaccination coverage and its relationship with changes in the pattern of hospitalizations and deaths due to COVID-19 in the elderly in Manaus, Amazonas State, Brazil.	It shows that younger individuals had more severe disease or progressed to death after the mass vaccination of the population over 60 years of age. In addition, it points out the overall reduction in the rates of hospitalization and death from the disease in the elderly. A partial regimen with the first dose of the Oxford/AstraZeneca vaccine may provide protection against symptomatic disease, however, less effective than with the Pfizer/BioNTech vaccine.
Kupek E (2021) ¹⁰	To investigate the relationship between COVID-19 vaccination coverage and COVID-19-related mortality by age group in Brazil in 2021.	Increase in mortality rate (MT) in people aged 60 and over. People aged >70 exceeded 95% vaccination coverage, while those aged 60-69 reached 80% with the first dose of the vaccine. However, the second dose reached 26, 76, and 64% coverage in people aged 60-69, 70-79, and >80 years, respectively. About 80% of the vaccine doses administered were CoronaVac and 18% were AZD122(ChAdOx1-S). A significant reduction in MD was observed, coinciding with a high coverage (90%) of the first dose in the population of individuals aged 60 years and older.

DISCUSSION

According to the analysis of the selected articles and the available vaccine leaflets, it was possible to observe the vaccination methodology used in the immunizers for COVID 19, recommended age, number of doses, interval between doses, and the effectiveness of protection attributed to each immunizer used (Figure 02).



The coronavac vaccine, produced by the Butantan Institute, which uses inactivated virus technology, was the first immunizer approved by the National Health Surveillance Agency (Anvisa) for commercial use in Brazil. Randomized studies were conducted with children from 3 years of age to the elderly aged 60 years or older to evaluate immunogenicity and demonstrated a consistent result, with a good antibody seroconversion rate. The recommended use is two doses of the recommended immunizer, 2 to 4 weeks for adults and the elderly, and only 4 weeks for children over 3 years of age and adolescents under 18 years of age³.

The Pfizer vaccine was the second approved in the country. Its mechanism of action is by synthetic messenger RNA. This vaccine was released for a target audience from 6 months of age, with a variation in the dose interval by age⁴. However, vaccination campaigns prioritized adults and the elderly, as efficacy studies addressed the age group over 16 years with the BNT162b2 vaccine, in the 21-day interval between doses, with 95% protection against COVID-19¹.

The ChAdOx1nCoV-19 vaccine (Astrazeneca) is an immunizer that uses an adenoviral vector, which was approved to be administered in two doses with an interval ranging from 4 to 12 weeks. In meta-analysis studies, a progressive reduction in IgG was observed with a peak at day 28 after the first dose of the vaccine. In addition, it was concluded that those vaccinated with the second dose, 84 days after the first, produced a peak of anti-SARS-CoV-2 IgG twice as high as those who received the second dose within 42 days of the initial vaccination. However, the possibility of acquiring the disease in the interval between doses was noted due to the lack of post-vaccine preventive measures. This scenario contributes to asymptomatic COVID infection and increases the number of disease transmitters. The efficacy of this immunizer for symptomatic infection was 70.4% against 28.9% for asymptomatic infection for the Alpha variant².

The fourth vaccine released in Brazil was Ad26.COVS.2.S (Jansen), which uses adenovirus serotype 26 (Ad26) vectors as a technology and has a single-dose regimen. It has been approved by ANVISA for people over 18 years of age. This immunizer was approved in the USA after a multicenter control phase study that provided an efficacy of 66.3% against the infectious¹. This immunizer can be applied as a booster dose (second dose) after at least 2 months in case of a homologous regimen (primary Jansen vaccine) or heterologous regimen (primary mRNA vaccine)⁵.

THE EMERGENCE OF VARIANTS OF CONCERN (VOCS) AND THEIR RELATIONSHIP TO THE VACCINE

Viral mutations are responsible for altering the pathogenic potential of the virus, so that even a single amino acid exchange has the potential to increase a virus's ability to evade the immune system, complicating all the progress made in developing a vaccine against it. Thus, SARS-CoV-2,

like other RNA viruses, has the propensity to evolve genetically, resulting in multiple variants that have different characteristics from ancestral strains¹.

In light of this, multiple variants of SARS-CoV-2 have been described in genetic sequencing banks, of which some are considered variants of concern (VOCs), due to their great impact on public health. Thus, studies have shown that VOCs are associated with lower neutralization by antibodies obtained both through natural infection with other strains and by vaccination, demonstrating a certain ability to avoid detection or a decrease in the effectiveness of vaccination in relation to the original strain, in addition to showing increased transmissibility or virulence¹. Based on the WHO epidemiological update, as of December 2021, five SARS-CoV-2 VOCs have been identified since the beginning of the pandemic, Alpha, Beta, Delta, Gamma, and Omicron, respectively in chronological order of reporting.

The Alpha variant, the first variant of concern in the chronological account, lineage B.1.1.7, was reported primarily in the United Kingdom in December 2020 based on genomic sequencing of patients who tested positive for SARS-CoV-2. That said, this variant has 17 mutations in the viral genome, eight of which are in the protein *Spike* (S), in addition to an increased affinity of this for ACE 2 receptors, resulting in increased viral binding and entry into host cells. From this point of view, the B.1.1.7 lineage was reported to be 43% to 82% more transmissible and people infected with it had greater disease severity and a higher risk of death compared to other VOCs¹.

Likewise the Alpha variant is refractory to neutralization by most monoclonal antibodies to the N-Terminal region (NTD) of the protein *Spike*, as well as relatively resistant to some monoclonal antibodies to the ancestral RBD receptor, threatening the protective efficacy of vaccines developed before their emergence. In summary, the immunizer that demonstrated the greatest efficacy for this VOCs was the ChAdOx1 nCoV-19 vaccine, produced in Brazil by the Oswaldo Cruz Foundation (FIOCRUZ)².

The Beta variant, second VOC in the chronological account, B.1.351 lineage, was first reported in South Africa in December 2020, and is responsible for the second wave of infections in that country. This variant has nine mutations in the protein *Spike*, of which three are located at the RBD receptor, increasing, as in Alpha, the binding affinity for the host cell's ACE receptors. That said, the B.1.351 lineage has an increased risk of transmission and reduced neutralization by both monoclonal antibody therapy and convalescent sera and post-vaccination sera¹.

In this sense, considering the similarity of mutations in the same protein between the Alpha and Beta variants, a complete vaccination provided moderate protection against infection caused by Beta, when the vaccine efficacy (EV) for the immunizer was analyzed ChAdOx1 nCoV-19. In other words, for this immunizer, the Beta variant was neutralized, avoiding hospitalizations, in 72% of those vaccinated, while 86% of those vaccinated neutralized the Alpha6 variant.



The Delta variant, third in the chronological account, lineage B.1.617.2, it was initially identified in December 2020 in India and was responsible for the deadly second wave of COVID-19 infections in April 2021. On North American soil, this variant was first detected in March 2021, proving to be the most dominant strain until the end of 2021. It has ten mutations, in genes distinct from the previous variants, in the protein *Spike*¹.

In a full-schedule analysis of two doses of the mRNA, ChAdOx1 nCoV-19 and Ad26 vaccines. VOC2. S, they performed better for the B.1.617.2 variant when compared to the adenovirus vaccine. Thus, complete vaccination by means of mRNA showed a VE of 70% against infection, 84% against hospitalization, 88% against ICU admission, and 90% against death⁶.

The Gamma variant, fourth in the chronological account, lineage P.1, also known as the GR/501Y variant. V3, was identified in January 2021 in Brazil. This variant harbors ten mutations in the *spike* protein, just like Delta, however, three of these mutations are located in the RBD gene. Thus, based on the WHO epidemiological update on March 30, 2021, this variant has spread to 45 countries, making it a VOC, due to its neutralization being reduced by monoclonal antibody therapies, convalescent serums, and post-vaccination sera¹.

Like the Alpha, Beta, and Delta variants, the Gamma variant was better neutralized by mRNA vector-based vaccines, with an IV of 71% against infection, 78% against hospitalization, and 81% against death in a two-dose vaccination schedule. These variants are similar both in their mutations and in their moderate vaccine efficacy compared to their ancestral strain⁶.

The Omicron variant, the fifth VOCs in the chronological account, also called the B.1.1.529 variant, was first identified in South Africa in November 2021. This variant has more than 30 changes in the *spike* protein, as well as in several other regions and non-structural proteins. For this reason, the Omicron variant shows a 13-fold increase in viral infectivity and is 2.8 times more infectious than the Delta variant. In addition, the Spike K417N mutation, also found in the B.1.351 variant, along with E484A is predicted to have a very disruptive effect, which makes Omicron more prone to uncovered windows of immunization between vaccines¹.

From this perspective, it is understood that the Omicron variant showed low EV, with 23% against infection, 56% against hospitalization and 82% against death. However, looking specifically at those vaccinated with mRNA vectors, there was a slight increase in VE against infection, which rose to 60%, as well as against hospitalization, which increased to 85%. In addition, it is possible to analyze the behavior of the immune response over time for the Omicron variant against the mRNA-1273, BNT162b2, ChAdOx1, Ad26.COV2.S and CoronaVac vaccines. The summarized EV, for a complete vaccination schedule of at least 2 two doses, was 44% against infection in the first month and later decreased to 6% in the sixth month. In addition, VE versus hospitalization was 71% in the first month and slowly decreased to 59% at the end of 180 days. At the same time, booster



vaccination showed a high protective effect, but also a decreasing effect against both infection and hospitalization at the end of 4 months⁶.

Therefore, the infectivity and immune evasion capacity of VOCs, compared to the original strains, were shown to be increased and the VE against VOCs was lower as well as rapidly decreased over time. On the other hand, it is necessary to understand that VE performance in the real-world setting is affected by public health measures, individual self-protection behaviors, access to health services, and vaccine hesitancy, factors that may not have been considered in vaccine efficacy studies².


ACKNOWLEDGMENT

The support of the National Council for Scientific and Technological Development (CNPq) and the University of Gurupi (UNIRG) for the development of the research.

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Semi-uncontrolled traffic and the subordination of immigrants. Between Asia and Europe. The rise of the extreme right

 <https://doi.org/10.56238/sevned2024.010-038>

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ABSTRACT

Intense global flows have led to an increase in migrant populations in European countries and in Portugal in particular. The growing difficulty of citizens from countries like Bangladesh, India or Pakistan in legalizing themselves and the political processes of rejection of those migrants - The Brexit for example - led to the search for alternatives to these routes dating back to the colonial era and the forced labor of indigenous people. Meanwhile, centuries later, smuggling is a reality, and it is in this context that Portugal in the post-crisis 2008 has become a legislatively friendlier country for immigrants, particularly through measures taken by the socialist government elected in 2015. Many of these immigrants, who - in some cases for decades - have not seen their relatives, could in 2018 fulfill that wish and some of them settled in Portugal, bringing their wives and having children already with Portuguese nationality. We will try to clarify how this process started in 2015 was developed and revealing, a social condition of individuals as unwanted pariahs and subjects of an illegal, and therefore exploitable body. The role of the state in overcoming this condition turns out essential.

Keywords: Immigrant, Illegal, Smuggling, Human rights.

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INTRODUCTION

It was estimated in 2006 that about 20 million people had embarked on migratory projects originating in India (TROVÃO and ROSALES, 2010, p. 7), although it was only from the nineteenth century and especially during the twentieth century that social networks of Indian origin could be identified operating in Europe, when Bangladesh and Pakistan did not yet exist.² Even today, the same religious motives, to which terrorism, poverty and climate change or political instability are added, promote violent geo-demographic adjustments in these societies, forcing their nationals to emigrate. This is the case of Bangladesh, India or Pakistan where tropical cyclones, hurricanes, tides, heavy rains and the consistent rise in sea level (in a state where the geography is mostly at sea level and not above – Bangladesh), cause population exoduses that, in the face of decrepit taxonomies, are confused with economic migrations. Moreover, in full line with what is reported to us by the report "Global Trends; Forced Displacement in 2017" by UNHCR, the UN refugee agency.

Globally, the forcibly displaced population increased in 2017 by 2.9 million. By the end of the year, 68.5 million individuals were forcibly displaced worldwide as a result of persecution, conflict, or generalized violence. As a result, the world's forcibly displaced population remained yet again at a record high. (Disponível em <https://www.unhcr.org/5b27be547>)

In 2019 and giving a glimpse of the intensity of the process and according to the report published by the same UN Refugee Agency (UNHCR), the number represents an increase of 2.3 million compared to 2017. In the same report "Global Trends" it is revealed that 70.8 million people are in a situation of forced displacement in the world. This has had consequences in the host countries with an increase in xenophobia and racism. These displaced or transitory bodies, without a place or space for citizenship, require another political paradigm and action from the authorities, starting with the deconstruction of a discourse that represents them as bodies and subjects without history. It is in this confrontational framework that we intend to address, from this article, the ways in which discourses of subordination of migrants are socially produced, resorting to racial arguments, which associate, for example, illegal/informal practices to certain nationalities/classes, thus triggering processes of infra-hierarchization between the *us* and the *other*, under several intersecting dimensions. Discourse appears in this context as a way of hierarchizing social actors and, simultaneously, as a mirror of this hierarchization, in a way that discourse and its object seem to be one. How does this happen? Nevertheless, it is up to us to deconstruct this apparent uniqueness. On

² At first, we reveal, in a colonial context, the recruitment of labor of Indian origin and its transportation to the colonies where its work was needed. It was a somewhat forced and deceptive migration, however, after the colonial period, a migration that Trovão and Rosales call "free" emerged, but following the migratory paths taken by their Indian ancestors, however, mostly confined to the territories historically subject to colonization (TROVÃO and ROSALES, 2010, p. 7 - 8). In a second moment, and more relevant to the case at hand, namely between the 50s and 60s, we detected migratory flows directed primarily to the territory of the English colonial power.

the other hand, we will seek to draw attention to the consequences and impacts of these processes on migrants and their migratory survival strategies. To this end, we observed from January 2015 onwards, Indian, Bangladeshi and Pakistani citizens who sought to obtain a residence permit in Portugal, analysing for this purpose travel financing strategies, search/supply of employment contracts or the social networks established and designed with a view, for example, to obtaining support in socio-economic vectors such as reception, housing, exchange of information, or countless other aspects that underlie the status of *illegal immigrant*. To this end, we used participant observation, with long periods of coexistence with individuals belonging to these populations, and non-participant observation, using semi-directive interviews,³ through which we intend to counteract the growing trend towards the objectification of illegal bodies.

The analytical perspective highlighted above involves apprehending the subjectivity of the immigrant, as an object/universe of study, through the analysis not only of their behaviors and strategies, but also of the conditions that are provided to them in the host land. Namely, SEF procedures⁴, immigration laws and their effectiveness, rights of applicants for residence permits, average waiting time until SEF issues a decision, daily difficulties that derive from the illegality imposed, in short, a panoply of constraints that are imposed on them, also at the identity level. This presupposes the deconstruction and consequent integration of concepts such as nation, emigration, globalization, host country and *homeland*, among others, so it is imperative to structure them not as abstractions, but rather as nomenclatures that reflect and impose multiple relationships and interdependencies, often embodied in feelings of belonging or disidentification with the other in multiple dimensions (Cf. WOLF, 1985, p. 3). Which cultures change, the arrival, the host or both?

FLOWS, GLOBALIZATION, MORAL/SOCIAL PANIC AND ITS DIMENSIONS

The history of the world and societies reflects contacts, relationships, encounters or disagreements, as well as the connections established in certain contexts and circumstances (WOLF, 1985). Often, however, history is apprehended from the point of view of great personalities or from a focus on great events, which are the primary sources of the construction of national identities/cosmogonies. However, anthropology, with the help of history, must celebrate⁵ those who are socially constrained to have no history by remission to the invisibility of non-citizenship. This perspective should stimulate an approach that encourages the rescue of this past – in the meantime,

³ In any of the cases involving travel to their homes and in the second case, numerous interactions maintained on Rua do Benfornoso, in their workplaces or businesses.

⁴ Foreigners and Borders Services. Recently dismantled, giving way to the Agency for Integration, Migration and Asylum (AIMA). AIMA appears on October 29, 2023 with the extinction of the Foreigners and Borders Service (SEF) and restructuring of the border control system. Administrative functions related to migrants and asylum are now handled by AIMA.

⁵ Halbwachs, 1990; Collective memory and the argument that what is not celebrated, is forgotten and if it is forgotten, it does not exist.

made invisible – underlining the role of this history/stories in the establishment of new connections, relationships and interdependencies. It is these different stories – multi-situated and multicultural – that, in interaction, bring to visibility the space of social relations, as an arena where authentic battles for survival and identity struggle are fought (ORTNER, 1984). It is our goal to underline and deconstruct the various subjectivities, in a process of encounter between cultures, which oscillates, dialectically, between the encounter and its reciprocal creation/transformation (SAYAD, 1999, 2014). This encounter/transformation does not always occur voluntarily, "often the bosses and the ruling classes would like to make use of the available immigrant labor, without paying a cultural price for it." (SAYAD, 2014). In other words, the transformation brought about by the migratory encounters we are talking about may not be desired. In the alternative, the intensification of flows of various kinds that we have been witnessing in recent decades has promoted the collapse of old organizational/representative logics in various dimensions; local, regional, continental and transcontinental.⁶ The aspects valued from the established interdependencies and their intensification (HARVEY, 1989, SHELLEY, 2010:37), especially at the economic and financial level - which, while advised by economic cycles of expansion - allowed the complacent, but selective, acceptance of socially, legally and administratively produced/incorporated migratory phenomena as illegal. Illegality has, therefore, at its base a fiction, which first defines a center of normality/legality and, in opposition to this center, elects numerous factors of destabilization, commonly known as illegalities. The notions of legality and illegality correspond, therefore, to a structure/power that monitors them, thus preventing a hypothetical loss of their structural and structuring effectiveness (BOURDIEU, 2002) In this context, the constitution of effective or reserve work grants, made up of individuals from countries typically or contextually in difficulties of various kinds, were conceived as useful or at least, indifferent. In this way, this interested and, therefore, subjective framing was legitimized in a social construction of a concept of illegality, gradually incorporated and thus becoming concrete. The relative social and economic stability in Europe and the United States in the post-World War II period - which lasted until the end of the twentieth century - as well as the staggering of a list of enemy countries, equally stable and easily represented as such⁷, facilitated this ambiguous view of migrants, both illegal and paradoxically useful, and often – while, unskilled or skilled - associated with inherently cheap labor. This stability has fostered the production of a taxonomy on migration, based on asylum seekers, economic migration, etc. (Cf. MEZZADRA, 2015, p. 11).⁸ In this context,

⁶ "Human trafficking has increased dramatically with globalization, the rise of illicit trade, and the end of the Cold War. Free markets, free trade, increased economic competition, and the decline of state intervention in the economy have underlined, as undeniable facts, the emergence of the globalization process. This process is also characterised by the intensification of the mobility of goods and people, as well as the acceleration of communications. Remote parts of the world are now integrated into the global economy. However, entry controls in certain countries create barriers for those seeking to migrate." (SHELLEY, 2010:37)

⁷ Greater effectiveness of institutions such as NATO and the UN.

⁸ Nowadays other concepts emerge, such as climate refugees, asylum seekers for gender discrimination, etc.

the borders, which were carved out - at the time - as geographical limitations, take on a dimension of mediators of social relations between individuals from different countries, existing and demarcating geographical limits and, therefore, symbolic, being characterized by a controlled porosity, however, surreptitiously consented and interested. It should also be noted that these taxonomies emerged at a time when the mobility of populations and individuals had nothing to do with the current one in size and intensity, so that currently, mobility and migration are concepts that intersect (Cf. LÉDRUT, 1979 and RÉMY and VOYÉ, 1994).

THE OTHER, STRANGE AND POTENTIALLY THREATENING – THE FAR RIGHT AND ITS RISE

The emergence of terrorist movements for which there was no such thing before, a framework - although terrorism is not a new fact in general - has demanded from the so-called developed economies an effort to adapt to a new type of war, unprogrammed, random, without military and military contingent, defined, which from the margins of the world structure emerges as a reinvented form of warmongering acting through violent operations called terrorists. that essentially affect the subjective feeling of insecurity, directing them to the centers of hegemonic power, namely reaching geographical areas of decision-making, of cultural, ideological, philosophical and civilizational expression *mainstream*. The identifiable enemy is followed by the opposer who may be the person with whom we have lived half-walled and known as a quiet neighbor for years. The paradigm of security is altered, as well as the imagery produced and associated with immigrants. They have become a threat to European political and social security and organization and even as probable culprits of the failure of the European welfare state, feeding the discursive enunciation of the extreme right on the rise all over the world. Flows perceived as entropic and potentiators of various disorders and, above all, as potentiators of the proliferation of terrorist acts. In Europe today, in addition to a xenophobic and racist reaction, there are moments of tension between Europeans themselves. Federalism, or the ideas that initially drove the EU, reveal cracks torn by nationalist ideals and negative prejudices towards the other. The recalcitrant agonism is not only directed at migrants or refugees⁹ from other continents, it is also directed at the mobility of Europeans in transit through the Schengen area.¹⁰ In this context, the countries close themselves off and claim for themselves autonomy that has been ceded for some time – by negotiation – while the tension between Europeans increases and the political discourse based on a *nationalist "we"* (BILIG, 1995), as opposed to a threatening *"they"*, enlists followers, in a process in which the production of the subjective sensation

⁹ In certain discourses, there is a dark intention to mitigate concepts and practices associated with the status of refugees, migrants and the possibility of some being terrorists.

¹⁰ Therefore, it seems reasonable to us to say that mobility and migration can in certain cases be the same thing, and in these circumstances their differentiation is essentially political – some are citizens, others are not citizens.

of threat/insecurity results from more or less concerted actions that produce social panic (BOCAYUVA:49, MEZZADRA, 2015, p. 25-26, RUBIN in VANCE, 1984).

The increasing number of illegal immigrants and trafficked persons in a given area may result in an increase in discrimination and hostility towards the ethnic and racial minorities concerned. (SHELLEY, 2010, p. 61)

BUSINESS CYCLES, RELIGION AND DISCOURSES ON IMMIGRATION

Other authors, however, argue in another direction; the conflict between immigrants and natives stems from the economic fragility, not only of migrants, but also of the economies of the host countries (DANCYGIER, 2012:1). In a confluent sense;

I delve into what this marginality and exclusion consists of and how they are elaborated and reconstructed in the web of everyday relations, often reflected by the procedures of institutions, for example the racialization of the economy and the law. (...) I want to underline the incongruity between an integrationist and multicultural rhetoric and the legal practices that seem to contribute a lot to its failure. I also want to deepen the concepts of citizenship. (CALAVITA, 2005:2)

Therefore, social panic is intensified by circumstances in which problems, also of economic origin, underlie this concertedly disseminated and produced alarmism that has essentially started to provide the extremist right-wing discourse since the economic and financial crisis. The economic aspect supported by Dancygier (2012:1), however, is not the only one to operate, currently, the religious issue takes on another dimension in the public sphere, re-entering and rekindling social panic, always latent and politically manipulated by ideological quarters. The prohibition of the wearing of the veil in France or the construction of mosques in Switzerland exemplifies cases in which religiously-based facts reassume a central role in public concerns (MAPRIL and BLANES, 2013:1), in a way that resembles homophobia or transphobia. These conflicts are reinforced by events in which social/moral panic generates violence against immigrants (https://www.rtp.pt/noticias/pais/agressoes-no-porto-contrainmigrantes-terao-ligacoes-a-grupo-de-extrema-direita_a1569448). Their motivation is varied and can range from Islamophobia, xenophobia or a mere aggressive reaction to immigration. Calavita tells us of a reactive phenomenon that occurred in Almería in the distant year 2000. Locals set fire to migrants' homes, shops and cars. As a result of these attacks, more than 70 immigrants engaged in agriculture were injured and hundreds lost their homes. A year later, in Salandra, Italy, nationalists attacked an orphanage housing 31 Albanian children, shouting, "Lynch the Albanians!" (CALAVITA, 2005:1, Cf. in the same sense BOCAYUVA:49, MAPRIL in LECHNER, 2015, Mezzadra, 2015). "(...) Unfortunately, this violence against migrants is very common (...)." ¹¹ Calavita, points out that there is a certain socio-structural

¹¹ A decade and a half later, Salvini emerges.

affinity between racism and the dominant culture, even when the discourse that emanates from this source underlines values of tolerance and apparent kindness in the face of multiculturalism (CALAVITA, 2005:2) On the other hand, we must also consider that the motivations, aspirations and desires of our interlocutors often go beyond the mere search for economic improvements to be obtained from emigration. "encompassing consumption patterns and lifestyles, family and kinship logics, search for autonomy, access to "modernity" projects, among many other vectors of analysis and action (...). This paradigm joins others that in the publishing Portuguese have been drawing attention to the study of the experiential dimensions of contemporary migratory phenomena (DIAS, 2012; Cf. MAPRIL, 2013, 2016, p. 475, LECHNER, 2015, MEZZADRA, 2015)". These facts give a subjective and agency dimension to the perspective and study of these phenomena, both from the side of borders as symbolic elements that generate illegality, and from the social actors object of this process.

ILLEGALITY AS A DIMENSION OF INCLUSION AND THE FOUNDATION OF EXTREMIST DISCOURSE TOWARDS MIGRANTS

Therefore, we see the existence of multiple social dynamics, both upstream and downstream of the migration problem (SHELLEY, 201, p. 8 Cf. CARRERA and ELSPEETH, 2016). Moreover, in this context, we consider that in contemporary times, Asian immigrants can easily be connoted with Islam¹², illegality or threat (<https://observador.pt/2024/05/24/lider-da-comunidade-do-bangladesh-nega-existencia-de-grupos-radicaes-e-pede-a-tanger-correia-provas-de-suposta-cimeira-de-partido-proibido/>) living in these conditions, sometimes for decades, in European countries where they incorporate a status of non-citizen or second-class citizen. More than a form of exclusion, illegality becomes a dimension of inclusion that sustains the xenophobic and racist discursive statement. Therefore, it was not only the old organizational logics of the world system that were in the process of collapsing, but also the epistemological efficacy of the classical scientific taxonomies on immigration.

(...) for this production of the "foreign body" of the "illegal migrant" who – it is important to emphasize – is not a mere figure of "exclusion". As an "internal other," the "illegal" migrant is first and foremost the product of what Nicholas De Genova, in an important work on migration from Mexico to the United States, defined as "an active process of inclusion through illegalization." (MEZZADRA, 2015, p. 14)

At the same time, this same paradigm of citizenship that serves as a reference and the associated welfare state is also beginning to be questioned by European elites in its practical effectiveness in relation to their own fellow citizens from an ideological perspective. On the other

¹² Many of our interlocutors refer to this as essential to the difficulty they experience in obtaining legality in Europe, which is why we have attached importance to an introductory note on terrorism and its consequences in Western countries.

hand, we are witnessing the emergence of a trend in the various systems of European citizenship, which gives primacy to the dimension of the culturalization of citizenship, that is, "citizenship is attributed according to the proof of the incorporation of certain values and ideas, in a clear assimilationist logic." In these cases, citizenship would be less access to formal rights and more the incorporation of certain ideas and patterns of behavior.¹³ Regarding the central issue, we do not deny the informalities/illegalities mediated as strategic ways for a hypothetical "legalization" in the national territory, but, more than associating them with the abstract condition of being an immigrant with a certain nationality, we seek above all to point out the factors that contribute to this marginalization/marginality of behaviors and strategies. To this end, we must bear in mind the past contexts of these migrants (SAYAD, 1999) and the confrontation with the experiences of another type of subordination, that is, the castration of rights, which constrains them to act strategically in the social and political arena, with reduced "mainstream" autonomy.¹⁴

INDIA, PAKISTAN AND BANGLADESH

The creation of stereotypes violently applied to migrants not only makes them prisoners of this prison of (<https://theconversation.com/como-a-islamofobia-e-o-racismo-antipalestino-sao-fabricados-por-meio-da-desinformacao-216336>) representations (Cf. MACHADO, 1999, 2003), but should also be the first aspects to be overcome by social scientists and activists, in order to approach migrations from a perspective that includes the various cultural dimensions of these individuals, not only as social actors and actresses received in "host countries", but also as coming from "countries of emission" of people, who had their own existence and cultures, at a stage prior to the migratory project. According to Abdelmalek Sayad, immigrant culture, when confronted with the culture that receives it, integrates metamorphoses that make it a culture of arrival or a culture in creation. (1999:19), so that the changes produced in the culture of immigrants when confronted with the society that receives them, will also produce effects on the culture of the *homeland* (SAYAD, 1999, p. 20-21).¹⁵ In Portugal it is possible to speak of the emergence of what authors such as Sandro

¹³ To think about the relevance of this theme, it is enough to recall the way in which, for many political movements in contemporary Europe, "Islam is seen as a 'foreign' religion, of 'immigrants', in the face of other so-called 'native' or 'autochthonous' religions and which, at best, has to be disciplined." (MAPRIL, 2016 and LECHNER, 2015)

¹⁴ How to get around these emasculating dynamics? How to survive in inequality of circumstances? How to deal with illegality? This is what we propose to accomplish, knowing in advance that the relations between individuals and institutions, or between individuals and groups, are generally unequal. This is accentuated in this context by the fact that some of these social actors only emerge as subjects as immigrants and illegals, stripped of their history and in some way of their identity/affections. (Cf. AGIER, 2002, KULIK, 2003, PELLUCIUS and MISKOLCI, 2007)

¹⁵ This is all the more important because this right of enunciation is often denied to it by the dominant discourses on migratory phenomena, which, in their logic of conduct, that is, of the governmentality of migration, organize these populations on the basis of their national, linguistic and religious belonging, silencing the complexities, ambiguities and procedural dimensions of the daily life experienced by concrete people (,,). The demotic versions (as Baumann, 1996 called them) analysed here contest precisely these homogeneous and dominant portrayals of immigration, introducing complexity and ambiguity. (MAPRIL, 2016:475, LECHNER, 2015)

Mezzadra and Brett Nielsen (2013) call border subjectivities ¹⁶and in this context it is possible to observe the ties that are established between Pakistanis, Indians and Bangladeshis, as well as, in another segment, between Brazilians or between Brazilians and Portuguese, in terms of the exchange of information and the availability of resources (suspended in social relations, in which the share capital raised plays a relevant role). These social networks are based on relations of nationality, common regional origin, gender, neighbourhood, sharing of language or knowledge and, in some cases, kinship (BOURDIEU, 2002, COLLEMAN, 1999, VERTOVEC, 2009). In specific cases, religion can also be a dimension of primary relevance. To understand them, we need to delve into the historical roots that underpin the relationship between, for example, Bangladeshis, Indians and Pakistanis. These networks reflect subjectivities that sustain the bridge between cultures of origin and cultures in creation (SAYAD, 1999), which can be rooted in the difficult living conditions in India, Pakistan and Bangladesh, marked by episodes of terrorism and poverty.

BRIEF SOCIO-CULTURAL BACKGROUND OF THE GREATER MAINLAND INDIA:

In order to understand the subjectivities mentioned above, we must make a brief review of the historical facts that have long sustained the relations between Indians, Bangladeshis and Pakistanis. Even in the twentieth century, both Pakistan and Bangladesh were part of greater India. In 1947 India was divided into India and Pakistan, with Pakistan being mostly Muslim and India Hindu. As a consequence of this division, the province of Bengal was partitioned into East Bengal (Pakistan) and West Bengal (India). These events culminated in 1971¹⁷ with a conflict over East Bengal's successful independence from Pakistan. This rebellion, which was based on a previous movement for the autonomy of the Bengali language (1952), resulted in the independence of Bangladesh. Earlier, the partition between West and East Bengal had had its social consequences. Muslims in Kolkata/Calcutta, India – West Bengal – are still a minority today in three respects: they belong to a community that is highly discriminated against on a daily basis, they belong to a group of Urdu speakers among a majority of Bengali speakers, and lastly;

(...) the third aspect to bear in mind regarding the minority status of Muslims in Calcutta is that they are essentially urban, while in East Bengal they live mainly in rural areas. The fact that they retain the language and customs of Bihar and Uttar Pradesh is the most eloquent comment on their sense of separation, not fully integrated into the life either of the city or of the state of West Bengal. (SEABROOK and SIDDIQUI, 2011, p. 5)

¹⁶ (...) by border political subjectivities, subjectivities that question the hegemonic models of construction of migratory regimes based on national belonging. This is especially true in the case Portuguese, where the idea of citizenship centered on interculturality conveys a model of organization of immigrant populations based on the idea of national communities, represented by their associations. (MAPRIL, 2016, Cf LECHNER, 2015)

¹⁷ The arrival of these immigrants in Portugal must be framed in the history of immigration from the territories that today belong to Bangladesh and in its relationship with some events that occurred in the world economy and in national policies. Migratory movements from present-day Bangladesh began long before the founding of the state, which took place in 1971, and assumed, until the mid-1970s, the pattern of immigration linked to the colonial experience. (MAPRIL, 2005)

Do you wonder why they did not transition to Eastern Bangladesh? According to Seabrook and Siddiqui, the explanation is simple; the Urdu-speaking Muslims residing in Kolkata hail from Bihar. There is a curious parallel between the isolation of these Muslims in India and those 1.25 million Muslims from the state of Bihar who decided to migrate to Pakistan in 1960.

This was partly a consequence of the partition of India and the result of unrest in the state of Bihar. The exodus took place in the conviction that opportunities for Muslims would be greater in Pakistan than in India. Nevertheless, these unfortunates were trampled by the Bangladeshi war of independence in 1971. Thus, they were ostracized by the Bengalis, connoted as collaborators and forced to take refuge in refugee camps, protected by the UN. (SEABROOK and SIDDIQUI, 2011, p.45-46)¹⁸

Within this framework, it will be easy to understand that in this, as in many other cases, emigration has economic motivations, many of them, however, spurred on by political factors, exogenous to individuals considered in isolation. Even today, in a migratory context, these divergences are perceptible, between individuals who were once part of a single country, India. Thus, religion, language and roots in the territories subject to change of sovereignty have led and continue to lead to processes of discrimination, even so, susceptible to transformation in migratory contexts, which can be explained by the concept of transnational positionality.¹⁹ This concept implies some duality in the directed analytical approach, involving the contexts of origin and destination. In Portugal, it is visible and observable in the relations between Indians, Bangladeshis and Pakistanis.²⁰

TAXONOMIES AND THEIR EPISTEMOLOGICAL EFFICACY

ECONOMIC, SOCIAL AND POLITICAL DIMENSIONS OF SUBORDINATION

These migratory flows to Europe, trapped by a tangle of various and multi-situated interdependencies that condition each other, are confronted with the prospect of an ever-increasing need for legal and administrative integration, which in turn is becoming more and more difficult to achieve through legalisation and the acquisition of differentially positive forms of citizenship. Therefore, alternative/informal strategies are activated as a form of reaction to increasingly hostile

¹⁸ Some of these camps in Bangladesh have become cities particularly similar to Calcutta (Kolkata). These Urdu-speaking Muslims were similarly stigmatized by the Communist Party, which converted poor people into small landowners, however, as long as they were Bengali speakers. Thus, the groups coming from Bihar were discriminated against and relegated to poverty, both in India (Calcutta) and in Bangladesh - refugee camps in Dhaka. (SEABROOK and SIDDIQUI, 2011:45-46)

¹⁹ Translocational positionality is, according to Anthias, "one structured by the interplay of different locations, related to gender, ethnicity, race and class (amongst others), and their at times contradictory effects. (ANTHIAS, 2002, p.276 e 2000 in BASTOS e GOIS, 2010, p.138).

²⁰ "Bangladesh, one of the poorest countries in the world, is the source of many and varied forms of trafficking, including forced marriage, domestic servitude, slave labor in factories, or sexual exploitation of women and children. Slave labor takes place in factories relocated from other countries of the world where labor costs were higher, thus exploiting the Bengalis. Ironically, this exploitation takes place in a country where wages are already among the lowest in the world. This exploitation of Bengalis also takes place in bordering countries such as India and Pakistan, as well as in some Gulf countries." (SHELLEY, 2010, p.169) Translocational *positionality* can, for example, mean that someone who in India held a lower status, can reverse that position in Portugal by virtue of being able to provide an employment or accommodation contract.

and politically worked reception contexts for this outcome. These strategies can easily be integrated by discourses of illegality, which reinforce the connotation with a status of subordination, operating through stereotypes linked to certain nationalities or religions. These processes, accentuated by emerging nationalisms, connote ethnicity/nationality with crime, and, within these, with certain types of crimes, which, in turn, underline orientalized/essentialized characteristics (MACHADO, 1999), which tend to be incorporated by the host societies as corresponding to and integrating these immigrants. In this way, the process of subordination already underway is reinforced.²¹ This state, which through its agents and institutions treats some as subordinates, creates anguish and frustration in the migrants who turn to it. The difficulty in legalizing or obtaining a legal employment contract encourages alternative avenues.²² In this generic framework, the figure of the illegal immigrant, contrary to what one might suppose, is not only a consequence of a process of exclusion, it is, in Mezzadra's view, a concept that assumes a dimension of inclusion, through hierarchies of citizenship (2015, Cf CALAVITA, 2005, p.2). In a global context in which neoliberalism reigns and the extreme right is on the rise, these undocumented workers nevertheless constitute a reserve of labor (Cf. SAYAD, 1999), for jobs unwanted by the natives and in conditions of total or near-slavery.²³ Still, public statements around ideals such as the integration of migrants are common. "(...) integration has become a mantra on the lips of governments officials, opposition party members, and immigrant advocates alike²⁴." (CALAVITA, 2005, p. 2). This may be happening today in Portugal, with citizens of Bangladesh, India and Pakistan (Cf. SHELLEY, 2010, p.149 and 151).

Many of the countries in this region (India, Bangladesh and Pakistan) are among the most densely populated in the world. Only India – among these – is experiencing any economic growth and a tendency towards the consolidation of the middle class. However, much of the Indian population, as well as Bangladesh, Nepal and Pakistan, remain in a state of deep poverty.

²¹ *Translocational positionality* can not only operate between Indians, Pakistanis and Bangladeshis abroad, revolutionizing old statuses and recreating new ones, but generally operates a downward social mobility in the face of the relationship built between them and the natives. Criminal imagery, for example, can also be seen through a scientific discourse that can reinforce it: Transnational crime was synonymous with drug trafficking in the past, however, in contemporary times human trafficking is practiced on such a large scale that many transnational criminal groups engage in this type of activity. mainly. Like drug trafficking, human trafficking exists because of the demand of the developed world. Some transnational crime groups such as the Chinese Triads, Thai, Indian, Pakistani, Nigerian, Mexican, Russian-speaking, Albanian, and Balkan specialize in trading humans. (SHELLEY, 2010, p. 5)

²² Forgery of airline tickets for example, one of our interlocutors paid €200 for one, in order to prove his entry into Portugal. Those who falsified the airline tickets were Portuguese.

²³ "This broad definition of trafficking includes sex trafficking as well as trafficking into exploitative work situations such as domestic help, agricultural workers, and workers in dangerous industries as well as those trafficked as child soldiers." (SHELLEY, 2010, p.11)

²⁴ We found that in Portugal the Bengalis, Indians and Pakistanis almost all use the same ones, since the passage of information is through word of mouth, at the same time, almost all these lawyers know each other. Their relationship with their customers is distant and in their waiting rooms, we see the daily presence of dozens of these individuals.

CITIZENS AND OTHERS

Neoliberal capitalism and the recent extreme right that has acquired greater visibility with the election of Donald Trump in the United States, based on a marked arbitrariness of the circulation of commodities, capital and images, conceives in these alterities to citizenship, the spoils of this same global neoliberalism - *losers*. From this perspective, southern Europe, and more specifically Portugal, constitute an interface of entry into the continent – either from a physical perspective of crossing a border, or in a conceptual dimension of conditional acceptance into citizenship, through the residence permit – where cultural, religious, economic and political borders are in constant negotiation and the traditional conceptualization of border as a geographical delimitation. It begins to absorb and evidence hints of struggle and tension between subjectivities (Cf. MAPRIL and BLANES, 2013, p.7, Cf. ORTNER, 1987). This is confirmed by Sayad's argument that thinking about immigration implies thinking about i/emigration and its consequences in the countries of origin (1999, p.15). To this end, we also use Mezzadra's concept of border, in which the nomenclature goes beyond its mere geopolitical dimension. The fact that they cross the border, which has no legal and institutional legitimacy, leaves them with difficulties which they will have to overcome, and this cannot be achieved by the standards of European citizenship. This form of inclusion by illegality ends up following Foucault's reasoning. In other words, in contexts of extreme surveillance, the conditioned deviation can be the reinforcement of the norm, which through a fiction is socially incorporated as nature (1978).²⁵

CONCLUSION

Authors argue that the way in which religious, cultural and political expression takes place in the public space reveals the social place attributed to the social actors who are the subjects of these manifestations (Cf MAPRIL and BLANES, 2013, p.10). This hierarchization ends up producing and, simultaneously, absorbing a discursive statement about migrants, so the study of the flows of people must be part of this discourse. Discourse is thus part of the object, in a dialectical relationship that integrates them mutually (SAYAD, 1999:16, Cf. FOUCAULT 1978, 2003). In this context, we draw attention to Calavita's argument, which points out the following, that "despite this political rhetoric aimed at integration, immigrants remain pariahs, vulnerable to the type of attacks described here, as well as to experiences of exclusion" (2005:2). In this context, we find that there are several factors to be taken into consideration regarding the existence of opposing forces that operate socially,

²⁵ With the incorporation of exclusion, the object is constituted as a special candidate for the status of threat and simultaneously of invisible, subjectivities that define its condition. Politically understood in this way, illegal immigrants are the contrast with the purity of the status of citizen, thus constituting themselves as the authority, the enunciation, the visibility and the political intelligibility of human subjectivity. On the contrary, the object suffers from a form of (impure) purity that demands silence as victims, invisibility, and apolitical beings. (COUTIN in GENOVA, 2010, p. 419)

generating tension, namely the economic recession experienced in Portugal since 2009. The fact that the country has assumed international relevance as a gateway to Europe and the Schengen area, religious aspects intertwined with the moral/social panic produced about global terrorism, refugees and immigrants, neoliberalism and its human wreckage, the resurgence of the far right in the Americas, Europe and also in Portugal, its contextual need for cheap and available labor exchanges, The strengthening of border policing, the increase in tension in social relations mediated by borders, the change in the paradigm of the concept of "work" and the competition for jobs and the contemporary global panorama, tends to conceive of immigrants as naturally illegal, thus incorporating them into societies, as a metaphor for non-citizenship.²⁶

In this framework of approaches to the daily life of exclusion by the inclusion of the illegal, we realize that the cohabitation between all these individuals, more than just a reference of nationality, essentially obeys religious indicators. We have seen Pakistanis living with Bengali Muslims because they share the same religion, just as we have seen Bengali Hindus living with Indians. We remind you that Muslims don't eat pork and Hindus don't eat beef. The coexistence in a kitchen of different symbolizations of pure and impure is an obstacle to this cohabitation, as can religious rituals. Another aspect that brings these individuals together is the knowledge of the language, for example. As we can see, although we are analysing social actors with very different cultures and identities, as well as with geographically different origins, we find that some of the strategies used in the migratory context reveal some similarities, not least because their networks intersect. In these cases, there are too many living in just one house, thus lowering rental costs. The sharing of dwellings with other people and the exchange of dwellings are assumed as a means of meeting contextual needs according to the mobilities necessary for the implementation of their strategies, which do not only take place on a zonal scale, but also between countries or continents. It is also one of the items to be observed in xenophobic discourse.

We also see that there is a hierarchy between legal and illegal. Some migrants are now on the lists of far-right parties as a counterweight to their official discourse. The legal ones take advantage of this situation in the face of their illegal countrymen. Access to resources - restricted or expanded by the network of contacts of social actors - is, by the nature of the situation, necessarily different from that which is triggered by an individual with the capacity to experience citizenship, in the sense of being a citizen with rights and not just duties (not in the sense of being a national of the host country). Therefore, it will be incongruous to produce discourses of subordination of the illegal Bengali, Indian, Pakistani or even Brazilian associated with illegality. Different circumstances imply different strategies, as well as different moral valuations of those strategies. Contacts between

²⁶ will allow me to problematize more broadly the nature of citizenship, belonging, and community in this global era. (CALAVITA,2005, p. 2)

compatriots and family members promote the entry of new individuals in Portugal, reflecting a growing importance of social networks and their weight through the internet. Nowadays, we see the presence of Asian immigrants in the large Portuguese cities and also in the rural areas of southern Portugal where they are mainly dedicated to agriculture. The gains made in Europe are capitalized on the *homeland*. We also conclude that the majority attempts regularization through article 88, which requires fewer requirements for granting residence permits, and which, because it is more generalist, also allows greater arbitrariness and discretion in granting or refusing permits – depending a lot on political orientations – a situation that, for the reasons already mentioned, changes in 2018 to the advantage of migrants.²⁷ It was, however, common for immigrants to spend years paying social security, without enjoying the rights corresponding to an individual with a residence permit.²⁸ The imbrication between globalized societies is clearly evident in the interpretation given to article 88 of Law 29/2012, amended in 2017 and 2018, which provided that at the end of 2014, beginning of 2015, a few thousand Bengalis, Pakistanis and Indian citizens moved to Portugal – Brazilians since the 80s and by phase professionally identifiable – from other European countries from which they began to be expelled – mainly from the United Kingdom – with the in order to legalize themselves. This last aspect underlines the preponderance of being an immigrant in the identity of the social actor, since nationality and other identity criteria prior to emigration are voluntarily made invisible. At the same time, the identity of the individual becomes that of "illegal", "undocumented", "refugee", etc. These labels acquire their own life and dynamics, which translate into the loss of rights. We also highlight the fact that these processes of subordination are associated with social dynamics of dehumanization of the other, accentuating the asymmetry in power relations between cultural centers and their peripheries, whether gender, nationality or economic. Nevertheless, the policies adopted in Portugal from 2018 onwards demonstrate how the State, in the sense of a structure that legislates and shapes behaviours/representations, has a role to play in the deconstruction of harmful categories, attributing to them more positive meanings. It depends a lot on the State, whatever it may be, to respect and ensure respect for human rights and the promotion of better living conditions for those who, at some point, as illegal immigrants, feel in their bodies the weight of having no place and are therefore subordinate. An immigrant, like a woman, is not born a woman, nor is he born an illegal

²⁷ Decree 9/2018, which regulated the Legal Regime for the entry, stay, exit and removal of foreign citizens from the national territory contained in Law 102/2017 – fifth amendment to Law 29/2007

²⁸ "There are still waits for appointments of almost two years: as in the case of Amardeep Singh. It will belong to a pool of about three thousand processes that were admitted without requiring the requirement of regular entry into Portugal and that were suspended after an order signed in March 2016 by the director of SEF, Luísa Maia Gonçalves, determining that it is an "unavoidable condition" for the immigrant who applies under article 88 to have entered national territory regularly or to be within the Schengen visa period (90 days). (available at <https://www.publico.pt/2017/03/07/sociedade/noticia/a-vida-em-suspenso-do-imigrante-a-espera-da-regularizacao-1764221>)" As we said in 2018, this obstacle was legally resolved, however, there are news of mafias operating in the captivation of vacancies for appointments with the SEF and their subsequent sale on the black market, simply because they are no longer available through government channels. In August 2019 this also seems to have been resolved and the vacancies have returned to their original locus.



immigrant. It is the result of a certain structuring of power relations at different scales, scopes and intersectionalities. In 2023, SEF is extinguished and the Agency for Integration, Migration and Asylum (AIMA) is established. The objective is to humanize the relationship with the immigrant, however, what we are witnessing at the moment is an even greater delay in the legalization processes in a European political context in which the restriction and tighter control of the flows of people is being discussed. Humanization and swift regularization are the best antidotes to the racialized and xenophobic discourse of the far right.




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Heteronormativity: Good language and bad slang: Sex and gender roles of Brazilian travestis in the context of transnational prostitution

 <https://doi.org/10.56238/sevened2024.010-039>

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ABSTRACT

Modernity and post-modernity correspond to the extension of globalizing phenomena, boosted by new technologies, both in the field of communication and in the economic interdependencies generated, highlighting processes of construction of dense urban networks, where it was possible to achieve anonymity in relation to erotic affinities or sexual orientation, experienced in a community context. The break in the unidirectional flow between sex and gender highlights asymmetrical and structural relationship schemes, as well as rooted models of thought. This cisgender collapse was, theoretically, possible when Rubin (in Vance, 1984), admitted the existence of two different systems of sex and gender, from an analytical point of view, operating, however, mutual influences up to the level of identity agency and life projects. In this way, Rubin highlighted the causes of the discontinuity between sex, gender and sexuality (Rubin, in Lewin, 2006, in Vance, 1984), seeing in them the justification for a biological sex not necessarily corresponding to a gender. The paradigm of this maximum systemic autonomy is achieved in the construction of a travesti identity in a context of transnational prostitution. The travestis, constituting themselves as a transnational group, marked by gender and geographic mobility, first within Brazilian borders and, later, in another phase of the project, to Portugal. The city, prostitution and migration emerge as key factors in geographic dispersion and the construction of the sexual/gender identity of this community. Language and slang play an important role in this identity.

Keywords: Travesti, Sex, Gender, Prostitution, Active, Passive, Discourse, Identity.

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INTRODUCTION

This research seeks to capture and analyze strategies and modalities of action developed by a segment of Brazilian travestis, who started migrating to Portugal in the late nineties of twentieth century and whose material sufficiency and identity narrative are possible by maintaining a significant intra-national and transnational mobility directed to prostitution market, that connects them through Europe and Brazil.² Supported by ethnographic study, we will try to show how travestis practices / agencies are built within and between various structures and by relation to them. To this aim, we mobilized analytical lenses essentially focused on the subject and his discourses, which simultaneously allow us to uncover structural features and limits that define a conditioning spectrum of discursive and performative possibilities to them.

In a migratory framework, where we could interact and observe Brazilian travestis in Portugal, we purchased an analysis of their agency modalities in relation to discursive and performative structures, which apparently exclude them (Namaste, 2000), interrogating constructions of gender and performative languages which they mobilize. To what extent these travestis embody and perpetuate dominant ways of thinking and acting masculine, feminine and heterosexuality? To what extent, however, they reframe performances of hegemonic gender and sexual roles, making them fluid and plastic, moldable and adaptable to specific circumstances? In which situations the connection between gender identity and sexual performativity relies on heterosexual normativity? In what other situations is renegotiated or, if we prefer, is constituted as a strategic relation with structure, and what combinatorial features can it reveal? This ambiguity in the dialogical relation between gender construction and sexual performativity can only be conceived as a strategy related to economic survival needs, due to prostitution scenarios where they engage in and which are characterized by particularly adverse contexts, both in Brazil and in Europe? We may perceive this ambiguity as a third gender possibility (Kulick, 1998: 226) or an underline of those existing?

ANALYTICAL CONCEPTS AND DIMENSIONS

ON THE NOTION OF TRAVESTI AND OTHERS RELATED

Urge, at this point of conceptual dimensions, to precise an analytical distinction between some gendered and sexualized social constructions, which may produce some miscomprehensions. We refer to transsexualism, transgenderism and homosexuality. Homosexuality/lesbianism is related to sexual orientation, while transsexuality and transgenderism refers to identity and gender construction, although, transsexuals at a certain stage of their lives become aware to their sex/ mind divergence and undertake a sex correction surgery medically oriented which make them in a certain sense structural products. Sexual orientation emphasizes the sexual attraction to men, women or both, gender identity

² Lisbon, Oporto, Milan, Rome, Frankfurt, Athens, Barcelona, Madrid, etc.

concerns to the way individuals feel and express their gender (Saleiro, 2009: 1-2). Travestis are a specific form of transgenders and in this article the term travesti qualifies only subjects that perform gender and signalize it by multiple social doings, however, not resorting to a sex-reassignment surgery (see Garfinkel, 1967, Kessler and McKenna, 1978). Our interlocutors self-represent themselves and present themselves mostly³ as travestis, getting their economic livelihood from prostitution, in which «the penis becomes the central element of their work». (Loise, 2006: 19, see Kulick, 1998)

Concerning to drag-queens, they perform female attributes acting before an audience returning to their daily male identity – which they never change - after the performance. Regarding to cross-dressers, they operate a touristic journey of gender (Ekins and King, 2006)⁴ - «between four walls, in sexual terms, everything is possible» (Adriana interview) - fact which is related to desirable erotic activities, however, also returning to their manhood status after that extraordinary event, separating private and public space concerning to their acting.⁵ Although, it also doesn't involve an identity construction. (Ekins and King, 2006)

The gender migrations only applicable to travestis, others transgenders and transsexuals (Ekins and King, 2006), highlights the use of trans prefix, which reflects a generalized conception of transgression, something that overcomes borders and simultaneously, as a collective aspiration of unity between those “*transgressors*” (Ekins and King, 2005, 2006, Namaste, 2000).⁶ So, if transsexuals converge with structure by submission to surgery, travestis often lie in a limbo, due to their resilience in maintaining a non-correspondence relation between sex and gender. By language they will frame their experiences and actions, which simultaneously frame that slung in a dialogical manner. Although, the implicit ambivalence we find in living like a woman, but having a man's sex, confers to their discursive enunciated specificities, often seen by structural powers like incongruences.

³ For example, at internet where they advertise sexual services; Thaira Lemos's advertises herself as «a beautiful trans». Day L. as «The travesti, sin color», referring indirectly to her blacked skin color.

⁴ Ekins and King argue that regarding to travestis we assist to a gender migration, which at transsexuals case goes further and that migration is extended to sex. On the contrary, processes which does not involve, identity constructions, like drag-queens and cross-dressers, are considered as touristic journeys with a consequent home come-back. (Ekins and King, 2006)

⁵ Zimmerman & West argue that gender has no specific context like other roles, namely doctors, police-man, nurses, etc. (1987)

⁶ Virginia Prince died in 2009 with 97 years old and was considered a pioneer in using the term transgender. Born as a male at Los Angeles, in 1912, early showed interest in cross-dressing, and gradually operating a total gender change and started to live as a woman until she passed away, since then. At Virginia point of view, a transgender is someone who was born as a male, although operates a change in the construction of his gender identity and lives thereafter always as a woman, putting breasts, but not resorting to surgery to genitalia. Often railed against re-reassignment surgery, when mind and body showed incompatibility of gender, arguing that the construction of gender has nothing to do with the sexual characteristics, however conceived this surgery as a valid alternative in cases of sexual incompatibility with mind. (Ekins and King, 2005)

FIELD WORK AND RESEARCH

This research was initiated in May 2006, using participant observation by living during some time at Adriana's homes at Oporto and Lisbon, and was extended till 2014 in the framework of a PHD thesis. Living at the social *locus* where they execute prostitution and also where they live their daily lives, allowed us access to their back-stages and having contact with many other Brazilian travestis, who traded home with her or with other travestis.⁷ In this research we also exercised ethnographic methodology, realized semi-directive interviews and observed – sometimes making part of it - social interactions in *facebook*, messenger and orkut.br. This on-line communication, made possible contacts with travestis living in many other cities of Europe, fact that would not be possible, without this communication channels.

SEX, LANGUAGE, BODY AND PROSTITUTION

“(...) If i was passive it was x, if i was also active, I earned x over x, so it was a lot of more money!” (Adriana's interview)

At Brazilian streets, after being expelled from their homes, starting or furthering a process of re-socialization in travestis social network, they face new circumstances and requirements. These behavioral patterns, resulting not only from the activity of prostitution which they perform, but also from the interaction with other group members, guide us to the assumption that the question of identity is negotiated in the field of interaction. First step token towards a re-socialization lies on the fact that new travestis arrived at Brazilians biggest towns⁸, can't live on their own, so they have, to look for a pimp's house – other travesti, usually an older one/*cafetina*– and pay her in a daily basis for the staying. At some cities, like Campinas, travestis also had, to applicate a minimum quantity of industrial silicone decided by older travestis – Cafetina - as a requirement to be able to stay and work there. That industrial silicone application was provided by the *cafetina/pimp*⁹ that does it in a handmade way using veterinary syringes and industrial silicone applied between the skin and flesh. Which may cause and already caused many deaths, including Adriana who in 2018, when she fell on the stairs of her home, saw the silicone enter the bloodstream causing sepsis.

⁷ By permuting houses, the majority of travestis may exercise prostitution at domicile, fact that does not happens in Brazil, where mostly they exercise prostitution/sex work at the streets. By this system of trades/home changes, a travesti today may be in Lisbon and Tomorrow at Oporto, or at any other city, in Portugal or Europe.

⁸ Rio de Janeiro, São Paulo, Campinas, Salvador, etc.

⁹ That travesti pimp often learned to applicate silicone by observing other applications and by doing on herself at the beginning. (See Kulick, 1998, Luis and Trovão in Trovão, 2010, Pelucio, 2006)

Image 1- Photo made at Adriana's home showing a silicone bottle and a veterinary syringe.



Than begins another stage level of being travesti, generally assisted by a street mother/*mãe* that has the function of initiating the new ones in sex work, while at the same time a street godmother/*madrinha*¹⁰ protects and teaches them about how to live in the streets and deal with other travestis and multiple kind of dangers.¹¹ So, at the streets and with a new micro socially reproduced family, their bodies become also a language¹², and at the same time a way of framing their discourse and slang.

GENDERING PROCESS. BODY, MIND AND STRUCTURE

So at another *campus*¹³ (Bourdieu, 2002) regarding sexual orientation and not gender construction, travestis begin to conceive themselves and be conceived by others as homosexuals, after they have their first sexual experience with a same sex partner – usually around 12, 13, 14 years old, at the same age they are expelled from home by their fathers (Kulick, 1998, Pelúcio, 2006, 2007, Luís, 2018) - and before they undertake the body transformation with silicone and hormones ingestion, done and acquired out of structure and at marginal networks markets. At the streets travestis realize sex practices which may not be only a question of pleasure or identity legitimacy, but also a guarantee of more income. (Kulick, 1998, Loise, 2006, Luís e Trovão in Trovão, 2010, Pelúcio, 2006, Luís, 2018)

¹⁰ Mãe de rua.

¹¹ These words are used by travestis. It useful to refer that in 90's, every street in Brazil had a chefe de rua, a street boss, and if a travesti went to street without asking permission, could be severely beaten or even killed. That is why they needed to be assisted and initiated at a street's livelihood.

¹² Body-done and used to sign their gender. (Benedetti, 2005)

¹³ Social field.

Thus, when we analyze identities and affiliations, that work must be done observing several approach scales (see scaled analysis - Silvano, 1997), characterizing them, and most of all, not looking for a logical and coherent line guidance between them, instead we must look for and analyze the processes of pursuing such legitimating logic, within a given scheme of thoughts, beliefs and rules, that influences subjects and vice-versa. By this argument the reflexive capacity of individuals is essential and always operates in relation to structure, and at a certain point, structure is dialogically determined by social actors, doings. And practices, even those that are considered subversives (See Giddens, 1984 – structuration and structural duality)

In this dialogical context, like many of her "*manas/sisters*"¹⁴, Adriana conceives sex with women – “never had an active relationship with anyone ... ever met a woman!” (Luís, 2018) - as incomprehensible (see in same sense Loise, 2006: 18). Women are part of the record of identifications (though incomplete) and friendships – “women friends, many! Woman, to me, is only friendship” (Adriana) in Luís, 2018. This symbolic process incorporates heterosexual normativity, which operates enormous influences on their discursive elaborations and practices strategies, as a reference. Although, not in a mimetic perspective, like argued Butler when referring to travestis and transsexuals. (2007, see also Namaste, 2000)

This multiplicity of relational contexts and consequent plasticity of variables involved in the legitimation of a social actor *being up* process – reflexively produced - is also clearly expressed by Pelúcio’s example of Fabiana, a travesti whom, within the borders of her “lesbian” relationship with Veronica (another travesti), wore masculine underwear at home, and in the context of the street prostitution wore female "panties", reproducing and reflecting through this scheme, different spatializations and subsequently, others scales of interaction and action also determined by interests, emotions and affections (Coleman, 1990, Ortner, 1984). This presupposes therefore, an entire construction of gender that is developed in specific and differentiated interactive contexts, on the one hand the "house", on the other hand the "street" and the client, managing in each context what is expected from the individual by other (Vertovec, 2009). However, if what confers meaning to the relationship with Veronica is an attempt to legitimate identity through the binomial panties vs briefs¹⁵, with the client this signaling function can be contextually altered and likely to search for other intelligibilities when, for example, the client asks to be "he" to use panties (Adriana), or when Fabiana uses panties at the streets. That is why, regarding to Fabiana and Verónica, while masculine and feminine wasn't present in their relation in bed, sexual relations could not be performed or understood. This fact underlines the need of presence of a masculine and a feminine to make sexual relation, intelligible. Symbolically it is always necessary a feminine with her attributes, usually

¹⁴ It means sister, a word used among Brazilian travestis when they refer to their colleges of prostitution and gender social construction.

¹⁵ An indirect path to represent male and female in the relation.



connected to being passive and exterior signs of a role. Being masculine, yet today, is symbolically suitable with being active, bossy, and dominant. Thus, in multi-relational contexts language orders experiences and practices, discriminating, erasing, or providing the possibilities of emergence of specific subjects or objects.¹⁶ Although that ordering function depends on the combination of variables, which, also depends on contextual factors and social hierarchies.¹⁷

GAYSPEAK

In different social and financial contexts, homosexuals developed words to classify themselves and the others (men) according for example to their social ranking or sexual likes, also recreating words which classify gay men according to their racial preferences. “White males who seek out black men (*dinge*) are *dinge queens*, while black male who prefer white men are *social climbers...*” (Stanley in Cameron e Kulick, 2006:54). Again, language frames the actions and produce difference between individuals. More than ordering only roles performed in sexual relations, words used in that dominium situate an individual at a broader social interaction. Adriana as we see by her discourse also ranks social and ethnically her clients, “black people and Brazilians I do not attend, no!” Or their colleagues/sisters/manas as belonging or not to the travesti community; “Fagot/*bicha* has no chest, has nothing, they have no body done!” Adriana reveals in her speech the intersection of socially differentiated variables and markers, which demarks borders and provides discursive identity repertoires.¹⁸ At another social level of analysis, gay men acknowledge and reveal in their practices the existence of an adequate behavior to male or female:

(...) the allocation of behaviours along the more salient dimensions of interests, such as focal points of sexual likes and dislikes and continua of masculinity and femininity (...) enculturation into a community entails the learning of the language and the normative behaviour at the same time; one is embodied in the other. (Sonenschein in Cameron and Kulick, 2006:47)

For example, often they use the word «meat» to qualify a man that sells sexual-services and on the other hand, they call «butch» to the masculine partner of a homosexual relation, who dresses clothes proper to the performing of his active role.

Language is thus, a socio-historical product developed in certain temporal, spatial and political context and those are not universal, on the contrary they are products of human behaviors,

¹⁶ See Ekins and King about strategies to build gender identities, through processes of erasure, implications, substitutions, conciliations, or insinuations, produced on and through the bodies, in order, to highlight female characteristics and to hide male features. (2006)

¹⁷ Sex and gender are social doings, like many others human productions, that's because sex, gender and language produce social stratification. Rubin considered that travestis, transsexuals and prostitution are ranked at the lowest scale of sex and gender doings by structural social perceptions, although in sex and gender speech we find other variables, which by different combinations between them can provide us many others analytical results. (Rubin in Vance, 1984)

¹⁸ This speech is produced in Portugal, ranking differently black people and brazilians comparing to what she did at Brazilian streets. Translocational positionality. (Anthias and Gabriela, 2000)

actions and historic established power relations (Ortner, 1984). That's why the newest communication technologies assumed great importance to minorities, tending to disseminate language more broadly in the same way that enhance the knowledge of slangs, which confers new dimensions to concepts of transformation, reproduction or identification and in parallel injects time and space (Ledrut, 1979), with new dynamic efficacies on slangs and collective identities. Anyhow "(...) any special gay language must be evaluated within a contextual Framework." (Hayes in Cameron e Kulick, 2006:68)

SLANG OUTSIDE THE STRUCTURE?

What we ask now is simple and concrete. Do slang keep structure like reference showing openness to it, or is it closed upon its own borders? These parallel linguistic processes will reveal us if groups are opened or closed to structural normativity. Hayes argues that language and slang is a specific speech produced to facilitate communication between members of a smaller group while at the same time excludes the other from it (Hayes in Cameron and Kulick, 2006). Although, others have a different opinion:

I have presented as a code growing out of a history with significance limited only to an in-group might be, expected to create differences in function as well. (Darsey, in Cameron and Kulick, 2006:80).

What Darsey emphasizes is the historical and interactive context in which *gayspeak* is produced, which, even that its efficiency only operates through the control of group expectations upon individual behavior, (Bourdieu, 2002, Coleman, 1990, Vertovec, 2009), however, is not only produced within the group, but through hard and complex interaction and negotiation with structural majorities that stigmatize it.

Shared specialized language bonds people, and for gays it can be a way of self-affirmation, a way of rejecting the taboo. Specialized language builds as well as responds to community. (Crew in Cameron e Kulick, 2006:56)

In this theoretical frame of dialogical connections between minorities and majorities, between individuals and structures, between actions and normativity, we propose in travestis case, an approach that conceives structure and social doings like the two sides of the same coin¹⁹, although sometimes operating that dialogical dimension of the relation through agonistic and painful social processes.

¹⁹ Structure duality. (Giddens, 1984)

SEXUALITY, GENDER, LANGUAGE AND BEHAVIOR CONTROL

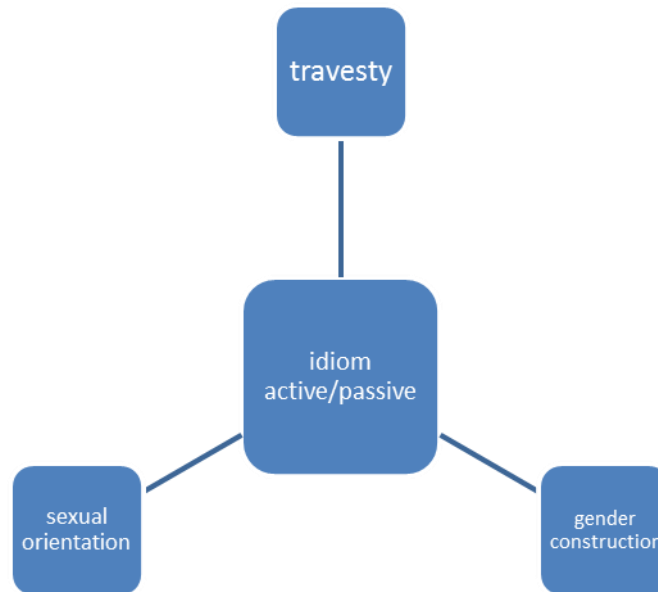
Reordering social variables, travestis in the context of Brazilian streets recreate other words to give meaning to individual's social positioning at interactions, namely words or expressions like *vicious-fag* or simply *vicious*. The first expression refers to a man, who besides looking for a sexual relation in which he is the passive partner, also tries to get it for free. Trying to have a free payment sexual relation is something very badly seen by travestis in the streets, because it devalues the main resource for their survival, which in addition to the lowest rank attributed to the client regarding is passive role, situate him in an inferior social hierarchy. Although, some travestis also perform and provide clients free payment sex. These ones are even more unpopular among other group/sisters/manas members - than the *vicious* clients – and may suffer sanctions imposed by other group members, like for example being expelled from her *ponto/place in the street*.²⁰ So by language, groups and its members can classify and hierarchize individuals, actions and behaviors.

By these previously mentioned symbolic system, social constructions and re-socialization processes made in it, travestis draw new relational links between variables, observing although a heteronormative guidance in terms of sex and gender performances. In this symbolic procedure, the system that ranks relations as heterosexual or homosexual is predominantly the gender one (Rubin 1976, in Lewin, 2006, in Vance, 1984) and not only sexual orientation, although revealing various interdependencies among them. These different line-ups of variables and liens established between them, turns possible that a man who maintains sexual relations with a travesti is not considered gay, if he is the active element. In this case he is considered heterosexual, as well as a relationship between two travestis can be described as lesbian and not as a homosexual one – the case we've seen of Fabiana and Verónica. “No! A man that stays with a travesti is not gay! He us just looking for another kind of sex” (Carla Tedesco in Carvalho, 2012), or “no way! A man wanting to be with a travesti is like he wanted to be with two women!” (Adriana in Luis, 2018)

Indeed, we consider that travestis operates a reordering of variables implied at sex and gender heteronormative systems.

²⁰ Their place in the streets. Their *pontos* in the streets are important on several dimensions. The first one refers to their survival, the second is a way of ranking prostitutes allowing them to stay at more visible places, or less visible ones, what operates great importance in their group status reproduction, since the ones with more social capital occupy the better places, and on the contrary, the lowest ranked one, the worst places. The visibility in streets also increases the possibilities of earning more money. All this structuration operates through their re-socialization in travestis group borders. (see in the context of prostitution in Netherlands, [Gregory, 2005])

Picture 1 –Active/passive sexual idiom.



Thus, travestis reorganize links between gender construction and sexual orientation. In other words, travestis distort structural connections between sexual system and gender system (Rubin, 1984 in Vance), just because they don't acknowledge their structural correspondence, although sometimes they use it strategically. It is especially in the context of sexwork that travestis's gender language, unfolds from heterosexual normativity, even when, subverts or distorts it by gender or sexual performances. (Kulick 2003 in Cameron and Kulick, 2006)

Indeed, at discourse and practices level, managed in everyday life interactions, travestis discover men / clients who seek the passive side and pay them to take an active part. What, in other contexts constitutes a factor that invests subjects of manhood, in this case, specifically, gives them an advantage in the market of sexual exchanges, and in parallel, classifies those men seeking the passive role, as *mariconas/fagots*²¹, underlining the presence of a heterosexual symbolic system based on active and passive elements, and looking further, on an ideological masculine dominance upon feminine gender (Rubin 1975 in Lewin, 2006, in Vance, 1984), sustained on patriarchal system (Vale de Almeida, 2000, 2000a, Freire, 1964, 1987, Rubin 1975 in Lewin, 2006, in Vance, 1984) and political power.

This synthetic procedure, operating different scales of hierarchies between gender and sexual systems, also at the dominium of practices, turns possible that a passive man, partner of a sexual relation, is considered a *pussy/fag/maricona*, however, as travestis don't regard themselves as homo-oriented men, not even as men, they do not classify themselves as homosexual's partners in that specific kind of sexual relation. Once more, in their constructions, we note a predominance of gender

²¹ Pussy, fag.

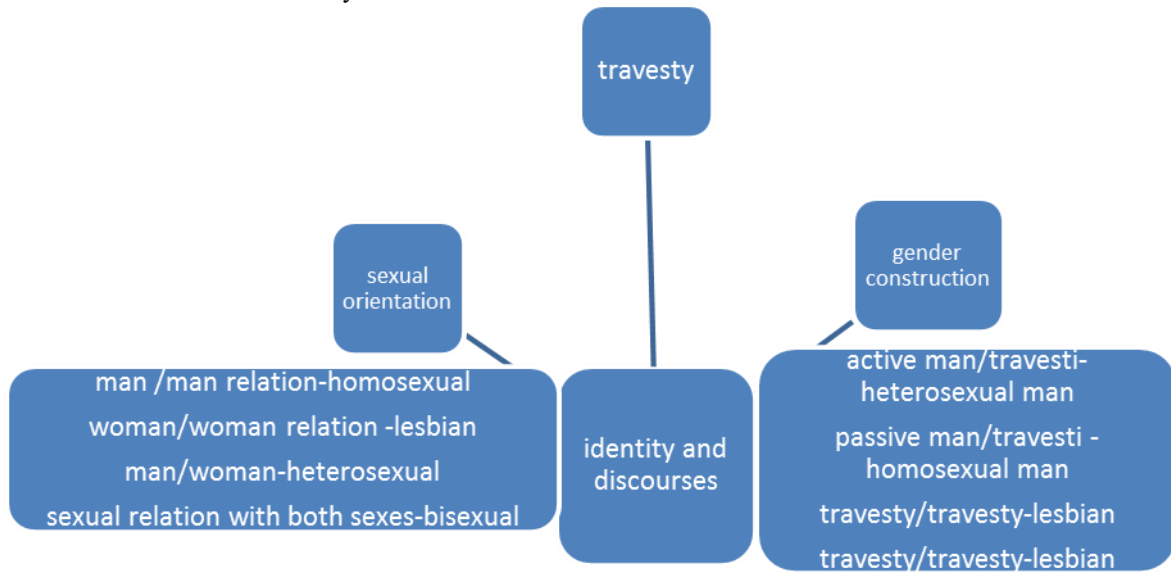
produced features upon sexual orientation roles. This way of delineating boundaries between sex and gender, might denote influences from a sexual model existing at the Brazilian Northeast – fag-man/*homem-bicha* model (Green, 1999, Kulick, 1997). This sexual and social arrangement prescribes that a man who participates in a sexual relation with other man, as active element, is not considered homosexual, while, the other male partner, being passive is classified as homosexual/*bicha*.²² In this view of things, the individual identity is positional (Hall, 1996) and he becomes male or female regardless of his sex, because the predominance is attributed to his gender proper role performed in a specific sexual relation. The male becomes female, only because he is passive and passivity is a female attribute, on the other hand, the male, the true man, stands male, regardless of having a sexual relation with a same sex partner, only because he is active.²³

These procedures show us that language which imbues sex and gender of secular ideologies, prescribes what is proper and inherent to a man and to a woman (Freire, 1987). As we see, according to this model - man/fag-man -, gender roles of activeness and passiveness are the key elements largely operating in this classification, and not the fact of being a sexual relation between two social actors of the same sex. Nevertheless, sexual orientation socially marked by the sexes of participants in a sexual relation, is greatly present in these symbolic and thought schemes. So, the homosexual is the partner that performs the feminine role and its proper attributes imbued (structurally) with naturalized characteristics. By an extensive interpretation of this model and by collecting an emic point of view from travestis interviewed, even when they perform the active role with a man, they do not consider themselves as the masculine partner, because they also show and signalize in their gendering doings the predominance of feminine qualities. This fact also highlights the positional perspective of the subject (Hall, 1996), which reveals us that in a social interaction, there are many more symbolic elements presents, besides the social actors participating can achieve.

²² Fag.

²³ What is incorrect by heteronormative sexual orientation criteria.

Picture 2 – travesti's scheme to classify their and the others – non-travesti - sexual relations. Essentialist constructivism



As argues Pelúcio (2006: 526), these dialogues maintain with structure, which sometimes travestis distorts, reveal us that Brazilian travestis expect from "real men" that they are masculine, active, enterprising, penetrators (see in the same sense Loise 2006 : 20). In this perspective the man will always be the one which assume the active role (Kulick, 1998: 124). This construction of gender and sexual performance roles, therefore, is not a rigid structure, however, the act of differentiating the two oppositional terms of the binary male / female, resulting in the consolidation of each terms, tries to operate an approach to the paradigm that conceives an unidirectional flow of coherence between sex, gender and desire, (Butler, 2007: 31), although changing contextually values, hierarchies and valuations of sex, gender and desire. Roberta advertising her sexual services at a specialized sight, underlined : *Skin color : white. Sexual orientation : Active, passive, complete. Accept men, women and couples.*

By this angle of analytical approach, heterosexuality is present as a reference, but when it comes to classify sexual practices using heteronormative criteria, travestis distort and reorganize that structural agents and do it by stretching gender elaborations efficiency, till it turn possible the emergence of their own spectrum of identity possibilities, in which they produce a specific gender and sexual identitarian narrative. Procedure which reversely floats to an original operation oriented by sexual system, when it classifies the other in a desirable and coherent sexual relation between non-travestie. Two men having sex are undoubtedly gays in travestis point of view, which at this point converges with the structural social judgement.

Like Rubin argues, there are two different systems operating at the social level, one is the sex system, by which the sexual performances developed by travestis and at the same time prostitutes/sex

workers, are seen and classified as perversions and *queer* sexual doings, the other is the gender system that constrains and socially acts upon their gender construction. Those two systems, which Rubin considers analytically autonomous (in Vance, 1984)²⁴, although exercising reciprocal influences on the practices level, seems to be the base of travestis classifications, although, somehow, distorting and subverting their original structural meaning. This procedure result in what Kulick considered an essentialist constructivism. (1998)

HETERONORMATIVE DISCOURSE AND ITS SOCIAL EFFICACY LANGUAGE, STRUCTURATION AND BEHAVIOR

This heteronormative guidance is well revealed by Paula Velasques, a brazilian travesti who arrived in Portugal on May 2007, that inadvertently showed us, like discourse may situate individuals also in different emotional and religious spaces. Talking about God she told us: “Christ that was ... that is Christ! He came ... he was broken, he was not accepted! He reached the point of being killed on the cross, why will I feel defeated by being discriminated in some way!” In Portuguese the verbs has grammatical gender and when Paula used the verbalization «defeated», she did it in the male form. We asked her why in that context she used that verbal form (see Borba, 2006). The answer was clear:

Because in this case, I'm talking about the religious part, you know? In this case I have great respect (...) I do the same with family, my family until today calls me Paul(o)²⁵, you know? In this case i do this way, and the more i try, i will not be able to change it! In relation to religion, i also do the same way. (Paula Vellaskez interview in Luis, 2018)

Persisting on travestiis affections and how they are cited or discursively produced, they were first socialized in heteronormative boundaries in which roles and gender performances appear clearly demarcated. Adriana says:

The friendship was more with women, I had that prejudice of friendship with men ... because i knew that from that I could expect what? Let's play ball ... and I did not want that child's play for me in my childhood! I liked to play with dolls, not with balls! hahahahah (Adriana in Luis, 2018)

This socialization process suggests a hierarchical conception of gender relations and their effectiveness in practical social terms, defining social and discursive fields of legitimated and anthropologically structured actions. Thus, also in their love relationships, travestis reproduce the structural roles of the woman / wife, expecting their partners who also fit this heteronormative paradigm (Pelúcio, 2006: 527) – they have to be real men, true men! So when a travesti refers to her boyfriend, she produce him discursively as “husband/*marido*,” again reproducing by this expedient

²⁴ After arguing that sex and gender systems were not autonomous between them. (Rubin 1975 in Lewin, 2006)

²⁵ The name used by family is not Paula, the feminine grammatical gender of her name, they call her Paulo.



and with more symbolic charge the naturalization of relations structurally established between man and woman. The “husband” – *marido* - is usually someone who starts being a client and that day-by-day gets closer to the anthropological space of home/*casa*, while the client belongs to the street. This woo process doesn't require the same time that *common* men and women usually needs, it only takes for them having had a pleasure full sexual relation with that man and if he wants presents and money, he becomes her husband. On the other hand, these relations usually finish fast, in a question of days or weeks. Anyway, the word *marido*/husband is a strategic approach to the heteronormative model, trying to legitimate their social doings as being naturals and not abnormal or *queer*.

Many times, we heard that being a travesti is not a matter of choice, it was born with them (Paula Vellasquez in Luís, 2018), statement which inadvertently constitutes the structural base to classify them as *queer*; abnormal or gender troubled people.

CONCLUSIONS

First I will justify why I use the word travesti – they are a specific production of Brazilian culture and embrace a dimension of resistance and fight for being who they want to be. Than, explanation made, I consider travestis performative and discursive productions of gendering, are very much produced within prostitution/sex work context and based on the dominant gender system, which relies on heterosexuality and as a consequence in kinship, from which results the majority of cultural and institutional human productions. Male and female, something that seemingly transcend (trans), are constituted like necessary elements for executing their strategies, manipulating both terms of the binomial in function of ambivalent and adaptable sexual practices and gender performances in the light of clients demands or, in parallel, in function of home affections. That ambivalence and plasticity seem to establish some bridges between their discourses/sexual practices and the identity construction of homosexuals in Brazil - the model man vs fag-man. (Green, 1999, Kulick, 1997, 1998)

The construction of a desirable female identity with naturalized features on a male body, that keeps its genitals, very much connected with unstable contexts brought up by post-modernity and its reflexive capacity of questioning structure - although, being constrained by it - undermines at our point of view the possibility of a third gender path (as argued Kulick, 1998). Realistically, travestis live in a state of liminality, based on models of acting masculinity and femininity which emerge from biological sex and cultural constructions, made up throw the basic observation of differences between men and woman genitals. Discursively and politically, those genitals acquires and incorporates symbology of penetrating or being penetrated, being active or being passive, being socially active or passive, dominant or dominated, which means, that more than sexuality, heteronormativity orders society, instituting the dominance of ones, above others, of men upon women (Ortner, 1984), on the



same basis that for example racism or social classes difference is socially structured and produced. At this sense, more than only a normative system operating upon sex and gender divergence, heteronormativity is an ideology that orders and ranks all society, heterosexuals also.

It also follows from this investigation that travestis phenomenon incorporated in prostitution transnational market is included in a process commonly known as globalization, in which the flows of people, ideas, images, capital, facilities and information are processed at a speed never seen or felt before, providing the encounter or clash of cultures and sub-cultures, languages and slangs - good and bad languages - good or bad practices, generating parallel processes which encouraged the emergence of difference's markets convergent with capitalism and fetishization of commodity. (Harvey, 1989)

Thus, by migrating, travestis move and act strategically in relation to multiple structures at different levels, in a geographical perspective when they undertake multi-oriented and situated migration projects, but also at a prostitution level, within which their construction of gender requires malleability regarding different performances contexts in which they act - clandestine / institutional, male / female, active / passive, etc. In fact, these various contexts are social fields which are also included in structure, constituting substructures in which travestis dynamically derive, depending on the strategies they perform in order, to pursue their interests, consciously oriented. For example, when they discursively elaborate concepts of homosexuality or lesbianism determined by gender construction although, we know that at a structural level these referents are shaped by sexual orientation/sex system, mainly. Now, I will also say why sometimes i use the word prostitution; that derives from the fact that words have symbolic charges and a punitive function. I did not want to hide the fact that the word prostitute is what they really feel from society as a social punishment for their identity and practices. So, Brazilians travestis in a context of prostitution use heteronormativity as a reference, however they do it in an ambiguous way that allows them to build and preserve their hybrid identity. Also is a fact, that this survival repertoire is very much connected with prostitution, which constitutes, the only labour activity available for them. All this plasticity of practices, although with effective coherence among the group - which also has its own control social devices that assures group behaviours, discourses and practices reproduction or its controlled transformation - becomes translated in words and discourses, that express relations and hierarchies within the community and outside it.

As we have seen all slangs have its production context. Only an existing social fragment can generate a word that classifies it and only a collection of social fragments may result in a discursive enunciation that frames them, however, always related with an existing and concrete power relations system. Travestis slang frames and it is dialogically, shaped by prostitution, streets,



colleagues/manas/sisters, clients, violence, discrimination, mobility (of gender and geographic), sex and gender constructions performed under a coercive supervision of structural heteronormativity, etc.

That slang reveals openness to structure when for example they reproduce, although in a creative way, speeches and words that nominates some institutional figures; husband, masculine/active, feminine/passive, masculine/passive/fag, mother, godmother, etc. It also reveals the interactive context of discourse production, only possible in a communicational process in which people are involved and willing to understand the other (Zimmerman and West, 1987), conferring at a certain level legitimacy and intelligibility to their communal social doings.

In our point of view there isn't a third gender path, on the contrary we argue that there is a reinforcement of the binary male/female, although resulting in something different from them, something that incorporates both and that changes hierarchical relations between sex and gender heteronormative systems. This dual incorporation allows them to build a specific identity, based on structural binomial, but, at the same time in rupture with it, since it does not constitute a polarized binomial. Inversely these two terms become mixed, being, classified by structure discourse as gender perturbations. Structure that produced discourses and social facts, creating identities like travestis or transgenders on a medical context, as a way to discriminate their non-conformity with it, implicitly acknowledges the non-natural correspondence of sex and gender and its social – naturalized - produced meanings, achieved through politic maneuvers in the context of systemic power relations.



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Brazilian travestis, sex workers and migrants. Body, culture and performativity; Epistemology of the political production of transgression and subordination

 <https://doi.org/10.56238/sevened2024.010-040>

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ABSTRACT

Borders, as symbolic delimitations that filter relations between subjects and groups of subjects, always fulfill a political function; to delimit, within the scope of these relations, the hierarchization of social actors/actresses and their bodies, according to a certain policy of sexes, genders, social class, race, color, ethnicity or geographical origin. The aim of this text is to demonstrate how body and culture, through performativity, are simultaneously objects and agents of their production as illegal or normalized, giving rise to the emergence of subjects in interaction. To this end, we will resort to an analysis that establishes a parallelism between gender and geographical migrations, seeking to demonstrate how the processes of border crossing, in both cases, present similarities that allow us to apply their analytical grids to both with a character of symbolic reciprocity.

Keywords: Gender Migrations, Geographic Migrations, Body, Culture and Borders.

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INTRODUCTION

DISORDERED IDENTITY AND GEOGRAPHICAL FLOWS.

Based on my doctoral thesis and consequent book (LUÍS, 2018), entitled *Brazilian Travestis in Portugal, Transmigrations and Globalization; the Transnational Sex Industry*, we generally verify that it is in a globalized socio-historical context that the need for social actors/actresses to communicate emerges exponentially from a context that is not always peaceful, between local, regional or global, which often places them in identity confrontation. This recalcitrant agonism is a form of survival and a condition for their emergence as political subjects. It is from this bio-cultural need, resized by multi-structured power relations and object of various intersectionalities, that multiple and geographically diverse performativities gain prominence, operating in various dimensions and moments of interaction. To communicate is to attribute meaning to something or someone and, in this sense, corresponds to the search undertaken by the social actor for the finding of a performative and discursive self/hetero-intelligibility. This is only achievable in the reflection of light that emerges from the interaction, which illuminates its subjects, while its hierarchical political participants, central in its dynamic and symbolically coded structuring. At the same time, we found that there is no performativity without discourse, just as there is no discourse to which performativities do not correspond. It is in this dialectical and multi-segmented structuring of the social (GIDDENS, 1984, 1991, 2000, 2004 and GIDDENS ET AL., 1997)² that the processes unfold at various scales, namely, within a dominant culture (always political) or at a certain point, diverging and contradicting it. This often happens by resorting to the same socio-transformative tools through which bio-powers sustain this structure, as a cultural, political, hierarchical and culturalized manifestation of a normalized and dominant nature, symbolically incorporated as such. See, for example, the case mentioned by João Dantas in his doctoral thesis, on the pathologization/subordination of gay bodies, when the AIDS pandemic appeared in the twentieth century (DANTAS, 58).

It is in this framework of naturalized authorizations and subordinations that we will seek in this exercise - in which we invite the reader to participate - to focus on the Brazilian travestis that we have worked in the context of immigration and prostitution³ in Portugal, as social productions of Brazilian cultural idiosyncrasy. In this sense, we will try to delve into their performativities and ways of communicating, questioning how this strategic negotiation is carried out inside and outside the heteronormative culture. Concretely, we will try to scrutinize how they do it alternately within the

² Structuring corresponds to the social process that encompasses structure and subject with reflective capacity, in the movement of social transformation, instead of polarizing dominance at the pole of the structure or the subject's capacity for agency.

³ The academy preferentially uses the term sex work, however, linguistics teaches us that words have a special and concrete weight, and this is what Brazilian Travestis feel in their flesh and skin.



scope of these socio-normative boundaries (TURNER, 1974), which in some way structure and restrict - not only symbolically - the agency and strategic possibilities of viability of each travesti social actor/actress, as a Brazilian and world citizen. (BOURDIEU, 2002, GIDDENS, 1984, 1991) In this context, it is essential to determine the reason for listing the hypothesis that travestis are effectively a Brazilian sociocultural production, exposing to this end, what we believe to be the foundations that validate this hypothesis, namely, the relationship they establish with their bodies and with the discursive statements produced about it and those of others. In another moment, we will try to determine the relationship that is established between discourse and behavior, crossing for this purpose, the symbolic production of the foreign and illegal body in a geo-migratory context - by the action of bio powers and by the symbolic and mediating capacity of borders - with the production of the body structurally perceived, as out of order; which is the case of Brazilian Travestis in both geographical and gender migration. How does the illegality of the body and the subject is produced, how does culture and structure act through its ordenating power, in order to impose multiple and diverse scales of citizenship, selectively restricting them? Are there, therefore, in mobility bodies that are not authorized and that only exist as such? Are Brazilian travestis so segregated and marginalized that they reactively close themselves off to the structure that assaults and punishes them when they dare to express a form of gender or engage in sex work? In this context, the foreigner may not only be the one who arrives and is a stranger to us, but also the one who, living next door, assumes cultural practices and chooses life projects that apparently subvert our *habitus* (BOURDIEU, 2002), critically questioning the stability of social fields where we find the fictional process of subversion which unsettles us and the structurally authorized and naturalized self-legitimation of our actions, behaviors, social expression or sexual orientation?⁴

For this reason, being an undocumented immigrant in times of massive and often semi-disordered flows in a world system in upheaval, unquestionably assumes an evident – and concomitantly active – parallelism with socially expressed gender self-determinations, when these pinch the heteronormative structure on which most of today's hierarchical institutions and relational systems are, structured. Marriage, kinship, church, morals, guilt, division of labor, in short, a varied panoply of potentially excluding imbrications. Borders, as geographically mediating elements of relations between people and countries (MEZZADRA, 2005, 2013, MEZZADRA and NIELSON, 2015) or between authorized and subversive bodies, take on a symbolic dimension that generates taxonomies that are essentially discriminatory. Body, culture/structure and performativity; they are assumed as the trilogy of an announced exclusion, yet silenced, generating asymmetries and hierarchies, through the selective attribution of the non-place to alterity (AUGÉ, 1994) - monstrous or illegal - in a process that sends it to an *undeclared or assumed refugee camp* - but margins of the

⁴ Cf. on the correspondence between norm/culture and nature, FOUCAULT, 1978.

world -where the State does not exist, nor its protection and as well, these unauthorized bodies are rendered invisible. they symbolically inhabit a dystopian space, only scientifically referenceable (Cf. AGIER, 2002 – Aux Borde du monde – Les refugies), emerging - under the watchful eye of the structure - only as heterotopic subjects and out of order. (FOUCAULT, 1967). As some authors point out;

It is enough to think of the prominent position that the figure of the "illegal" or "clandestine" migrant has assumed in migration policies, in official rhetoric and in the popular imagination since the beginning of the seventies of the last century to begin to understand the absolutely concrete effects of labels and taxonomies that concern migration. The "illegal" migrant has become the most important place of production of what Étienne Balibar has recently called the "foreign body", the monstrous (and internal) figure of otherness that confirms the stability and validity of the code of citizenship and the "body of the citizen" The language and spectrum of race continue to be mobilized in many parts of the world in order to offer a kind of supplement to this production of the "foreign body" of the "illegal migrant" which – it is important to emphasize – is not a mere figure of "exclusion". As an "internal other," the "illegal" migrant is first and foremost the product of what Nicholas De Genova, in an important work on migration from Mexico to the United States, defined as "an active process of inclusion through illegalization. (MEZZADRA, 2015:14)

Therefore, we hypothesize the existence of a power that, through its political-cultural seal, produces authorized bodies in different mobilities, or, on the contrary, illegal/clandestine/marginal bodies – travestis, migrants and prostitutes. However, this form of exclusion is contradictorily based on the inclusion by illegality of their bodies and migrations, in a process similar to that which generates the exclusion of migrants, symbolically subordinated and imagetically represented as illegal, undocumented or undocumented. It is in this sense that, through performativities - only possible in interaction - individuals emerge, as integrated or disintegrated political subjects - in their encounter with power (FOUCAULT, 2003) and their taxonomic seal of the "fictional natural" (FOUCAULT, 1978) - in an unequal struggle, but to which, even so, they do not renounce, against the taxonomies that structurally produce them, only insofar as they are dangerous people without a social place or ontological/anthropological legitimacy, illegal ones, monsters, or mere pathological anomalies. It is in this way that we intend to demonstrate the applicability of the analytical grids used in the analysis of geographical migrations to the gender and geographical migrations of Brazilian Travestis.

In this context, we must emphasize that performativity, within a given sociocultural context, allows us to glimpse the power relations that condition the agency possibilities of the bodies of social actors/actresses, and those who migrate and naturally positioning themselves, with greater fragility before the political and cultural seal of power (FOUCAULT, 1978, 2003), which symbolically produces them as out of order. In an epistemology of transgression, the natural questioning arises about who produces it, the social actor/group, the political and heteronormative macrostructure or both, in the process of co-production of illegality and social/symbolic non-place, through the creation



of borders with their selective porosities? To this end, we based ourselves on the ethnographic study with Brazilian travestis, sex workers and migrants - mostly undocumented - living and working in Portugal. Using participant and non-participant observation, through the realization of twenty semi-directive interviews carried out with the collaboration of social actors/actresses, travestis and non-travestis, in multiple transits and transitivities, defined by the lack of definition of a global agenda, which sometimes inadvertently grants opportunities grant them, although, apparently do not recognize them as political subjects and citizens.

Participant observation and the ethnographic method were developed through alternating stays of a few months at Verónica Vellaskes's house in Porto and Lisbon, where countless other travestis passed through in transit. We will start with the procedural and theoretical equivalence of gender and geographical migrations. We draw attention to the fact that the use of terms such as prostitution, prostitute or illegal, intend to underline the social weight of these nomenclatures - which mark bodies and individuals, real people and not mere rhetorical figures - which we do not intend to whitewash through the use of academically elaborated and sophisticated expressions, which remove from words the coercive function that they effectively perform within the scope of a system that discriminates infra-hierarchizes, them.

TRAVESTIS, IMMIGRANTS AND PROSTITUTES

It is our purpose in this article, not only, but also to unravel the ways in which discourses of subordination of migrants are socially produced, resorting to racial, sectarian and xenophobic arguments that associate, for example, illegal/informal practices to certain nationalities/classes, thus triggering processes of hierarchization between the *us* and the *other*, from multiple perspectives. Discourse appears in this context as a way of hierarchizing social actors/actresses and, simultaneously, as a mirror of this hierarchization, in a way in which discourse and its object seem, from the outset, to be one.⁵ It is up to us to deconstruct this appearance of uniqueness as if it were something of natural/biological. To this end, we observed travesti immigrants of Brazilian nationality, who migrated and continue to emigrate to Portugal since the year 2000. From this approach, we aim to reach and produce an essay that allows us to discover public and heteronormative discourses, as strategies oriented towards their integration through an imposed

⁵ Cf. Em diversos contextos migratórios: CALAVITA, Kitty, 2005, "Immigrants at the Margins; Law, Race, and Exclusion in Southern Europe, Cambridge University Press: Cambridge. Carrera, Sergio e Guild, Elspeth 2016, "Irregular Migration, Trafficking and Smuggling of Human Beings Policy Dilemmas in the EU", Centre For European Policy Studies (Ceps): Brussels. DANCYGIER, Rafaela *Immigration and Conflict in Europe*, Review by: Sara Wallace Goodman in "The Journal of Politics", Vol. 74, No. 3 (July 2012), Published by: The University of Chicago Press on behalf of the Southern Political science association. GENOVA, Nicholas, 2010 "Deportation Regime; Sovereignty, Space, and the Freedom of Movement", Duke University Press: Londres. MACHADO, Igor. 1999, "A Invenção do Brasil Exótico entre Imigrantes Brasileiros no Porto, Portugal", Apresentação no GT Migrações Internacionais, XXIII Anpocs, Caxambu, Brasil 19 a 23 de Outubro.



illegality, structurally and symbolically. Either from the perspective of subversion to the docile heteronormative body, or from the perspective of the foreign and immigrant body and subject.

The analytical perspective underlined above involves apprehending the subjectivity of the gender and geographical migrant, as a universe of study, through analysis, not only of their behaviors, cultures, strategies and performativities, but also of the conditions that are provided to them structurally - in order to make their life projects viable - or, on the contrary, the daily difficulties that derive from an imposed and coercive illegality, created by a fiction that is based on the existence of a hypothetical correspondence between nature and culture, that is, between nature and dominant culture/power, which apparently dare to subvert and question, paying a price for that, becoming illegal. This is the case, for example, of the heteronormative paradigm and its ability to sanction "deviations" from the nature of gender, which only conceives of the binomial, masculine and feminine, hiding its political and politicized essence. This presupposes the deconstruction and consequent integration of concepts such as nation, migration, globalization, host country and *homeland*, male and female, natural or unnatural, legal or illegal. In this way, it is imperative to structure them discursively, not as mere abstractions devoid of individuality and life, but rather as nomenclatures that reflect multiple relationships and interdependencies that are often embodied in feelings of belonging or disidentification. These socializing ambivalences are also expressed by the performativities, through which these concrete subjects emerge as political and social actors/actresses, mostly infra-hierarchical and, in practice, deprived or restricted in their citizenship. (Cf. On performativity KULICK; 2003 in CAMERON and KULICK, 2006). This leads us to consider that we are facing a human rights problem, when our reference for study is the life, lived and suffered of Brazilian Travestis in multiple transits, also guided by the transnational universe of prostitution.

This perspective stimulates an approach that encourages the rescue of this sanctioning and coercive invisibility over the subjects, underlining the role of history and stories in the establishment of new connections, relations and social interdependencies. It is these different stories – multi-situated and multicultural – that, in agonistic coexistence, bring to visibility the space of social relations, as an arena where authentic battles for survival and identity struggle are fought (ORTNER, 1984). As Victor Turner concluded, for individuals or groups, the social arena is a kind of dialectical process that includes the successive experience of the high and the low, of *communitas* and structure, homogeneity and differentiation, or equality and inequality. The passage from a lower situation to a higher one, in terms of social hierarchy, is done through a limbo of absence of "status". In such a process, in which, the opposites, so to speak, coproduces each other and are reciprocally indispensable, in order to be each of them (1974:120). In other words, there is no hierarchy between equals, but between different people, even if this different at a given time does not even have a social



place. This process occurs with the geographical migrants deprived of their history when crossing the border, which, therefore, doubly befalls the Brazilian Travestis in context of geographical and gender migration, in the framework of the migratory and sex work project they develop in Portugal and Europe. However, and following from what we have been saying, this does not mean that this paradigm will not be surpassed by the agency capacity of the subjects and the activity of an academy committed to deconstructing these processes.

We reiterate, therefore, that in this context, it is our objective to underline the various intervening subjectivities (Cf. GENOVA and PEUTZ, 2010, DIAS, 2008, MAPRIL, 2012, MAPRIL in LECHNER, 2015:475, BOCAJUVA, MEZZADRA, 2005, 2015), in a process of encounter between cultures and alterities, which oscillates, dialectically, between the encounter and its reciprocal creation/transformation (SAYAD, 1999,2014).

The relative social and economic stability in Europe, the United States and Brazil in the post-World War II period - which lasted until the end of the twentieth century - as well as the staggering of a list of enemy countries, equally stable and easily represented as such, facilitated this ambiguous look at migrants, simultaneously illegal and paradoxically useful, and often – while, unskilled or skilled - associated with inherently cheap labor. Moreover, how do Brazilian Travestis in the process of gender and geographical migration reveal, mostly as undocumented and sex workers in Portugal and Europe. This stability – characterised by a slower pace of social transformation and in which socialisation operated more successfully in the cultural production of subjects, who tended to be one – promoted the production of a taxonomy, which was also stable, on migration, namely, and by way of example, asylum seekers or economic migrants (Cf. MEZZADRA and NIELSON, 2015:11).⁶ In this generic framework, Harvey underlines the compression of two fundamental categories of organization of human thought and action - space and time - relating it to postmodernity (1989), where the multiple belongings and the growing identity defragmentation of the subjects stand out, when equated by comparison with the single and classic subject of pre-modernity.

In this context, the boundaries designed as geographical limitations, assume the aforementioned dimension of mediators of social relations between individuals from different countries, demarcating geographical/symbolic limits, from which a semi-uncontrolled and, therefore, selective porosity of flows emerges, however, surreptitiously consented and interested. It should also be noted that these taxonomies emerged at a time when the mobility of populations and individuals had nothing in common with the current situation, in terms of size and intensity, so that, currently, mobility and migration are concepts that intersect, giving the social new temporalities and spatialities

⁶ Nowadays other concepts emerge, such as climate migrants, asylum seekers for gender discrimination, etc. At the same time, postmodernity brings with it, in terms of gender and sex migrations, a profusion of classifications at this level as well; Transvestites, Crossdressers or Transsexuals, in which the social actors themselves claim, in a dialectical and performative process, the belonging to each of these or other conceptual nomenclatures. (LUIS, 2018, 30-43)

(Cf. LÉDRUT, 1979 and RÉMY and VOYÉ, 1994), which converge in torrents in the form of numerous social landscapes, of which we will highlight the landscapes of gender/sex and geographical migrations. (the *APPADURAI Escapes* , 1990).⁷

GENDER JOURNEYS

In the context of gender migrations or tourisms – analytically distinct processes – although both integrated into the concept of identity mobility, certain key concepts stand out, such as those of substitution, conciliation, implication/insinuation, redefinition or erasure (EKINS and KING, 2006). What culturally evidences a gender is replaced by primary characteristics (chest and/or genitals, depending on the circumstance) and secondary characteristics (hairstyles, haircuts, nail treatments, ornaments),⁸ which reflect belonging to another gender, reconciling disparities, erasing incongruities, replacing or insinuating, signaling and redefining roles to be played accordingly (GOFFMAN, 1993). According to the terminology used by these authors, gender oscillation (which is opposed to a tendentially permanent change, mostly characterized by substitution), is equated to tourism, insofar as substitution,⁹ being generally irreversible, therefore has an irrelevant weight in trans-tourism, being supplanted in this case by erasures, implications, insinuations or contextual conciliations.¹⁰ closely associated with the performance of roles in private spaces and never in the public sphere, which is therefore followed by a return to the original gender sphere in public spaces. This is the case of crossdressers, who live a feminine perfectly delimited in space and time, who are distinguished from dragqueens, because they perform their artistic shows in a public space –equally delimited – but in front of an audience. Both, however, in a different process, return to the expression of a heteronormative masculine, in the private/public sphere of their lives.¹¹

Ekins and King also draw a parallel between gender migrations and the concept of travel (2006), and the notion of oscillation between a home (bio-socio-cultural gender) and an out-of-home

⁷ Analogy with the various landscapes/*scapes* referred to by Appadurai.

⁸ Objects may be neutral, but they are not always neutral, taking on a gender connotation. Pierre Clastres, in *Society Against the State*, and based on the observation of the Guarani, verifies that the bow and arrow are the symbol of masculinity and the basket where the food collected or hunted is placed, symbolically represents the feminine. Any man who turned out to be a bad hunter would suffer the sanction of carrying the basket instead of the bow and arrow, and his manhood would be publicly affected. This example reveals how culturally and circumstantially objects signify something more than their immediate utility, they carry culture, values and social hierarchies.

⁹ For example, replacing the male breast with the female breast through the application of silicone.

¹⁰ In fact, these concepts express only an observable tendency, since in gender/sex migrations there are also erasures and reconciliations. The act of insinuating can in certain cases translate into the action of deceiving or pretending, namely when transvestites, in a pre-surgery phase, put soaks on their breasts or buttocks (ALENCAR, 2007). As they say in slang, learning to do the trick. (PETULL, 2005)

¹¹ Everything that indicates belonging to the political category of men and consequently socially structured gender must be reconciled and/or erased, and everything that indicates belonging to the category of women must be implicated/insinuated. (EKINS and KING, 2006, 100). In this case, we are faced with different dimensions of public and private space. The public space of the artistic performance does not fail to reveal a relative preservation of the private space of intimacy with regard to the Drags, while the private space of the crossdressers is fully so, since their performance is not artistic.

(metaphorically a welcoming context), underlining the differentiation that is established between migration and tourism. The first involves a mobility, with no foreseeable return home; the second, a transitory journey that assumes as its precondition, an implicit return home.¹² A house, which in fact was never abandoned. In the first dimension, you move house, in the second, you pack your bags and leave with a round-trip ticket, perfectly situated in time and space. From this second perspective, gender tourism implies extraordinary practices that provide new experiences – desirable for social actors/actresses – as opposed to a migration in which these extraordinary practices become everyday practices, replacing the original ones that gradually tend to erase (EKINS and KING, 2006, 98 -99). They are, therefore, forever made public and an affirmative expression of an identity that assumes and reinvents itself. As in geographical migrations, also in gender mobilities, tourism is, as a process of invasion and crossing of borders by foreign bodies and subjects, better tolerated than gender migrations. In the case of Brazilian travestis, this process is accentuated by conceiving in their penis a primordial agent of their sexual and social performances – breaking the cissexual paradigm. In this way, they exponentiate the impact of the heteronormative incongruity evident in the discontinuity between sex and gender. Transgression implies a consequence, the application of a sanction, on the unnatural and unacceptable. The norm is cissexuality and not the discontinuity between sex and gender.

As we can see, there are certain regularities in this area that we can point out in gender and geographical migrations. Leaving home and crossing borders, beyond an objective and physical scale, contains symbolic valuations that pre-exist it and that befall the social actors who in some way dare to undertake this Transposition/Transgression - in the form of social sanctions of a system that reduces their agency possibilities through evident coercions in their citizenship. The truth is that before being citizens, they are symbolically and socially produced as illegal and transgressive. This process, in practice, translates into a situation in which this citizenship, as a social resource, is forbidden to them from in reason of the migration they have decided to undertake. Apparently, they can challenge the structure and its borders, fighting even for symbolic, identity and financial resources, which are by definition scarce and the object of power relations that determine who can access them, stratifying groups and individuals, and on another scale, societies (Cf. COLEMAN, 1990 and BOURDIEU, 2002).¹³ Nevertheless, inclusion as a process/category of exclusion seems evident to us. When we establish this parallel between migrations, it seems curial to us to integrate Brazilian Travestis in the illegal migrations, of the undocumented or undocumented in both meanings addressed here, geographical and gender. For this purpose and based on the testimonies provided to us, the travesti is the one who keeps the penis, and therefore there is no sex migration, which is

¹² The anthropological house, center of historical, cultural, relational and affective references.

¹³ For Coleman, social capital resides in social relations, for Bourdieu in individuals.



generally better accepted, because it is mediated by social actors who tend to have greater financial capital and who communicate to the outside world the "coherence" between sex and gender, somehow reinforcing the norms and the "nature" of the heteronormative system. Even so, Pelúcio and Miskolci argue that there is more than just subversion or confirmation of heteronormativity, as they reflect the subjection to heteronormative parameters that also allow them self-intelligibility, as human and social beings (2007, 264). It is, therefore, from this need to "make sense" that Travesti performativity emerges as a vehicle for identity viability, for themselves and before society. In Kulick's words, "Performance is something that the subject does. Performativity, in turn, is the process through which the subject emerges" (2003 in CAMERON and KULICK, 2006, 286).

TRAVESTIS; BODY, CULTURE AND PERFORMATIVITY - THE STRATEGIC AND NEGOTIATED EMERGENCE OF THE SUBJECT

In line with the argument we have been tricotting, performativity is everything that subjects strategically elaborate to produce themselves as such, and to position themselves in a social space and time, before themselves and others. Discourse, posture, gestures, speeches, languages or symbolic boundaries are essential means for this process of affirmation. The discursive actions of social actors, more or less concerted, more or less legitimizing and legitimized, more or less evident or implicit, authorized or prohibited, constitute themselves as performativities and, simultaneously, as forms of language that elevate the individual to the level of the community, promoting the orphanhood of the restricted scope of mere isolated performance, disconnected from a vast social context. It is only a sign of a certain individual socio-anthropological position, which does not benefit from its political and collective affirmation. Performativity in our work presupposes, therefore, a community and political context, which dialogically confers meaning to the practices and intelligibility to the social actors who put them into practice, through reiterated relations and practices – although fluid and transitory – in a more or less restricted framework of individuals, who are therefore united by common identity traits and discursively oriented towards a sense of belonging. An individual who, in his/her practices and interactions associated with them, is not understood by the other and as such, is not willing to understand the other through a similar process, does not emerge as a subject in interaction and a political actor. It is, therefore, at this point that the political dimension of individual identity requires a social group or community – through identification, sharing or denial/contestation – and mirrors a process of public externalization, claiming this same group identity, although distinct from the individual identities that form it. Thus, the body signals and legitimizes the aspirations of the subjects before the structure, other subcultures, or before themselves and their group. Some aspects stand out from this dimension of the legal or illegal body:



1. The use of technological mechanisms that act on the body – transforming it – thus allows individuals to be integrated into one or another structural classification and, at the same time, provides them with the referents to understand themselves and be adequately perceived as subjects with a *social topus* in their relationship with themselves and in their relationship with others.
2. The legitimization of a certain conceptual classification of transsexuality by medicine makes the fact that this category is in this perspective stand out, framed in the structure, because authorized by it and macro socially created, as a category that promotes the continuity between sex and gender.
3. The illegitimate/illegal nature of a travesti gender construction in the way they cross borders – in which sex and gender do not correspond – discontinuity – nor are individuals interested in it – even constituting an essential part of the exercise of sex work – collides in an evident way with power, demonstrating the agencyal viability of the social actors who thus, they confront secular institutions such as patriarchy, heteronormativity, misogyny or androcentrism.

In this sense, the body, as a cultural expression and language, is an agent of vindication, struggle and transformation, so Brazilian Travestis are not passively represented as illegal bodies and unnatural subjects. They claim their right to a *social topus* and do so by alternating cycles of opening and closing to a structure that will inadvertently provide them with opportunities; identity and financial. This political context, in which differences are discussed, may involve negotiating, claiming and implementing strategies for the pursuit of common social and cultural goals (institutional recognition, struggle for rights, etc.), from which emotions and expectations, suffering or pleasure are not excluded.¹⁴ In this sense, performativity can produce group idiosyncrasy by discursively instituting the expected gender performances of the individual before the group. It is in a globalized context, which enhances various transnationalisms, that Travesti performativities achieve, from a theoretical perspective, greater richness and from a symbolic and normative dimension, an imagery of polysemic representations. In this context and from a structural perspective, the profusion of multi-situated interactions of Brazilian Travestis is highlighted, which through this process, imprint¹⁵ various instabilities, both to the structure and to the practices which are dialogically related to it, by opposition, confirmation or, simply, through strategic fluctuation. In this sense, the

¹⁴ Any analytical framework to be used in the social sciences should not deny the relevance of emotions, desires and frustrations.

¹⁵ The structuring of Anthony Giddens is situated between structuralism and agencyism, insofar as he attributes to both the ability to co-produce themselves socially. The postmodern subject, of whom we consider the Brazilian Transvestites to be a paradigmatic case, uses their critical capacity and reflexivity to question the structure (1983), unlike the traditional societies on which Bourdieu seems to focus when conceiving a *habitus* successfully forged, through successive socializations in social fields previously authorized by the structure, which, it greatly conditioned the possibility of change. (2002)

constructivism that reveals itself in Butler (2007) as a linear mimicry of practices (Cf. Namaste, 2000), unequivocally assumes for the author, the invented, reinvented and naturalized fictional character of the gender, as a product and social expression that emerges within the scope of structural limits, anchored to a given space and instituted at a certain time in the form of discourse.¹⁶ Attentive to this theory of performativity, Kulick contextualizes it within specific groups, paying special attention to the production of discourses (slang), as well as to their imbrication in performances and subsequent performativities, integrating this language of each group (slang), within the scope of the social behaviors covered by it and respective identity strategies (1998). This concept of performativity is a condition for the emergence of social actors/actresses as political subjects (KULICK 2003 in CAMERON and KULICK, 2006).

PERFORMATIVITY, BODY AND OBJECTS. THE PRODUCTION OF GENDER

In the travesti context, the incorporation of models of subjectivity – which ideally coherently link gender, sexuality, personality and emotions – resurfaces when travestis self-elaborate as people and subjects in multiple relational contexts, reinventing meanings and instituting efficiencies that collectively legitimize their practices and performativities (LUÍS, 2018). This multiplicity of relational contexts demands from travestis a plasticity and fluidity of performances (even in the use of the body in sex work - alternately framing it in the symbolic language of passive and active) - which reflect an ambivalent relationship, developed and maintained with the structure,¹⁷ in which, despite everything, they find the resources and capital necessary for its viability. while Trans subjects, doubly migrants. These performances, found in language and in their transformed bodies, referents that organize the concrete experience by structuring their practices in a way that they intend to be credible, for themselves and for others, in varied contexts and circumstances – travestis, Brazilians, gender migrants, economic migrants and sex workers. It should also be noted that most of our interlocutors come from families where material resources are scarce (KULICK, 1998, 38, PELÚCIO, 2006, 524). This constraint may explain the appetite in the future evidenced in the desire to achieve material success, as geographical migrants and trans social actresses. As we were confided in by two Brazilian travestis we interviewed; "I also have my goals, I want to have my house, my

¹⁶ When we argue that this invented character of gender, as a social construction, may have transpired involuntarily in Butler, we do so because discursive and rhetorical figures do not construct or invent something, those who do so are real subjects and these are present in Kulick (1998), but can hardly be unveiled, in Butler (2007). Moreover, gender as *a social doing* involves not only concrete social actors, but also the interaction between them. (KESSLER and McKENA, 1978 and ZIMMERMAN AND WEST, 1987)). This observation does not detract from Butler's enormous merit in his work.

¹⁷ For Garfinkel (1967) and for socially dominant thought schemes today, social viability is only possible when there is a correspondence between sex and gender. From a structural point of view, the process that leads someone to become a transsexual is basically a process that seeks to match sex and gender and eliminate incongruities. In another sense, and as we have seen before, there are authors who frame transsexuality outside their production as a medical category, and in this sense, genital surgery is not a condition for someone to express a transsexual gender identity. (Cf. SALEIRO, 2013)



things, you know?" (Julia Vellaskez) Or in the words of Armanda Parllatori when describing the moment she left home: "*I want to have my little house, my things!* I won't have anything here!" Thus, like other migrants, when Brazilian Travestis emigrate, they intend to improve their lives and ascend socially and economically, and, if possible, help their families - once again revealing affinities with other migratory segments.

Financial independence and emancipation is something that arises at the level of the achievement of adulthood, an adulthood that is deeply associated with sex work, most of the time the only way to achieve it and a condition for overcoming the situation of generalized poverty in which most of them are immersed (Cf. Pelúcio, 2006, 527 and Luís, 2010 and 2018):

I lived in a house that only God knows what it was like... Half of the door existed upwards, below it did not exist. Rats and more mice, frogs, water on the floor... a wooden shack, it wet everything when it rained, when *the tiles* flew away... Huge terrain... and so on and I'm here! (Feline)

However, prostitution privileges those who have a made body, imprinting observable regularities in their practices. Namely, a travesti profile of constant action on the body that Lopes called "a metaphor of transitivity and fluidity inscribed in contemporary sexualities." (2002, 68). This form of social affirmation also reflects an endless search for an ontological coherence, even if it is based on highly mutable practices – which, precisely because of that nature, generate performative instabilities, both in the self and in the non-travesti interlocutor, with whom they interact on different stages and multiple geographies. Such framings - in which sometimes some ambivalence prevails - are resolved by travestis, resorting to verbal and non-verbal language, through which they seek legitimacy and authenticity for their identity and performative specificities. However, contradictorily, this mutability of practices, which rests on fluid discursive statements, becomes a stable identity trait on which their strategies of action and survival are based. While, for example, in drag-queens or crossdressers, we detect a reversible mutability by definition, given the socially extraordinary character of their journeys, in travestis mutability and transitivity are an ordinary practice of everyday life, since they become irreversible - substitution.¹⁸ Somehow, part of the foundational, ethos of this new identity house are made possible by this fluidity. Thus, the unfinished character of the "making" and "remaking" of the body,¹⁹ as a vehicle of language, reflects these instabilities and generates a double efficacy. The body is not only a language in itself, it is also the object and condition of the production of a discourse about itself. In this sense, the body does not only frame

¹⁸ The established marginality of transvestites as deviant women underlines and reinforces social gender norms, but at the same time highlights the constructed character of gender by challenging boundaries or redesigning them. (Cf. JENSSEN, 2003, 97)

¹⁹ Cf. Zimmerman and West (1987) and the *doing gender*. For these authors, gender is a structure and not a social role. In our view, gender is a structuring principle, as a social construction/expression it also has a structured dimension that corresponds to social roles and statuses.



experiences as a language that reflects and organizes them. It becomes itself an experience structured by language.

(...) The body is a construction on which different marks are conferred in different times, spaces, economic conjunctures, social and ethnic groups, etc. It is not, therefore, something a priori, or even universal: the body is provisional, mutable and mutant, susceptible to innumerable interventions according to the scientific and technological development of each culture, as well as its laws, its moral codes, the representations it creates about bodies, the discourses that are produced and reproduced about it. (GOELLNER, 2003, 28)

From this art, body and language emerge as basic elements in the construction of the travesti identity narrative or, in the words of Ekins and King, *gendering, an unfinished and continuous process of gender-making, managed in and by the multiplicity of daily interactions (2006) – the family, the husband, the sisters or the client*. As Verónica Vellasquez told us:

Silicone... Silicone is like a drug, we never feel good as we are, whether we want a little bit there, or a little bit there, we don't want to look like women, we want to look better than women... "Guys" want to have perfect legs, a perfect ass, beautiful hips, a small waist, beautiful breasts. I mean, we don't want to be like women, we want to be better! So when I say that there has to be a touch up here, there has to be a touch up there, always giving some touch-ups.

Somehow, the travesti socially produced identity, implies an unfinished process (DANTAS, 2018) – a gendering process (EKINS and KING, 2006) – a task in which the body evidently assumes its culturally manipulated and simultaneously biographical dimension - present and future - and, at the same time, reveals a phenomenological component expressed in the subject's relationship with his own body and with the body of the other. In this context, to cite the practices is to make them emerge as actions of political subjects (COATES, 1998, 301), in a given *social campus* (BOURDIEU, 2002) and, in this way, to produce them, as travesti social actors/actresses - real and not mere rhetorical or discursive figures. This socially produced character of gender collaterally points to the same processual and socially/discursively constructed nature of heteronormativity, mirrored in the way they reverse adopt the dominant heterosexual discourse. In the same vein, Eckert and Mc Connell-Ginet maintain that language is a vehicle of symbolization; It invests or disinvests the subjects of power, connotes them and arranges them or, on the contrary, destabilizes them, through this same connotation or denotation, hierarchizing, stratifying, illegalizing or subordinating. Performativity exists, therefore, because discourse and structure give it intelligibility (1992, 483). In turn, this discourse emerges in a system of concrete interactions, which, when cited and performed, place the subject on the plane of social and political existence - reinforcing in parallel, a certain scheme of relations and thought instituted, although apparently through its subversion. In short, they institute, reproduce or produce a model, updating it contextually, through a fluctuating hierarchy of people and values.

In the course of this process, language can be used as a marker of inclusion of the "other" in the group or of self-exclusion of groups constituted by the other/s. In a framework marked by openings and closures to majority socio-structural contexts, Marcos Benedetti, when working with travestis in Porto Alegre (2005), considered that they, in the course of this process of search for an ontological self-legitimation, they have sought to operationalize, through language, an attempt to naturalize their transvestility, meeting a biological cause for their gender expression and erotic desire. "It's not an option, it's something that is born with us", says Júlia Vellaskes, converging, involuntarily, to society's representation of them, as suffering from a psychosis, pathology or anomie – a deviation from nature.²⁰ Nevertheless, and at the same time, there is the elaboration of one among many other strategies, conceived and activated by Brazilian Travestis in order to prevent the stigmatization of which they are targeted. It becomes evident that "The body of the Travesti is a *becoming*" (Dantas, 2018, 124).

In this context, the use of naturalization – which they seek, also when making the *body* – intends legitimation in the same way that heteronormativity is based – the norm fictitiously elevated to the plane of nature – which brings us back to the starting point of this topic; language and the made body are constituting catalysts of this naturalized expression of gender.

On another scale, it is the transsexuals who - in the testimonies collected - conceive in naturalization a way of differentiating themselves from travestis, stating that being a travesti is an option, unlike what happens to them, who were born that way. In this biological/naturalized perspective, a woman is born a woman – contrary to Simone de Beauvoir's argument, according to which no one is born a woman, but rather becomes a woman (in BUTLER, 2007, Cf. SANTOS, 2006). Contrary to Simone de Beauvoir's constructivist argument, the naturalist perspective assumes that being is not an option. In the first case, we are witnessing a strategic redefinition and a pragmatic operationalization (although it may be unconscious) of identity instruments, explainable in view of the fact that both identities and experiences are variable and positional concepts (HALL et al, 1996, HALL in SILVA, 2000, KULICK 2003 in CAMERON and KULICK, 2006). The contextual identification of the position of the subjects in the interaction allows us to unveil the repertoires summoned for the construction and affirmation of their identities. As such, individuals are organized discursively and in their practices in a contextual way (SCOTT, 1994, 18), according to symbolic and non-symbolic normativities – mostly not represented as such, but rather as nature – seeking to achieve a social *topos*, an "objective" intelligibility for the subjectivity of the concrete. There is, therefore, in the case of Travesti a distortion of heterosexual law/normativity, which ambiguously and reversibly constitutes itself as a referent of this subversion (Cf. FOUCAULT, 1978 and the reverse discourse). This ambivalence depends on the circumstantial execution of strategies and their

²⁰ In May 2019, transsexuality is no longer considered a mental disorder by the World Health Organization.



concrete and situationally structured positioning in relation to the structure, before which they are intended to legitimize at various levels and at different scales of the agency of the concrete. In this sense, Kulick claims to have documented:

How travestis think and strategically organize their lives, in terms that invert, distort or reorder gender configurations, in a way that for the non-travesti is unimaginable. (1998:191).

However, the existence of referents that make gender what it is, at a given moment – also in the cultural aspect of the body – is for some authors that we subscribe, due to historical/political facts which institutionalized and socially integrated performance of the gender category (Cf. SCOTT, 1994, 1995, 1998). Gender identity, as a cultural construct and social expression, thus becomes richer and more polysemic than sex identity, confined to the genitalia. For this reason, some authors point out that psychoanalysis "as we understand it, deprives the anatomical sex of the guarantee of unequivocal direction for the psychic constitution." (LIONÇO, 2006, 2). To this end, the aforementioned technological actions on their bodies become essential to travestis, as a way of signaling and communicating their differences or convergences:

In this sense, the psychic and symbolic dimensions become vectors that give a framework to the experience of the body, to the history written and inscribed in it (BUSSINGER, 2008), attributing to the actions and discourses a remarkable plasticity, which can be seen in the fluidity with which the travestis elaborate themselves narratively on various stages. (LIONÇO, 2006

SEX AND GENDER SYSTEMS; REFERENCES OF THE PERFORMATIVE LANGUAGE TRAVESTI

For Gayle Rubin, the psychosocial structure of individuals is shaped by experience, experienced in the relationship with others – especially in a more puerile phase of the individual's development – just as the experience itself is conditioned from the outset by the system of communications and neuronal information processing, which experiences, knows and recognizes it, according to its bio-neuronal – dynamic – pattern of appropriation of the objects with which it interacts. In the cultural aspect of sex and gender policies, the author referred to this process as sex and gender systems.

Through which, a set of conventions shapes biological material in its raw state, through the action of intervention and social interaction, transforming and culturally and politically shaping facts such as human sexuality or procreation. Such processes make their satisfaction possible in conventional ways, regardless of how bizarre these forms of satisfaction and the conventions that legitimize them may be. (RUBIN 1975 in LEWIN, 2006:90)

In recent history, the continuity between sex and gender has been broken, which has had two immediate consequences. Gender can be socially expressed in a non-cissexual way and sexuality as



part of human behavior has become independent of both the socially constructed and expressed gender and the sex one is born with. This externalization of discontinuities was and is socially fracturing, so that, as we have been verifying, it implies that in performativities there is an analytical element of greater relevance; identity (and a sense of belonging).

Kulick's argument, which emphasizes the difference between identity - which in sociolinguistics and anthropological linguistics is translated to us, as a greater or lesser awareness of a certain sociological position - and identification - which reflects a process or set of operations through which the subject is constituted as such in interaction (KULICK 2003 in CAMERON and KULICK, 2006, 293) - seems to us to be somehow equivalent to that of performance and performativity, in which the second allows us to glimpse, how the speeches and behaviors of Brazilian Travestis in the relationship between themselves and with other social actors/actresses, allow us to unveil the process as anthropologically, the subject produces himself and is co-produced by others. In this way, it is also the performativity that, in this interaction, reflects processes of identification and disidentification as well as, in parallel, the normativities that regulate these relations and the omnipresent power dynamics. The other becomes, therefore, essential in the construction of the different self. In other words, identity passes at some point through the incorporation of the otherness that it rejects, sometimes annihilating it.

In this panorama of secularly instituted social relations and interactions, in which gender is mostly the social division of the sexes and a process of differentiation from other transgender categories, as well as their positions towards the structure, we highlight the fact that travestis affirm themselves in the first person as a non-cissexual category, reflecting in their practices and gender expressions – androgynous – the autonomization of the sex and gender systems conceived in the plan by Gayle Rubin (in VANCE, 1984). Transsexuals, on the other hand, defined and sometimes self-defined based on medicine, seek reconciliation between sex and gender through surgery, while crossdressers or dragqueens²¹ intend to live the two structural genders in a compartmentalized way, somehow recognizing them as independent and non-mixable in terms of identity. As we have already said, these Trans categories are also negotiated and renegotiated by the individuals themselves, never fully corresponding to the category that arises from the dialectic maintained with the structure and that results in a conceptual abstraction or rhetorical figure that classifies them.

Thus, what we highlight in the Brazilian Travesti community that we address is the fact that they are not just a group with minority gender expression or sexual orientation, a fact that gives them identity traits that emerge from multiple social planes and allow us to listen to them well-marked regularities in various aspects. On the one hand, they are based on an androgyny that does not mean

²¹ The drag queens, although in their performances present themselves in an ambiguous way, return to their masculine identity outside this scope, not mixing what is artistic performance and what is identity.

wanting to be a woman or, in a certain sense, wanting to stop being a man, but rather being both or even more than both.

BODY AND SILICONE. THE BODY IS LANGUAGE AND CULTURE, AND THE DREAM IS EUROPE

Silicone plays a central role in the travesti narrative and, being largely the reason that triggers its mobility, from the outset between Brazilian cities, it also constitutes a hierarchical marker in the relationships established between them and between them and the structure. In 2011 Day L. tells us about another travesti. Namely, Kamila Garcês, used to *riding* on the streets of São Paulo and according to Day L. much more aggressive in dealing with other travestis and clients. Here, we explain, with due prior permission – as in all cases – the initial dialogue he had with Kamila, when they shared a house for the first time in Portugal:

Kamila Garcês –Let it pinch your ass!
 Day. L. –Belisca Mulher!
 Kamila Garcês –You have silicone on your butt and legs!
 Day L. –I don't!
 Kamila Garcês –Travesti
 without silicone, she is not a travesti!
 Day L. - I've been taking hormones since I was a little girl, this was born with me!²²

This discursive statement reveals not only the search for authenticity in gender expression through cultural signs in the body, mediated by the application of silicone, but also, on the part of Day L., the naturalization of discourse (Cf. FOUCAULT, 1978 and the reverse discourse) in order to justify being a travesti in biological terms. According to this naturalistic position, which, as we have seen, contradicts the constructivist arguments, everything was born with her and she only takes female hormones – which, in most cases, corresponds to periods of their lives that precede the application of silicone, but which nevertheless constitute cumulative resources in a post-silicone phase; by changing the tone of the voice or causing the chest to grow slightly.²³ Both female hormones and silicone are usually obtained from illegal and parallel markets. Techno-mediated action on travesti bodies has been carried out, tending outside medical sponsorship and legitimacy, contrary to what happens with the bodies of medically "authorized" transsexuals.²⁴ In the travesti

²² "The law is not simply a cultural imposition on an innate social heterogeneity, it also demands conformity to its own notion of nature." (BUTLER, 2007:143 -144)

²³ That is why some transvestites in the sex industry (in their advertisements) refer to the fact that they have hormoneized breasts, as opposed to silicone breasts; However, most of them, and at an early stage of their assembly/transformation, hide the fact that they have hormoneized breasts, while the mounted transvestites appear in the ads with their breasts bared. The hormoneized breast in advertisements is usually the subject of deletions and innuendos. They erase a male breast by insinuating the existence of a female breast, usually using underwear suitable for the circumstance, the bra. (Cf. Ekins and King, 2006)

²⁴ We are witnessing a certain medicalization of the social.



context and outside the scope of the medical seal - during the completion of our doctoral thesis - we noticed the recurrent presence in Verónica Vellasquez's home,²⁵ in Porto, of a pharmacist or her constant telephone calls, looking for new travestis to provide sexual services in exchange for facilitating access to hormones, condoms or lubricating gels. This predominance of clandestinity means that in the field of sex work the majority resort to pumpingsilicone "in the hand" of pimps and bombadeiras, not only as a condition of admissibility in the group, in the city (when they are still in Brazil), on the street or in the category of legitimate travestis, but also because they do not have the necessary economic resources to carry it out in other conditions. There are, however, exceptions; they occur in other phases of their careers as travestis and sex workers, mostly corresponding to moments in their journey when they are already in Europe and only with those who have achieved some success. The use of surgeries in the context of legality or illegality therefore operates stratification, also resulting from a previous socioeconomic differentiation. Fernanda, who has lived in Porto since 2005,²⁶ travelled to Miami in 2011 to perform a series of surgeries on various parts of her body, including her face. However, she did so when he had already been established in Portugal for a few years and after having achieved success with the clientele (and not at an early stage of his career). This option coincides with a phase in which aesthetic medicine had reached an unobservable degree of development, for example in the 80s of the twentieth century, when the first *bombings began* in Curitiba (KULICK, 1998). In the same vein, Vanessa Nobre tells us how, while traveling through Europe, she performed 3 plastic surgeries in 20 days. There is, therefore, an observable difference: the transformation, when initiated in Brazil, tends to be carried out in the field of clandestinity, whereas, if this transformation is initiated in Europe, it tends - from a certain moment of the gender and geographical migratory project - to take place with the use of plastic surgery, cumulatively with clandestine interventions on the body, These predominate, at a time when there is still a small amount of financial capital. The reason for this difference lies essentially in the economic means available to them in one place or another. Nevertheless, it seems to us that the use of plastic surgery has been gaining ground to the industrial silicone bombs, especially with, regard to younger travestis, who continue to arrive in Portugal in 2020. Some of them, who arrive in Europe still without a body and very young, immediately assume as their goal prostitution in order to begin their transformation. Something, which a few years ago, and still in the twentieth century, did not happen. At that time – in the 70s – travestis arrived in Europe via Italy and France, with their bodies

²⁵ Adriana was our main ally in this incursion into the world of Brazilian Transvestites in the context of sexual and migratory work. He died on January 19, 2019 after a fall that caused the displacement of the silicone that he had applied for decades, culminating in a generalized infection that made his early death inevitable.

²⁶ He still lives and works in Porto.

made exclusively in an artisanal and illegal way. However, in 2020 the silicone bombs did not disappear and it can be said that they still coexist with plastic surgeries.²⁷

With regard to *pumpers*, generally those who apply silicone have already undergone this same process and under the same conditions (Cf. ANDRADE and MAIO, 1985), reproducing a social dynamic in which being *pumped* means the beginning of learning to one day become a *pumper*. In many cases, a *pump* also starts by applying silicone to herself, "I've already put it on myself on my buttocks, on my legs. You have to be cold-blooded, don't you?" – Laughter – "but we go through so many more difficult things in our lives and survive, that's nothing!" (Verónica Vellaskez). Access to these resources is selective in the Brazilian context and is generally associated with being a pimp/cafetina and/or street boss, being able to charge a fine – exercising the toll – to other travestis or clients, that is, being the holder of a certain social capital of prestige within the group. In short, an asymmetrical and supra-hierarchical positioning in the interaction – therefore with implicit power relations – with other travestis, also an indicator of a different status in the group resulting from contextual alliances established on the street and from the access and activation of a wider and more varied range of social resources available and, above all, accessible (BOURDIEU, 2002). This manipulation of social capital, which is only effective in the domain of interactions, brings individuals closer to the management of selective resources that are not available to all. Thus, Verónica Vellaskez, by raising *sisters* through the exchange of information about a surgeon she knew in São Paulo to whom she herself resorted to be *pumped*, learned through the observation of silicone applications performed on her friends and on herself. In Porto, she tells us: "To this day, if a friend comes here, I do it, because in the past it made a lot of money, until today it does, when they look for "us" to do it." However, she states that in Portugal there is no liquid silicone²⁸ for sale, but that in Brazil or Spain it is easily accessible. During the time we spent at her home in Porto, the existence of this type of silicone and syringes for veterinary use for large animals was visible. In Portugal, Verónica Vellaskez charged between €250 and €350 per liter of silicone applied, depending on the parts of the body where it would be administered. To give you an idea, a breast can take more than 3L. Jota Joyce, says that in Brazil being *pumped* can cost the travesti between 1000 and 2000 reais. (LUÍS JSA, 2018)

The importance of the body, not only as an object of experience, but also as an agent of experience itself, is therefore undeniable, insofar as its markings express a macro culture and a culture of specific gender and sexuality in dialogue. This multiplicity of contexts and consequent

²⁷ At the beginning of the emigration of transvestites to Europe, prostitution was assumed as the purpose of this mobility, at this time, with more and more migrants, prostitution carried out in Europe, being seen as an end and a means to start the transformation. Let's say that the new global contexts and their interdependencies have not only determined new mobilities and paths, but also the activation of new strategies in the legitimate transvestite process.

²⁸ Silicone for non-medical use and sado, for example, in the cleaning of aircraft fuselages.



plasticity of elements and variables involved in the process of legitimizing "doing oneself" and being a travesti is clearly expressed when Pelúcio uses the example of Fabiana. In the midst of his "lesbian" relationship with Verónica (another travesti), she wore underwear at home and in the context of prostitution –street – she wore "panties". This prop sustains, therefore, an entire construction of gender that develops in specific and differentiated interactive contexts: on the one hand, the "house"; on the other hand, the "street" and the client, managing in each of the contexts, what is expected of the individual. If, in relation to the relationship with Veronica, one of the markers of the construction of a legitimized identity is the "panties" versus "underwear", within the relationship with the client this signaling function can be contextually altered and subject to search for other intelligibility, when, for example, a client asks to be the one to wear the panties (Verónica Vellasquez) or when a travesti is sought by a woman (Vanessa Nobre).²⁹ In this sense, in the context of the travesti universe, what seems to confer the status of heterosexual or homosexual/lesbian relationships is the expression of gender and not sex/sexual orientation, although several interdependencies can be revealed between both dimensions. A man who has sexual relations with a travesti is not necessarily seen as homosexual, just as a relationship between two travestis can be conceived as a lesbian relationship and not a homosexual one in the strict sense. Therefore, in the cultural production of the body, we find an intimate connection between objects of non-neutral symbolic valuation and their contextual performativity, in a process that confers specific intelligibility to the subjectivity of concrete interaction.

Heterosexual classifications in relation to sexual orientation are absorbed and restructured by travestis with reference to gender construction/expression. For example, and as we have seen, the relationship of a travesti with another travesti can be perceived as lesbian within the group, since it takes place between two feminine constructions. However, on another scale, it will always require the presence of a male and a female for sexual intercourse to occur in intelligible ways: one will be the penetrating agent and the other the penetrated/passive agent (Pelúcio, 2005, 2006). In this line of argument, an active man who maintains a relationship with a travesti is heterosexual, since in this relationship both male and female are present (in which he is the masculine/active element). On the other hand, a passive man, participating in a sexual relationship with a travesti, may be perceived as homosexual. Although the travesti does not identify with homo-oriented individuals, her performance of the passive role in a relationship is not represented in the same way, compared to the context of the relationship involving a passive man and a travesti, since this "man", having a sexual orientation, did not elaborate another gender expression connoted with passivity. Thus, the passive travesti is

²⁹ However, it should be noted that prostitution can determine the existence of sexual relations with women who seek them for this purpose, although not all transvestites make themselves available for this type of service. In this sense, prostitution further destabilizes the way in which they produce and represent themselves as subjects.

feminine and the passive man is homosexual. From the perspective of a transsexual, the travesti, by preserving her genitals, is relegated to the field of homosexuality.³⁰

Sexual orientation is, from this point of view, much more objective and, at the same time, less susceptible to generating role entropy. When the construction of gender incorporates the heterosexual criterion of sexual orientation and operates the ordering of subjects and their relationships, everything becomes more ephemeral, moldable and complex. In these cases, the filter of the phenomenological body operates,³¹ since the body acquires a symbolic dimension that can distance it from the hegemonically structuring classifications and translate a specific position of the subject, in relation to his body and that of the other. From this perspective, people who live in a gender outside the hegemonically original sex tend to conceive of their sexual orientation based on the gender expressed. However, in travesti prostitution the facts are never linear. This justifies the fact that travestis do not publicly classify the men they seek in the paid relationship with them, the passive side, as homosexuals. This could result in a reduction in their clientele, while undermining the group's widespread representations that those who seek a travesti for sex are not looking for a man. On the other hand, in prostitution, secrecy and discretion are one of the keys to its success.

Even so, in this fluidity of practices and consequent classifications, we can capture some influences of the man/gay model, identified by Fry and McRae (1993, 43-44, Cf. GREEN, 1999, 6 and KULICK, 1997) in northeastern Brazil, in which in a relationship between two men, only the one who plays the passive role is considered homosexual.

In this way, in this Brazil that we are calling "popular", as among the Guaiaqui, the boy is called "" not simply because he is supposed to like to have homosexual relations, but because he is "effeminate" (plays the feminine role) and because if he maintains a homosexual relationship, he will play a "feminine passive" role. The boy who plays the male role and who could be the sexual partner of the (therefore maintaining a homosexual relationship), is called a "man" or a "macho". (1993, 43)

It is, however, above all in the context of prostitution that the travesti gendered language reveals itself from heterosexual normativity itself, even when it apparently subverts or performatively distorts it. In fact, in the process of constructing practices and discourses that mark and signal their daily lives, travestis discover men/clients who "look for the passive side" and "pay them to take on an active side". As Loise (2006:19) points out, the penis then becomes a work tool. What in other contexts constitutes a factor that invests the subject with masculinity, in the specific context of prostitution, confers on them an added value in the market of sexual exchanges and, at the same time, performs the collateral function of classifying these men who seek the passive side, as

³⁰ We note the permanent negotiation between identities with the aim of achieving legitimacy and, at the same time, how all of them tend to express themselves as subcultures in identity struggle among themselves, having as an archetype the heteronormative macrostructure, which considers them a deviation, which reinforces its norm.

³¹ The sublimated perception of bodies, which goes beyond their materiality.



mariconas/fagots (PELÚCIO, 2006, 2007), emphasizing once again the presence of a heterosexual symbolic system, based on the active and passive elements. If, in the private sphere, travestis adopt the feminine role of passivity and receptivity at the level of sexuality, in prostitution they may be circumstantially summoned to play the male role, expressed in being active (LOISE, 2006:20). Once again, the body reveals itself not only as an object of experience, but also as a structuring agent of experience, signaling the shared culture and, therefore, thus making it understandable to the participants in the interaction, assigning it roles, defining situations and clarifying circumstantial intelligibility.

In this sense, travestis expect "real men" to be masculine, active, enterprising, penetrating (Cf. in the same sense LOISE 2006, 20, PELÚCIO, 2005) – a man will always be the one who assumes the active role (KULICK, 1998, 124). This construction of gender (and consequent contextual performance of corresponding roles) is not structured in a rigid way. The act of oppositional differentiation of the two terms, masculine/feminine, results in the consolidation of each of them and the respective coherence between sex, gender and desire, through processes that maintain a dialogical and dynamically positional relationship with the structure. However, not in a discursive way unilaterally dictated by the structure (BUTLER, 2007, 31). In addition to their own private sexual experience challenging them to particular reconfigurations and re-significations of their sexual performativities, in relation to gender identities, the contexts of sex work force them to renegotiate, according to the needs and expectations of their clients (LOISE, 2006:67), the relationship between gender identity and sexual orientation. As the late Verónica Vellaskez explained to us, the fact that "a man seeks out a travesti for a sexual relationship... it doesn't cause a man to lose his masculinity." In the view of the travestis involved in this research, as well as from their discourse on sexuality, these men would not be less men just because they seek sex with travestis, but, above all, because they seek a certain type of sex, the passive side of the relationship. "With us, they don't want anything conventional." (Cf. In a confluent sense PELÚCIO, 2005, 239). Ambiguously, Kulick found that for Brazilian travestis in Salvador, the penis is an element of pleasure and that the possibility of surgery scared them tremendously, fearing that it would drive them crazy. (1998)

CONCLUDING NOTES

The Brazilian Travestis, referred to as such for their specificity that we consider to be unique, also, as an idiosyncratic dimension of Brazilian culture, are primarily gender migrants, thus experiencing all kinds of discriminations that begin at home, at school or in the neighborhood. Leaving home is the only solution and the street is their replacement home, in which they find a new family made up of their *sisters, mothers, godmothers* or on another plane their *husbands* – *A travesti doesn't have a boyfriend, she has a husband!* (Verónica Vellaskez). However, it is also on the street



that the street bosses/donas da rua and pimps/cafetinas are found, who impose duties on them, coercively, in a process that we could call a second and alternative socialization.

On the streets, the bodies made are more successful and in order to do so, they start a process of mobility between Brazilian cities, usually from the smaller ones to the large cosmopolitan centers. This crossing of gender and even sexuality boundaries entails discrimination and exclusion on the basis of a body socially perceived as illegal, in a process analogous to that of geographical migrants. At some point, they experience emigration, that is, they cross the Brazilian geographical borders and decide to emigrate to Europe. Arriving in Portugal, not only is her travesty body illegal, but her stay for three months, renewable for another three, also becomes at some point the symbolically illegal body of the undocumented immigrant. Still, they prefer to be illegal immigrants in Europe than legal citizens in Brazil, because, in fact, in Brazil they find themselves relegated to the streets and to the night, where they do nothing more than survive in a society that reveals itself to be intensely transphobic. Rather illegal outside Brazil than legal in Brazil. Unfortunately, the scenario seems to have worsened with the unusual election of President Bolsonaro.

In the essay that we have now concluded, the universe of study is apprehended through an analytical grid that necessarily has to cross two types of migrations, which, independently of this grid and at the level of practices, cease to be dissociable from a given moment. Since Brazil, mobility has been a condition for making the body, usually with the resources made available by sex work. And so they continue in Europe. In fact, it must be said that it is difficult for Brazilian travestis to fit into Brazilian society as citizens. The reason is her body and what it represents as resistance to a sexist and discriminatory society against sexual and gender minorities. Keeping the penis in a body full of heteronormatively feminine references is the climax of this resistance, calling into question secular institutions and centuries-old power relations, from which their agents do not want to disconnect - either because they are unaware of cultural relativism, or simply because they want to perpetuate relations of power and domination.

The Brazilian Travestis actualize an apparent subversion of the heterosexual law/normativity, which, however, is ambiguously constituted as a referent of this subversion (FOUCAULT, 1978). On the other hand, if it is a fact that for travestis the real man condenses a series of attributes implicit in being active, it is no less true that in the exercise of prostitution (in addition to the income earned), another of the reasons reported is the sexual pleasure obtained in its exercise, which leads them to roughly exclude the possibility of sex reassignment surgery. Evidencing, once again, the ambiguity of the hierarchies that emerge from the circumstantial character of the interactions. The man who is not a real man and who therefore positions himself in a hierarchically inferior way, can be sexually considered as a source of pleasure, although discursively produced as a *maricona*, being subject in this context (to at least) two different valuations. The intelligibility achieved in the relationship



between gender and sexual performance/sexual orientation therefore depends on the context and the way in which the variables intersect. The multiplicity of experiences generates instability in the referents that frame it, so that the search for factors that can be circumstantially generators of some stability, in instability, find in language and also in the body - as such - an equally privileged vehicle for this purpose. The body of the Brazilian Travesti is this language and, at the same time, a structuring condition of this same language. Her body somehow condenses observable gender relations and her performativities contextualize them.

We also found that between gender and geographical migrations, many theoretical crossovers can be established and that this can definitely enrich our studies. We also conclude that this migratory double meaning in which they are integrated, as well as the sex industry to which they are dedicated – mainly this one – prevent them from being at the forefront of associative or academic objectives and interests. Being a travesti, being an immigrant without papers and a prostitute,³² condenses in a single subject, symbolically infra-hierarchical attributes, even in the context of relations with other sexual and gender minorities that are more politically organized within the LGBTQI+. At the same time, this process not only proves to be essential to the construct of identity elaboration of those who conceive them in this way – the other – and in a more pernicious way, in the way in which Brazilian travestis, migrants and prostitutes are faced in their lives with a very conditioned spectrum of possibilities of full experience of a citizenship, which has always been theirs, coerced. In any case, we have in common, as a sanction, the probable illegalization/subordination of bodies, as a consequence of the TRANSpassing of limits and borders gender-compatible sexuality, paid sex and undocumented immigration. As Verónica Vellasquez confided to me at one point - who died in January 2019 due to the industrial silicone she had in her body, when she fell down of the stairs at home. O silicone moved and entered the bloodstream, causing septicemia – there is always a price to pay –the subordination of bodies and subjects:

It saddens them all... clear... You get to a certain age where loneliness squeezes... Loneliness affects "people", loneliness... We are human beings... We have heart, we... We like people, we have feelings, we're a normal person like any other. We're no different from anyone else, so I mean... There comes a certain point in our lives when loneliness comes and squeezes... And when it presses... Look... It's sad, "we" suffer, cry and... but you can't do anything! It's a one-way trip, it's what "we" have to pay for the change we've made and what we can take away from it is to move on with life and try to take advantage of it.

The journey has come to an end. Thank you for the anthropological gift - dádiva/marcel Mauss - Verónica Velasquez. How handy it would be now to be a believer and simply say, rest in Peace.

³² The term prostitute is used here in a non-derogatory way, however, in order to reflect all the negative weight that surrounds it.



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Territorialization: Situational diagnosis for planning health actions in a coverage area of the family health strategy

 <https://doi.org/10.56238/sevned2024.010-041>

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ABSTRACT

Introduction: Health is a universal right and a responsibility of the State, especially in the organization of health services where the basic units are located. Territorialization, together with situational diagnosis, is described as an essential process to identify health priorities and direct effective actions to meet the unique demand of each community. **Objective:** To describe the importance of territorialization and situational diagnosis for the planning of health actions aimed at the individual and collective priorities of the community of an area enrolled in a health unit in the municipality of Porto Nacional. **Methodology:** Qualitative and descriptive approach, with emphasis on bibliographic research and situational diagnosis of micro-area 61 of the territory of the Mãe Eugênia Basic Health Unit, Porto Nacional - Tocantins. **Result and Discussion:** Based on the study carried out in the area covered by the 201 families living in the neighborhoods that make up the area in question, it was possible to identify the risks and classify these families according to their living conditions. This research provided a differentiated and attentive look of the researchers, who experienced in practice an activity developed by the Community Health Agents, who are fundamental in this process. **Final considerations:** Territorialization is responsible for bringing the collection of quantitative and qualitative information, population number and situational diagnosis that will provide the planning of actions, emphasizing the interaction between the community and health professionals, in addition to the crucial role of Community Health Agents in this process, for the promotion of care for the population.

Keywords: Primary Care, Situational Diagnosis, Family Health, Territorialization.

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INTRODUCTION

Health, in addition to being a universal good, is a duty of the State, which, in the same way, is responsible for the organization of health services, according to the territory where the Basic Health Unit is located. Thus, health is directly related to the territory and depends on the way in which health services, social facilities and various public institutions and establishments are designed and organized in it (FARIA, 2013).

In this way, it is understood that the territory is the place with defined limits, where people live, work, circulate and perform their functions of daily life, where the built and natural environments are part of it. Above all, it is a space for power relations, information, evolution and exchange of ideas and ideologies, health and the promotion of quality of life (BRASIL, 2021).

The National Primary Care Policy (PNAB) considers the territory as a specific, decentralized geographic region of the Unified Health System (SUS), where strategic activities aimed at health surveillance, promotion, prevention, protection, and recovery are carried out (SILVA et.al., 2021).

In this mode, according to Brasil (2020), it is understood that the work carried out day by day by the Family Health Teams has undergone constant modifications, programs to improve the quality of care for users are implemented based on a more humanized and comprehensive reception. For workers who are at the frontline, that is, face to face with the user, they need to be prepared to face all the situations brought by them.

Thus, Primary Health Care (PHC) is care for the patient, society and family in a primary context and level, and is focused on the process of preventive care, capture and active search for data and information from households with the support of essential characters of the Unified Health System (SUS), such as community health agents and endemic diseases. and professionals allocated to the region's health unit (GONDIM; MONKEN, 2019).

The fundamental purpose in the Territorialization process is to allow the identification of priorities in terms of problems in social groups, which will be reflected in the definition of the most appropriate actions, according to the nature of the problems identified, with a greater impact on the health levels and living conditions of the target population (SILVA et.al., 2021).

Understanding this context, the article aims to describe the importance of territorialization and situational diagnosis for the planning of health actions aimed at both the individualities and the collectivity of the community of an area enrolled in a health unit in the municipality of Porto Nacional.

METHODOLOGY

The present research was developed from a qualitative and descriptive approach, of a basic nature. Regarding the objective, the type of exploratory research is highlighted, and regarding the

procedures, data collection through bibliographic research. Basic research, according to Lakatos (2017), brings together studies that aim to fill a gap in knowledge used only to expand knowledge; refer to those in which there is the acquisition of "new knowledge directed to broad areas with a view to solving recognized practical problems".

According to Gil (2011), bibliographic research is a work of an exploratory nature, which provides theoretical bases to the researcher to assist in the reflective and critical exercise on the theme under study. At first, it is very useful to arouse the curiosity of the researcher and arouse concerns about the topic to be studied.

For Gil (2013), qualitative research deepens the concept studied, enabling the actions of describing, understanding, explaining, precisely the relations between the global and the local in a given phenomenon.

According to Kedingler (2018), exploratory research aims to facilitate the researcher's familiarity with the problem object of the research, to allow the construction of hypotheses or to make the question clearer. The most well-known examples of exploratory research are bibliographic searches and case studies in which they are used for: bibliographic surveys/studies; analysis of examples that help the understanding of the problem; surveys and interviews with people involved with the problem object of the research and case study.

The present work consists of a descriptive study through the experience report of the students of the 10th period of the nursing course through the curricular internship discipline of Nursing Care in Primary Health Care II, from February to March 2024, under the supervision of the professor and nurse coordinator of the health unit.

To carry out the situational diagnosis of the territory, the coverage area was recognized in partnership with the community health agents, who through the on-site visit were able to recognize the territory and carry out records of strategic points and household and territorial records. For the population data collection, data from the e-SUS report were used through the individual registration forms and the household and territorial registration of the population registered in the area assigned to a micro-area of the basic health unit.

After this stage, the Coelho and Savassi scale was used to classify family risk as a way to plan health action strategies. After analysis of the territory and observations of the e-SUS indicators, the information and consolidation of the information obtained were tabulated in a Microsoft Excel 2010 spreadsheet for statistical treatment and we elaborated the situational diagnosis, exposing the results.

RESULTS

The beginning of the activities took place through the collection of information and recognition of micro-area 61 belonging to the territory of the Basic Health Unit (UBS) Mãe Eugênia

in the Jardim Brasília sector. To this end, the e-SUS (Primary Care Information System) database was used through the individual registration forms of the citizen and the household and territorial registry, which enabled the survey of information on the territory.

The data collection process took place during a field visit with the preceptor and the Community Health Agent of micro-area 61 of the assigned area. The nursing students carried out the geographical recognition of the territory, identification of the population through household and territorial registries, and records of the existing points in the area for population evaluation.

It is interesting to note that the objective of the territorial survey goes beyond home visits, as it is customary to think; It also covers checking vacant lots, landmarks such as churches, associations, supermarkets, etc.; the registration of the territory, the houses, the families and the person responsible for them, the problems of that sector, among other attributions that are inherent to the work of the CHA.

After this analysis, it was experienced, in practice, how the territorial registrations of vacant lots and strategic points are carried out, as well as the household and individual registration of families in the territory, achieving, as a result, the situational diagnosis of the area.

The recognition of the territory made it possible to survey the population data of the micro-area 61, revealing the number of existing people and the most relevant health conditions. After consolidating and tabulating the data, the table below represents the total population and the families registered in the micro-area according to their specificities.

Chart 1: Distribution of people according to: population and families in the micro-area, children aged 0 to 4 years, pregnant women, hypertensive patients, diabetics, women aged 25 to 64, PCCU and the elderly.

Variables	Values
Total population of the micro-area	544
Total number of families in the micro-area	201
Children from 0 to 4 years old	34
Pregnant	2
Hypertensive	86
Diabéticos Mellitus	33
Women aged 25 to 64 (Pap smear)	158
Elderly	91
Leprosy	4
Tuberculosis	0

Source: Prepared by the authors, 2024.

In possession of these essential elements, the Coelho-Savassi scale was used, which evaluates the stratification of familial risk through a standardized instrument with risk sentinels. For this purpose, numerical scores and colors are used: Green, Yellow and Red, representing, respectively, Low Risk (score 5 - 6), Moderate Risk (7 - 8) and High Risk (9 - +), as shown in Chart 2.

Table 2 – Coelho-Savassi Familial Risk Scale

Dados da ficha A SIAB (sentinelas de risco)	Definições das sentinelas de risco	Escore de risco
Acamado	Toda pessoa restrita ao seu domicílio, por falta de habilidade e/ou incapacidade de locomoção por si só a qualquer unidade de saúde.	3
Deficiência física	Defeito ou condição física de longa duração ou permanente, que dificulta ou impede a realização de determinadas atividades cotidianas, escolares, de trabalho ou de lazer.	3
Deficiência mental	Defeito ou condição mental de longa duração ou permanente, que dificulta ou impede a realização de determinadas atividades cotidianas, escolares, de trabalho ou de lazer.	3
Baixas condições de saneamento	Saneamento implica no controle dos fatores do meio físico do homem, que podem exercer efeitos prejudiciais à sua saúde.	3
Desnutrição grave	Percentil menor que 0,1 e peso muito baixo para a idade.	3
Drogadição	Utilização compulsiva de drogas lícitas ou ilícitas, que apresentem potencial para causar dependência química (álcool, tabaco, benzodiazepínicos, barbitúricos e drogas ilícitas).	2
Desemprego	Situação na qual a pessoa não esteja exercendo nenhuma ocupação (não incluir na avaliação férias, licenças ou afastamentos temporários). A realização de tarefas domésticas é considerada ocupação (trabalho doméstico), mesmo que não seja remunerado.	2
Analfabetismo	Pessoa que, a partir da idade escolar, não sabe ler nem escrever no mínimo um bilhete, e/ou que sabe apenas assinar o nome.	1
Menor de 6 meses	Lactente com idade até 5 meses e 29 dias.	1
Maior 70 anos	Toda pessoa com mais de 70 anos completos.	1
Hipertensão arterial sistêmica	Pressão arterial sistólica maior ou igual a 140mmHg e pressão arterial diastólica maior ou igual a 90mmHg, em indivíduos que não usam medicação anti-hipertensiva.	1
Diabetes Mellitus	Grupo de doenças metabólicas caracterizadas por hiperglicemia e associadas a complicações, disfunções e insuficiência de vários órgãos.	1
Relação morador/cômodo	Número de moradores no domicílio dividido pelo número de cômodos na residência. São considerados cômodos todos os compartimentos integrantes do domicílio, inclusive banheiro e cozinha, separados por paredes, e os existentes na parte externa do prédio, desde que constituam parte integrante do domicílio, com exceção de corredores, alpendres, varandas abertas, garagens, depósitos.	>1: 3 pontos Igual a 1: 2 pontos <1: 0 ponto

Cálculo do risco familiar

Escore total	Risco familiar
5 ou 6	R1 – Risco menor
7 ou 8	R2 – Risco médio
Acima de 9	R3 – Risco máximo

Source: BRAZIL. Ministry of Health. Coelho-Savassi Familial Risk Scale. PlanificaSUS.

Thus, it was possible to obtain a comprehensive view of the socioeconomic and health conditions present, revealing that the community consists of 201 families, housing a total of 544 individuals.

When classifying them according to the above-mentioned standardized scale, a heterogeneous distribution was observed: 190 families were categorized as "green", equivalent to 94.5% of the population, suggesting a comfortable financial condition, but with possible areas of improvement in health and well-being; 9 families were classified as "yellow", accounting for 4.5%, pointing to a situation of socioeconomic vulnerability and the need for care to prevent health problems; Finally, 2 families were categorized as "red", representing only 1% of the total number of citizens in the micro-area, indicating a condition of extreme socioeconomic vulnerability and serious health impairment.

Table 3 - Risk Classification of Microarea 61



Source: Prepared by the authors, 2024.

The last activity to be elaborated was the creation of a visual model of the map of the micro-area, as shown in the figure below. The geographic space of a territory is not only a graphic representation of a micro-area, but a powerful tool for understanding and planning health actions, it defines the diversity of situations encountered and favors information such as physical, social, economic and cultural characteristics of a population.

Table 4 – Territorial Map of Microarea 61



Source: Prepared by the authors, 2024



DISCUSSION

This experience report provides a detailed and enriching look at the activities carried out during the Internship. The engagement of the group, under the supervision of the preceptor in charge, shows a serious commitment to learning and assimilating public health practices.

The comprehensive approach to the proposed tasks, from the comprehension of the structure of the UBS, according to the National Primary Care Policy, to the practical execution of territorial and household registries, demonstrates a complete immersion in the context of primary health care, providing a view of the administrative and care practice of nurses. In addition, the emphasis on the importance of CHWs as an initial link between the community and health services highlights the relevance of the work of these professionals in identifying risk situations and formulating preventive strategies. (CARVALHO, 2020).

The analysis of the territory goes beyond home visits, encompassing aspects such as the identification of vacant lots and strategic points, which reflects a comprehensive perception of the peculiarities of the community served by the UBS. The use of the standardized Coelho-Savassi scale to classify the vulnerability and care needs of families demonstrates a commitment to systematic and objective evaluation, facilitating the prioritization of interventions and the targeting of available resources (MENEZES, 2012).

In view of this, situational diagnosis plays a fundamental role in the planning of health actions, providing a vast and detailed understanding of the demands, resources and challenges faced by a specific community or population. It allows you to identify gaps and priorities, guiding the efficient allocation of resources and the formulation of appropriate strategies. In addition to promoting the active participation and engagement of the community in the planning and implementation of health actions, increasing their relevance, acceptance, and impact (CARVALHO, 2020).

In short, this experience report illustrates not only the development of technical skills, but also the understanding of the importance of comprehensiveness in health care and the fundamental role of nursing professionals in promoting well-being and preventing diseases within the community.

FINAL THOUGHTS

Knowing the territory through situational diagnosis is necessary for the planning of health actions in primary care, as it favors the reorganization of the work process of the ESF (Family Health Strategy), adding programmatic actions to adequately meet the demands of the territory, establishing needs and care for families with greater vulnerability. Through the experience lived in the field of practice, it was possible to understand the importance of the Situational Diagnosis together with the



stratification of family risk through the Savassi Rabbit scale as a way to determine the social and health risk of each family nucleus.

Such devices allowed us to identify and understand the real urgencies, in addition to classifying the vulnerability of Microarea 61 of the territory of the Mãe Eugênia Basic Health Unit. In this way, it was possible to identify the specific problems of the community and, with that, collaborate with the planning of health actions programmed to meet the requirements of the micro-area adscribed. In addition, it was found that this tool can contribute to greater interaction between the community and health professionals.

In addition, with territorial recognition, it was possible to perceive the importance of the performance of community health agents in this process, as they are responsible for the link between the community and the health team. Through the home visit, this professional understands the individuality of the family and, thus, contributes to the planning of care and follow-up at the family risk.


Finally, the results of this study enable health professionals to better understand the vulnerabilities of the families served, thus allowing them to understand the importance of the population survey process with situational diagnosis as a useful tool for the adequate planning and direction of actions, providing the necessary interventions for the promotion and prevention of diseases.



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Relationship between incidents occurred in the beach area and the presence of return current on beaches in the metropolitan region of São Luís, MA

 <https://doi.org/10.56238/sevned2024.010-042>

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ABSTRACT

Rip currents are known to be the biggest cause of rescues and drownings within the surf zone. In Australia, about 90% of all rescues carried out in the surf zone and the majority of drownings are related to rip currents (Short, 1999). The objective of the work was to make a relationship between rip currents and the incidents that occurred in the great island of São Luís. For the research, a survey of the accident record was carried out, images were obtained and awareness and information work was carried out. The interpellation of the data was applied in a participatory way, seeking the knowledge of all those who were involved in the activities carried out on the beaches, through a direct approach to those who frequent this environment, in addition, it was using data from historical series provided by BBMAr (Fire Brigade Maritimes of Maranhão). Despite the adversities and all the obstacles faced during the execution of the research, it was possible to locate with some drone overflights the place where the rip currents appeared along the main beaches of the state, identifying the points that could represent a real risk of drowning. and incidents for visitors to these beaches. This work serves as a starting point for further research to be carried out, since there is not an expressive number of works with this approach in Maranhão, precisely on the large island of São Luís.

Keywords: Return currents, Beaches, Incidents.

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INTRODUCTION

Coastal environments are extremely dynamic and various terrestrial, oceanic and atmospheric processes converge in them, constantly changing their characteristics. The morphological changes are the result of variations in the incident energy regime (wave and wind climate), water level variation (storm events), and imbalances in the local sedimentary supply (SHORT, 1999, KLEIN, 2004). Of the various environments found in the coastal area, the beach environment stands out. Its morphological and sedimentary behavior is the result of the complex interaction between sediment source, wave energy and the characteristics of the adjacent internal shelf (KOMAR, 1998).

In this sense, beach environments represent the transition zone between the action of marine and continental processes, being subject to temporal variations in both sea level and sedimentary supply. The sedimentology of the beaches can be formed by grains of different compositions and granulometry, and the grain size in combination with the climate of incident waves, interact and condition the morphology of the beach profile (HOEFEL, 1998).

According to Dalrymple et al. (2011), MacMahan et al. (2006) rip currents can remove large volumes of sediment, resulting in a potential risk of erosion during extreme events. However, the greatest risk is related to bathers; hundreds of drowning deaths and tens of thousands of rip current-related rescues are recorded worldwide each year (BRIGHTON ETAL., 2013; AROZANERA ET AL., 2015).

The risk posed by rip currents to bathers is largely underestimated, which can have a negative effect when it comes to allocating funds to rescue services (BRIGTHON *et al.*, 2013). In the USA more than 100 people drown each year in rip currents (NOAA, 2016), in this country these currents are responsible for more deaths than: hurricanes, tornadoes, floods, lightning or sharks (LUSHINE, 1991, FLETEMEYER AND LEATHERMAN, 2010). Lushine (1991) published an article presenting the number of annual drownings in southeastern Florida attributed to these currents, as well as the relationship between these and certain meteorological and oceanographic factors.

The safety of bathing in the sea in the city of São Luís, Maranhão, as in any other large tropical coastal city, where the high frequency of bathers is always a concern. Conservative figures provided by the local lifeguard agency indicate that an average of 1,586 accidents are recorded per year on the Atlantic coast, and this total is expected to be about 20% higher, since not all occurrences are recorded, judging by the understanding of the lifeguards themselves.

The monitoring and collection of information to analyze the relationship between rip currents and incidents that occurred in the beach area, in addition to raising awareness among bathers and government authorities about the importance of these currents on the beaches of the large island; To monitor the variations of the beach features helping to identify erosive and/or depositional behaviors, understanding the morphodynamics of the place.

The mapping of rip currents and the identification of the location of dragging occurrences contributes to the safety of users, so that authorities obtain important information to assist in decision-making and prevention strategies.

In view of the above, this research assumes great importance since studies from this perspective are not found in expressive numbers for Brazilian beaches, especially for the northeast region and, more specifically, São Luís. The objective of this work was to make a relationship between rip currents and the incidents that occurred on the large island of São Luís.

MATERIAL AND METHODS

SURVEY OF ACCIDENT RECORDS

The data referring to incidents with bathers that occurred on the beaches served in the research were collected from a partnership with the Maritime Fire Battalion (BBMAr), which belongs to the Military Fire Department of Maranhão, and is in charge of the missions of attending to occurrences of prevention, search and rescue in aquatic environments, serving the metropolitan region of São Luís. Information on these accidents was collected between 2014 and 2019, in order to trace a relationship between drownings and the place of possible predominance of rip currents.

IMAGING

Visual record searches were made using images available in Google Earth® and Google Maps software. These images were used to identify the sites of formation of the Rip Currents and to classify them as fixed or mobile. In the field, a drone was used to obtain aerial images of the possible places where the rip currents appeared. These images were always taken at low tide, the best period for viewing this oceanographic phenomenon.

AWARENESS AND INFORMATION WORK

After locating the Rip Currents, a "*Blitz*" of presentation and information was made with the visitors of the analyzed beaches, and pamphlets were distributed with definitions and location of the rip currents, the most frequent places of appearance of the currents and especially the way to get out of them in case any bather accidentally falls into one of these currents. At this stage, the project had the support of the firefighters and members of the Oceanography and Aquatic Microbiology laboratory, going to the most frequented beaches and with the highest reports of drowning and visualization of currents to carry out information work and demonstrate the places of danger of drowning

RESULTS AND DISCUSSION

A total of 4 visits were made to collect data at the BBMAR (Maritime Fire Battalion) headquarters. The occurrences were divided into drownings with death and without death, since the meaning of drowning is asphyxiation by the replacement of air by water or some liquid. The following table shows the drowning data collected during the survey (Table 1).

BEACHES	DROWNING WITH	DROWNING
Pebble	6	8
One-eyed	1	0
Ponta da Areia	3	0
Araçagy	9	4
Dry Mangrove	7	4
Guia Beach	1	0
Water Eye	1	3
Fox	1	0
Tajaçuaba	1	0
Guarapiranga	1	0

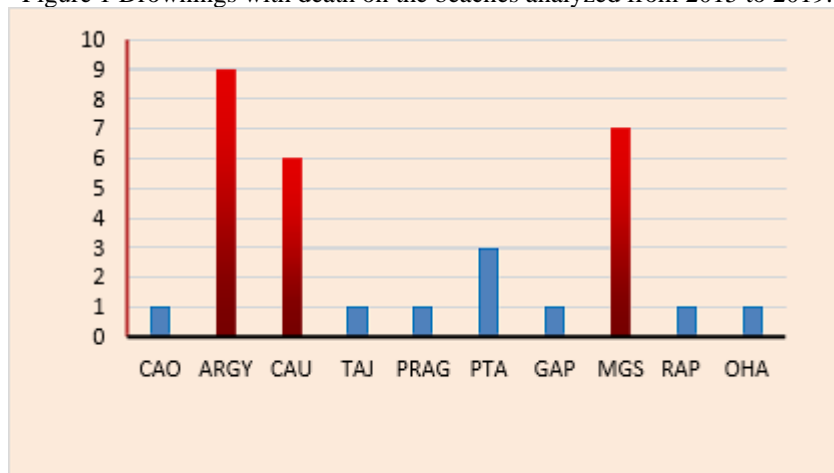
Source: Author

Analyzing the table, it is possible to verify that three (3) beaches have significant numbers of drowning cases: Mangue Seco, Calhau and Araçagy. These beaches are highly populated beaches on weekends due to their location, such as the pebble beach, which is one of the postcards of the capital.

Araçagy beach got its name from a fishing village that existed in the region; It was one of the first beaches on which bars and restaurants began to stabilize and it is believed that, because it is one of the few beaches that still allow cars to move freely on the strip of sand, it attracts more and more bathers, being one of the busiest beaches in the capital on weekends. Another factor that has been increasing this growing number of bathers on the beach is real estate speculation that has been growing in this region, attracting more and more people to live close to the beach (IBGE 2016).

Figure 1 shows several beaches that had only one case of drowning with a recorded death. Many of these beaches are far from areas with a high incidence of people, for example: PTAJ (Praia do Tajaçuaba); PRAG (Praia da Guia); PGAP (Guarapiranga Beach); PRAP (Praia da Raposa)

Figure 1 Drownings with death on the beaches analyzed from 2015 to 2019.



Araçagy beach is located at latitude 2° 27' 50"S, above the beaches of Olho d' Água, Calhau and Ponta da Areia. In the data collection, it was found that 1/3 of the victims who drowned on the beach of Araçagy were found on the beach of Olho d'Água, perhaps due to the presence of a rip current passing through these two beaches and carrying the bodies to the beach of Olho d'Água.

Despite the indications of the presence of rip currents, overflights were carried out with the drone to identify and punctuate the places where the currents appeared, the danger of these currents is extremely underestimated and their power is accentuated at low tide as it increases the surf zone generating greater pressure in the currents and consequently a higher speed

Rip currents or "*Rip currents*" as they are called around the world, produce a kind of funnel that is their great danger. According to Serrão Pedro (2019) and Berribili Marcos (2020), these funnels are very characteristic and are indicative that can be used to characterize the presence of rip currents in a given location, since these "funnels" are nothing more than places where there is no formation of waves that will end up forming this characteristic.

Mangue Seco beach, located in the municipality of Raposa, had a total of seven drownings with death. This beach, unlike those that have a high number of fatal drownings, was not so frequented between the years 2014 to 2016, but from 2017, it began to become popular for being an isolated beach in the metropolitan region and, for becoming known for being a clean beach, presenting beautiful landscapes, since it was not unsuitable for swimming.

With this gradual increase in bathers, the authorities began to observe an increase in the number of drownings with death and without death, which culminated in a considerable increase in cases. In addition, this beach is known for its fishing potential, where fishing families reside.

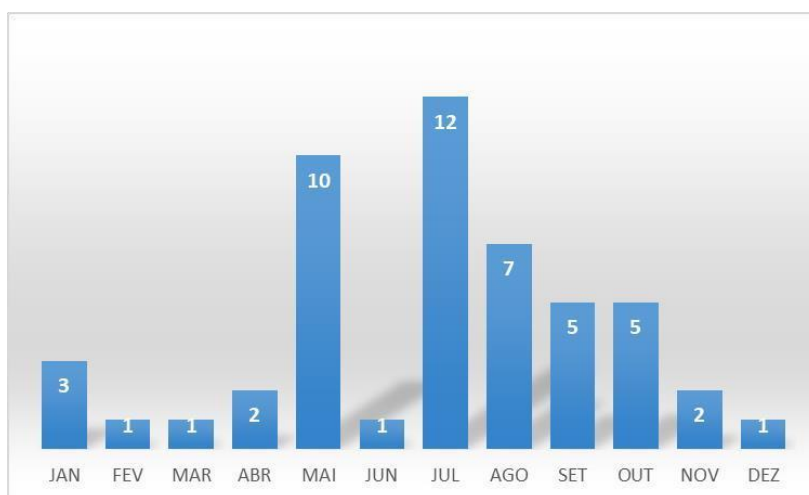
Mangue Seco beach, however, is also known to be a dangerous beach according to reports from the families of fishermen in that locality, as they claim that along the coast there are several "ditches". What fishermen call a ditch are actually natural erosive processes that occur due to the trajectory that the rip current makes once it stirs the bottom and ends up excavating the sand.

(SHORT, 2001; MACMAHAN et al., 2006).

Through documentary research of drowning records provided by BBMar, it was possible to conclude that most of the drownings recorded in the period from 2015 to 2019 were of fishermen who left to exercise their trade.

Regarding the months that had the most cases of drowning, we can analyze figure 2, which shows the graph with the number of drownings and the month in which they occurred; It is possible to observe that the month of July was the month with the highest number of drownings on the beaches evaluated, with a total of 12 drownings, it is worth mentioning that this total may be higher than we really know, since there is still an underreporting of cases.

Figure 2 - Total number of drownings recorded by BBMar in the months of January to December in the period from 2015 to 2019 by beach.



The month of July is the month of vacations in most Brazilian states, which corroborates the idea that there is a greater concentration of people in these leisure environments, thus increasing the possibility of drowning.

Many bathers end up venturing beyond the surf zone, through reports from the firefighters themselves, what happens is that many think they are good swimmers, but according to Criado Sudaú (2016), the rip currents can reach speeds higher than 2 m/s. The men's world swimming record (César Cielo/BRA/2009) for 100 m freestyle is 46.91 sec., which is equivalent to a speed of 2.13 m/s.

In the case of non-professional swimmers, good swimmers are those who maintain an average speed of 0.9 m/s for 12 minutes. This explains the risk that rip currents pose for all bathers, including those who are good swimmers.

The discrepancy between the estimates of deaths and drownings caused by rip currents is explained by the lack of reliability in this information (CRIADO SUDAU 2016). Another uncertainty regarding the number of rip-current related redemptions is due to the fact that 83% of survivors of these currents escape without the help of lifeguards, so they are not recorded in official statistics

(DROZDEWKI et al., 2012).

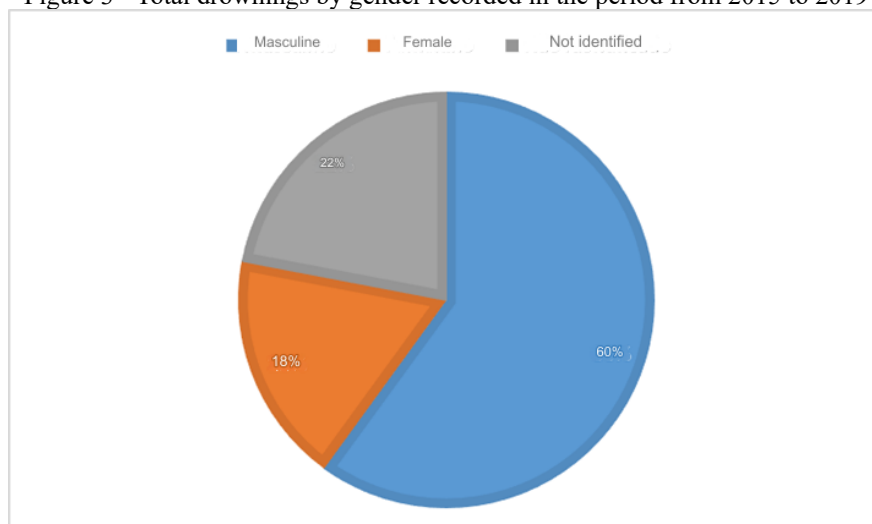
Brihgtton et al. (2013) after analyzing drownings and rescues in Australia between 2004-2011, indicated that rip currents were responsible for 57.4% of rescues. Although this is a considerably lower percentage than what has been used to date, there is no doubt that rip currents are the main causes of drownings and rescues on ocean beaches around the world.

In their work, Vanz and Fernandes (2014) showed that the main causes of drowning in Rio Grande do Sul and Santa Catarina are rip currents, which were responsible for 42% of cases, followed by falls from rocky shores with 10% of cases. People who have suffered sudden illness come next with 9%. Albuquerque et al. (2010) concluded that the main type of hazard associated with Praia do Futuro (CE) is rip currents, with 86% of the occurrences

The risk posed by rip currents to bathers is largely underestimated, which can have a negative effect when it comes to allocating funds to rescue services (BRIGTHON et al., 2013). Drownings with no fatalities are also reported and serve as a parameter to classify beaches as dangerous or not. Calhau beach is a place frequented daily by people doing leisure activities, unlike Araçagy, which is usually more frequented during weekends, which can cause a difference in the number of cases verified on these beaches.

The gender of drowning victims was also analyzed. Figure 3 shows the drowning relationship between men and women and the number of people who drown and does not record their age and gender, indicated in the figure as unidentified.

Figure 3 - Total drownings by gender recorded in the period from 2015 to 2019



The graph above shows that 60% (30) of the drownings that occur, whether with or without death, are male, and 18% (9) correspond to females. According to the firefighters, many of them enter the sea after having ingested some type of alcoholic beverage, causing them to quickly be pulled by a current without offering any effort.

The cases of drowning whose gender was not reported correspond to 22% (11) of the total. This information, which is often suppressed from the records drawn up during data collection, makes it difficult to draw a more concise profile of this variant, which would help to set up prevention strategies, in addition to assisting in searches and statistics.

Regarding the age of the people who drowned, the data show that 50% of the victims did not have their age reported, evidencing the failure to collect data on these types of accidents. The known age group with the highest rate of drownings is between 10 and 20 years old, according to firefighters, usually because they are young they end up not caring about the dangers that the sea has and ignore the calls of lifeguards and guidelines.

Deaths from drowning on the beaches of Santa Catarina and Rio Grande do Sul are concentrated in the age group under thirty years, 66% of the total. This percentage rises to 84% when deaths up to forty years of age are counted, and according to Albuquerque et al., (2010) the majority of victims in Praia do Futuro (CE) are male (59%), aged between 21 and 28 years, as we can relate along with the data above, where it shows that 60% of the incidents are linked to male victims (VANZ. A AND FERNADES, L.G, 2014).

After collecting data from the fire department and taking aerial images, information *blitzes* were carried out in the places with the highest incidences of drowning incidents and in the places, which coincided with the drowning sites, where rip currents were seen. These actions took place on weekends when the density of bathers in the strip of sand was higher, and the teams were divided along the beaches observed in this study, in order to cover a larger area and provide information to a greater number of people.

On the occasion, educational and preventive brochures were distributed and explanations were made on the subject. At this time, questionnaires were not applied, because the main objective of the action was to identify the degree of knowledge of bathers about the subject addressed, however, it was evidenced that it is necessary to carry out a more in-depth work in this sense, addressing more visual communication and information strategies

CONCLUSIONS

Despite the adversities and all the obstacles faced throughout the execution of the research, it was possible to locate with some drone overflights the place where the rip currents appeared along the main beaches of the state, identifying there the points that may represent a real risk of drowning and incidents for the visitors of these beaches.

Even in the face of easy visualization, these currents are little known by bathers, and are often underestimated as a danger for drowning, as stated by Mocellin (2006), 80% of the cases are due to rip currents, which increases their degree of danger and thus increases the cases of drowning caused



by these currents.

For these reasons, it was quite evident the need for the authorities to carry out more visual marketing actions, in addition to the need for a coastal management plan, in order to mark the points already known as dangerous for bathing in the coastal strip and invest more in the dissemination of information about rip currents, their dangers, how to avoid them and how to get out of them, because a simple action can save lives.

This work serves as a starting point for other researches to be carried out, since there is not a significant number of studies with this approach in Maranhão anymore, precisely on the large island of São Luís.



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The importance of public policies to mitigate mental illness among public servants

 <https://doi.org/10.56238/sevened2024.010-043>

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ABSTRACT

This study investigates the importance of public policies in mitigating mental illness in public servants, focusing on the implementation phase of the Public Policy Cycle. The research uses a systematic and quantitative approach, analyzing five articles that address different aspects of the topic. The analysis reveals a substantial understanding of the public policy cycle (76%), however, it highlights the need for further identification and detailing of implementation challenges (48%). Regarding the effectiveness of strategies (60%) and resource allocation (60%), a modest assessment was observed, suggesting the importance of a more detailed analysis. The active involvement of employees in the implementation presents an average of 60%, indicating moderate consideration. These results highlight the complexity and importance of effective public policies for the mental health of employees. The discussion between the authors highlights the need to improve the analysis of specific challenges and identify more effective strategies. In conclusion, the results provide valuable support for the development of more effective public policies to promote the mental health of public servants.

Keywords: Work Environment, Mental Health, Public Policies, Public Servants.

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INTRODUCTION

Mental illness refers to psychic conditions that affect an individual's emotional, cognitive, and social well-being, and can result in disorders such as anxiety, depression, and stress. In the context of public servants, factors such as professional pressure, high workload, and challenging work environments can significantly contribute to the increase in these conditions (Baasch *et al.*, 2017). Concern about mental health in the workplace dates back to the late 19th century, when the Industrial Revolution was in full force. During this period, working conditions in factories were extremely inhumane, characterized by long hours, unhealthy environments, and the absence of labor regulations. The excessive exploitation of workers has resulted in a range of health problems, including mental disorders arising from stress and poor conditions (Mattei *et al.*, 2018).

At the beginning of the twentieth century, with the growth of trade union movements and the consolidation of labor rights, the importance of considering not only the physical but also the psychological aspects of work began to be realized. The emergence of Industrial Psychology in the 1920s represented a significant milestone, as it introduced the idea that the psychological well-being of workers was critical to efficiency and productivity (Attridge, 2019). During the mid-twentieth century, particularly from the 1950s and 1960s, attention to mental health at work intensified with the growing recognition of disorders related to stress and work pressure. Studies, such as the one by Elton Mayo at the School of Human Relations, have highlighted the influence of social relationships in the workplace on workers' mental health. In the 1980s, in response to the increasing challenges of globalization and technology, there was a significant expansion of discussions about quality of life at work and mental health (Blustein, 2008). The World Health Organization (WHO) has formally recognized the impact of the workplace on mental health and has initiated campaigns to promote healthier work environments. The advent of the twenty-first century has brought with it a paradigm shift, with a renewed emphasis on the importance of work-life balance. Companies have begun to adopt well-being policies and stress prevention programs to deal with the increasingly complex demands of the contemporary world (Marten; Wilkerson, 2003).

Today, society recognizes that mental health at work is not just an individual issue, but a shared responsibility between employers, governments, and society at large. The implementation of specific public policies for the mental health of public servants thus becomes an integral part of this historical evolution, aiming to create healthier and more sustainable work environments for all. In the legal sphere, several countries have recognized the importance of promoting healthy work environments and have implemented specific legislation to deal with issues related to mental health at work (Leka; Nicholson, 2019).

In Brazil, for example, the Federal Constitution guarantees the right to health, and Law No. 8,112/1990 provides for the legal regime of civil servants, making room for the implementation of policies aimed at protecting the mental health of these professionals (Bontempo, 2023).

In view of the growing recognition of the challenges faced by public servants in relation to mental health, there is a demand for specific public policies. These policies seek not only to diagnose and treat pre-existing conditions, but also to prevent mental illness through the promotion of healthier work environments and ongoing psychosocial support. The Public Policy Cycle is a model that describes the process by which policies are conceived, developed, implemented, evaluated, and, if necessary, adjusted. Composed of several stages, such as formulation, legitimation, implementation, and evaluation, this cycle offers a broad framework for the development and continuous improvement of public policies (Nardodkar *et al.*, 2016).

The formulation of public policies usually occurs as a response to a demand identified in society. In the case of the mental health of public servants, this stage may involve the analysis of epidemiological data, consultation with specialists, and the active participation of civil servants and their representatives. Legitimacy comprises the official approval of the policy, whether through legislative, regulatory or other institutional mechanisms. This step is indispensable to ensure that the policy has legal backing and is recognized as a priority at the governmental level. However, it is in implementation that public policies become tangible. This phase is central to the study in question, as it is at this moment that the actions are put into practice. The effectiveness of strategies to mitigate mental illness in public servants is directly linked to the quality of implementation. This includes the proper allocation of financial and human resources, the training of professionals to deal with mental health issues, and the creation of mechanisms that facilitate employees' access to support and treatment programs. The evaluation is a subsequent stage, where the results and impacts of the implemented policies are analyzed. In the case of the mental health of public servants, this assessment may cover indicators such as the reduction of cases of mental illness, the increase in job satisfaction and the improvement of the work environment. Based on these analyses, adjustments can be proposed to optimize the effectiveness of policies. The review phase closes the loop, allowing for the continuous adaptation of policies according to changing social, economic, and health conditions. This flexibility is significant in addressing emerging challenges and ensuring that policies remain aligned with the needs of public servants over time (Knill; Tosun, 2020).

The work environment for public servants is often associated with stressful and challenging factors, which can lead to mental illness. In view of this scenario, there is a need to investigate how public policies can fulfill an attribution in mitigating these problems, with emphasis on the implementation stage of the Public Policy Cycle. The central issue is to understand how the policies implemented can effectively contribute to the promotion of the mental health of public servants.

In view of this assumption, the central question of this research arises: In view of the evident prevalence of mental illness among public servants, how can public policies, with a special focus on the implementation phase, be designed and executed efficiently to mitigate the adverse impacts on the mental health of these professionals?

Thus, the objective of this research is to investigate the importance of public policies in mitigating mental illness in public servants, focusing on the implementation phase of the Public Policy Cycle, aiming to provide subsidies for the formulation and execution of effective strategies in this context.

The relevance of this study lies in the understanding of the specific dynamics of the implementation of public policies aimed at the mental health of public servants. By identifying challenges and opportunities in this process, it will be possible to develop practical recommendations for managers and policymakers, contributing to healthier work environments and, consequently, to increasing the quality of public service.

Based on the assumption that the effective implementation of public policies aimed at the mental health of public servants can have a positive impact on the work environment, we believe that well-designed and executed strategies in this phase of the Public Policy Cycle can significantly reduce the rates of mental illness, promoting a healthier and more productive environment for civil servants.

LITERATURE REVIEW

The implementation of preventive strategies for mental illness among public servants represents a critical dimension in human resources management, considering the direct impact on the efficiency and well-being of these professionals (Lamontagne *et al.*, 2014).

The *Job Demand-Resource Model* emerges as a central framework. He postulates that the balance between the demands inherent to work functions and the available resources directly influences the mental health of workers. Therefore, evaluating the effectiveness of well-being and mental health programs for public servants requires careful consideration of how these programs manage the specific demands of the work environment and provide the resources necessary to promote mental health (Lu *et al.*, 2021). In addition, the application of the Ecological Model of Mental Health at Work enriches understanding by recognizing the complex interplay between individual, organizational, and social factors. This broader perspective contributes to a global analysis of the effectiveness of the programs, taking into account not only the individual aspects, but also the organizational and social dynamics that permeate the context of public service (Sallis *et al.*, 2015).

In terms of behavioral and psychological theories, Bandura's Self-Efficacy Theory offers interesting insights, as the belief in one's own ability to face challenges directly impacts the behavior of servers. Thus, in the evaluation of the effectiveness of programs, the promotion of self-efficacy emerges as a primary indicator, indicating the potential positive impact on the levels of mental well-being of public servants (Maddux, 2016). Social Support Theory also plays a significant role in highlighting the importance of social relationships in the context of work. Programs that strengthen support networks and foster a supportive work environment are analyzed from this perspective, considering the positive impact on the mental health of public servants (Harandi *et al.*, 2017). When exploring risk factors in the workplace, the Occupational Stress Theory is instrumental. The critical analysis of these factors, such as professional pressure, work overload, and challenging environments, provides decisive clarifications for the identification and mitigation of risks associated with mental illness in public servants. At the same time, strategies to promote resilience, inspired by the Occupational Stress Theory, are fundamental. Coping skills training, *mindfulness* programs, and psychosocial support emerge as key elements in mitigating the negative effects of these risk factors (Dawson *et al.*, 2016).

Analysing the impact of legislation on the mental health of public servants is a complex and invaluable task, as shaping healthy and sustainable work environments involves not only legal aspects but also social implications. Understanding this intersection between laws and mental well-being is critical to critically evaluating the effectiveness of existing policies and norms and proposing necessary improvements. In the Brazilian context, the Federal Constitution and specific legislation, such as Law No. 8,112/1990, establish the legal framework for the rights and duties of civil servants. Critical evaluation of these laws, particularly as they relate to mental health in the workplace, is essential to understand how civil servants' rights are guaranteed and what gaps or challenges still persist. The Federal Constitution guarantees the right to health, and, in this sense, the legislation should be examined as to its effectiveness in promoting a work environment that contributes positively to the mental health of civil servants. The legal analysis of these provisions seeks to identify whether current laws provide a solid basis for the implementation of effective mental health prevention and promotion policies (Bontempo, 2023).

The legal analysis also extends to the practical and operational implications of laws in the implementation of specific policies for the mental health of public servants. Investigating practical cases in which legislation has influenced the implementation of such policies is essential to understand the real dynamics and to identify challenges and obstacles that may arise in the application of the standards. The discussion of legal challenges and strategies to overcome them offers remarkable interpretations for policymakers, managers, and human resource professionals. The interaction between current legislation and day-to-day practices in public institutions requires careful

evaluation to ensure that mental health policies are implemented effectively and that the rights of public servants are adequately protected. In addition to the legal analysis, it is essential to consider the social implications of the legislation on the mental health of civil servants. Legislation does not operate in a vacuum, and the way it is perceived and implemented by society can influence its effectiveness. This involves assessing how laws are understood by civil servants, how they are communicated, and how they impact the organizational culture in relation to mental health. While social analysis is inalienable to identify possible gaps between the legislation and the reality experienced by civil servants. Understanding the perceptions and experiences of public officials in relation to legal mental health policies offers a relevant perspective to adjust and improve the effectiveness of these measures (Bontempo, 2023).

The evaluation of the implementation of public mental health policies is a complex process that involves the critical analysis of the effectiveness of the strategies adopted, identification of challenges faced, and recognition of opportunities for continuous improvement. This assessment is critical to ensure that policies achieve their objectives while effectively promoting the mental health and well-being of public servants (Wainberg *et al.*, 2017).

The critical analysis of the implementation of mental health policies in public servants should begin by evaluating the effectiveness of the strategies adopted. This includes examining the coherence between the objectives set out in the policies and the results achieved in practice. Tangible metrics, such as the reduction in cases of mental illness, the increase in job satisfaction, and the improvement of the work environment, are key indicators to consider. The effectiveness of the strategies can be analyzed by comparing data before and after the implementation of the policies, as well as by comparing them with benchmarks and best practices of other organizations. The quantitative and qualitative evaluation of the results provides a comprehensive view of the effectiveness of mental health policies. The quality of monitoring and evaluation plays a role in the effectiveness of mental health policies. Examining the methods used to monitor and evaluate the implementation of policies is essential to ensure that the data collected is relevant, accurate, and useful. This involves clearly defining performance indicators, collecting data regularly, and systematically analyzing the results. Monitoring and evaluation mechanisms should be sensitive to the nuances of the organizational context and the specific needs of public servants. The implementation of continuous feedback systems, involving the active participation of civil servants in the evaluation, contributes to a more complete and accurate understanding of the impact of policies (Zuiderwijk; Janssen, 2014).

Identifying and analyzing the challenges faced in the implementation of mental health policies is essential to propose solutions and improvements. Common challenges may include organizational resistance, lack of adequate resources, cultural barriers, and stigma associated with

mental health. The in-depth analysis of these challenges allows the development of more effective strategies adapted to the reality of the public service. Opportunities for improvement arise from identifying good practices, lessons learned, and areas that can be strengthened. Analysis of experiences, both inside and outside the organization, provides analysis to improve the implementation of mental health policies. The search for innovations, collaborations, and the incorporation of evidence-based approaches contribute to the continuous improvement of policies. The review cycle closes the analysis, allowing for the continuous adaptation of policies in response to changing social, economic, and health conditions. This flexibility is significant in addressing emerging challenges and ensuring that policies remain aligned with the needs of public servants over time (Zhou *et al.* 2019).

METHODOLOGY

The methodology used in this research adopts the systematic review of the literature, aiming to identify, analyze and synthesize the available evidence on the central theme: "The Importance of Public Policies for the Mitigation of Mental Illness in Public Servants, with emphasis on the Implementation Stage of the Public Policy Cycle."

The research question that guides this systematic review is formulated as follows: "How have public policies, especially during the implementation stage, been addressed in the literature in the context of mitigating mental illness in public servants?"

The keywords selected for the search encompass terms pertinent to the theme, including "public policies", "mental illness", "public servants" and "implementation". The use of Boolean operators AND and OR allowed a comprehensive search, addressing several perspectives related to the public policy cycle and the mental health of public servants, forming the following combinations: (Public Policies) AND (Mental Health) AND (Government Employees) OR (Civil Servants) OR (Public Servants).

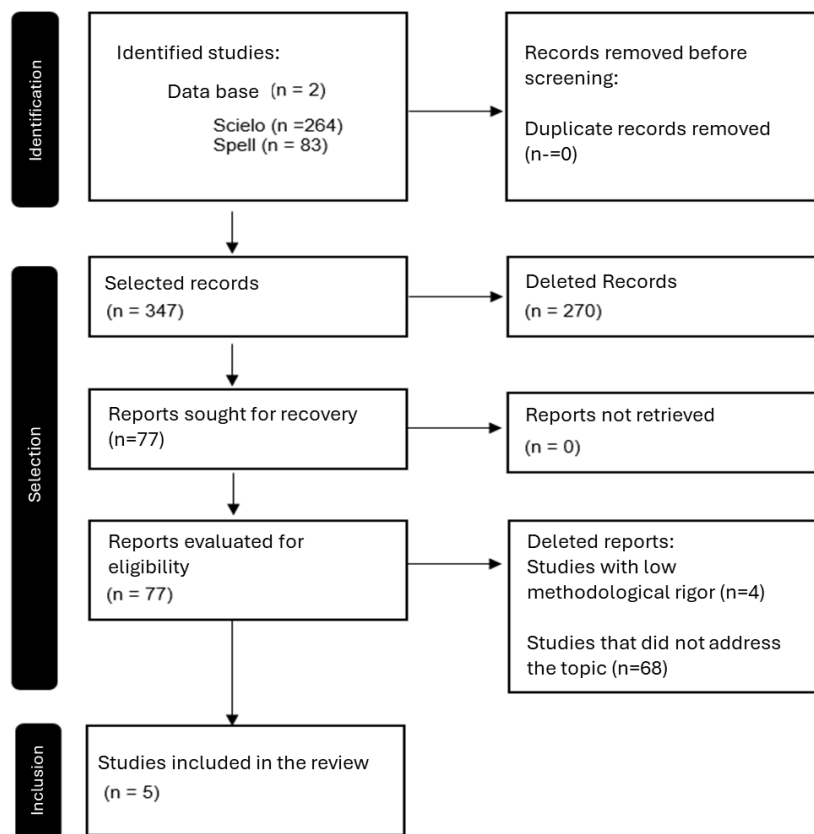
The databases chosen for this systematic review are SCIELO and SPELL. The selection of these databases is justified by their multidisciplinary scope and the ability to provide a generalized view of academic and practical discussions on the proposed theme.

The inclusion criteria were rigorously defined, covering direct thematic relevance, scientific quality (with the inclusion of peer-reviewed studies), and a publication period in the last five years (2019 to 2023) to ensure the timeliness of the information. For research in Scielo, documents from the Brazilian collection were considered, of the citable article type, in the Portuguese language and in the thematic areas of human sciences and applied social sciences. For research in Spell, we considered documents of the article type, in English and Portuguese. Exclusion criteria were

established to avoid studies that were irrelevant to the proposed scope, had low scientific rigor, and were not available in Portuguese or English.

The conduct of this systematic review will follow the guide of the PRISMA diagram (*Preferred Reporting Items for Systematic Reviews and Meta-Analyses*), providing transparency and replicability to the data collection process. This systematic method will allow a clear visualization of the flow of information, from the initial search to the final selection of the articles included in the review.

Figure 1: PRISMA diagram prepared for research



Source: The Authors (2024)

After data collection, a corpus of studies will be defined, consisting of articles that meet the established inclusion criteria. This final selection will represent the analytical basis for the conclusions of this systematic review, providing relevant information on the implementation of public policies to mitigate mental illness in public servants.

During the analysis of the selected articles, a structured *checklist* (Table 1) will be implemented, developed as a systematic tool to critically evaluate and analyze the included studies.

Table 1. Quantitative Evaluation of the Implementation of Public Policies for the Mitigation of Mental Illness in Public Servants

No.	Criterion Analyzed	Rating Scale (0 to 3)
1	Incorporation of the Public Policy Cycle: To what extent does the study consider the Public Policy Cycle, especially the Implementation phase, as a theoretical framework in the approach to mental illness in public servants?	0 (Does not consider) 1 (Partially considers) 2 (Consider moderately) 3 (Consider Completely)
2	Identification and Detailing of Implementation Challenges: How detailed is the analysis of the specific challenges encountered during the implementation of public mental health policies in public servants?	0 (Identifies no challenges) 1 (Partially identifies) 2 (Identify moderately) 3 (Fully identify)
3	Analysis of the Effectiveness of the Strategies Implemented: To what extent does the study perform a comprehensive analysis of the effectiveness of the strategies implemented during the implementation phase, considering measurable indicators related to mental illness?	0 (Does not perform comprehensive analysis) 1 (Partially perform) 2 (Perform moderately) 3 (Fully performs)
4	Detailed Consideration of Resource Allocation: How in-depth does the study discuss the appropriate allocation of financial and human resources during the implementation of public policies, with a focus on mitigating mental illness in public servants?	0 (Not discussing) 1 (Partially discusses) 2 (Discuss moderately) 3 (Discusses completely)
5	Active Involvement of Civil Servants in Implementation: To what extent does the study highlight the active involvement of public servants in the process of implementing policies, considering their experiences and needs related to mental illness?	0 (Does not highlight) 1 (Partially Stands) 2 (Moderately highlighted) 3 (Fully Stand Out)

Source: the Authors (2024)

This *checklist* It addresses specific topics related to the implementation of public policies, from the identification of challenges to the analysis of strategies adopted to mitigate mental illness among public servants. Each point of the *checklist* It represents a focal area, ensuring a detailed and targeted focus during the review of articles.

RESULTS AND DISCUSSION

After data collection, it was possible to compose the corpus of the study, and the conclusions of five articles related to the theme were synthesized, according to their objectives and conclusions.

Table 2. Summary of the studies collected on the research "The importance of public policies for the mitigation of mental illness in public servants"

No.	Database	Author/Year	Title	Objective	Conclusion
1	Spell	Kobernovicz, and Stefano (2020)	Engagement at Work: An Analysis of the Engagement of State Public Servants of a Higher Education Institution	To analyze the engagement in the work of public servants of a Higher Education Institution in the state of Paraná.	High engagement in the work of the employees, not only financial, but covering several organizational aspects.
2	Spell	Montezano, et al. (2019)	Perception of Public Servants Regarding the Implementation of Risk Management in a Secretariat of the Federal Government of Brazil	Describe the perception of civil servants about the implementation of risk management in a federal public organization, including difficulties and possible gains.	Perception of more gains than difficulties in the adoption of risk management, with emphasis on process improvement, preventive action, increased engagement and institutional strengthening. Identification of four difficulties to be faced.
3	Spell	Andrade et al. (2019)	Dimensions of Quality of Life at Work and Organizational Justice: A Study with Municipal Public Servants	OBJECTIVE: To analyze the perception of municipal public service employees about Quality of Life at Work (QWL) and Organizational Justice.	Contribution to the proposition of the BPSO-SP instrument for the diagnosis of QWL in the municipal public area. Worse satisfaction rates in social aspects. BPSO-SP is an adaptation and validation of the BPSO-99 model.
4	Spell	Ribeiro and Marra (2021)	Relations between the Meanings of Work and Job Satisfaction: An Analysis with a Category of Public Servants	To analyze whether the meanings of work influence the satisfaction of federal public servants.	Identification of moderate forces of association between the meanings of work and job satisfaction. Genuine effect of the senses of work on satisfaction. Aspects such as ethics, autonomy, relationships, and learning positively influence the level of satisfaction.
5	Spell	Camões et al. (2023)	The cycles of engagement in the work of federal public servants	Describe the work engagement cycles of federal public servants based on their professional life histories, identifying relevant demands and resources of the occupational environment.	Identification of positive and negative cycles of engagement, related to opportunities, appreciation, dysfunctional productivity and administrative discontinuity. Proposal of the concept of "coping cycle" as a subsidy for policies aimed at disengaged civil servants.

Source: The Authors (2024)

The quantitative analysis provided an in-depth view of the bias adopted by the articles in relation to public policies for the mitigation of mental illness in public servants. The average of 76% in the incorporation of the public policy cycle reflects a substantial understanding on the part of the authors about this fundamental process. This indicates that, in general, the articles recognize the importance of following the phases of the public policy cycle, with special emphasis on implementation.

However, when we look at an average of 48% in identifying and detailing implementation challenges, an area of opportunity emerges. This score suggests that there is room for improvement in the analysis of the specific barriers faced by servers during policy implementation. Detailing these challenges is imperative to provide findings and guide more effective actions in mental health promotion.

Therefore, although there is a significant understanding of the public policy cycle, the gap in the detailed identification of challenges highlights the importance of deepening the analysis for a more effective implementation of policies to mitigate mental illness. This improvement can lead to more precise and adaptable strategies, aligned to the specific needs of public servants and thus contributing to the effectiveness of proposed policies.

Regarding the analysis of the effectiveness of the strategies implemented, the average of 60% reveals a moderate evaluation in this aspect. This score indicates that the articles address, to a certain extent, the effectiveness of the strategies proposed for the mitigation of mental illness. However, she underscores the need for a more detailed analysis to identify which strategies have proven most effective in specific public service settings. A deeper understanding of this prism is essential to guide the implementation of more targeted and effective interventions, considering the particularities of the organizational context and the demands of civil servants.

With regard to the detailed consideration of resource allocation, the average was also 60%, indicating a moderate conception in this irreplaceable aspect. This score reflects that the articles recognize the importance of adequate allocation of financial and human resources during the implementation of mental health policies. However, it should be noted that a more in-depth analysis could provide more specific understandings on how to optimize the allocation of these resources, considering the different demands and challenges encountered by servers. A more efficient management of resources can enhance the results of implemented policies, contributing to the promotion of mental health in the public service.

As for the active involvement of public servants in the implementation of policies, the average of 60% suggests a moderate consideration at this point. This score indicates that the articles recognize, to a certain extent, the importance of the active participation of civil servants in the process of implementing mental health policies. Highlighting the central role of these professionals



in this context is substantial, as they are directly involved in organizational dynamics and are fundamental to the success and effectiveness of actions aimed at promoting mental health.

Reinforcing the emphasis on the active participation of civil servants can strengthen policies, since these professionals have practical knowledge of the demands and challenges faced in the work environment. Active involvement not only contributes to the more accurate identification of critical areas in need of intervention, but also fosters a participatory and collaborative work environment. The active inclusion of civil servants in the implementation process not only promotes the acceptance of policies, but also enables adaptations that are more adjusted to the reality of the public service.

Thus, even with a moderate consideration, the importance of emphasizing and fostering the active involvement of civil servants in the implementation of mental health policies is emphasized. This more participatory tactic can maximize the effectiveness of interventions, ensuring that policies are more aligned with the real needs of civil servants and, consequently, more effective in mitigating mental illness in the context of public service.

Considering these results, there is an opportunity for improvement in the scope of public policies. Reinforcing the identification of specific challenges, deepening the analysis of the effectiveness of strategies, and considering in more detail the allocation of resources are important aspects that can strengthen the implementation of policies aimed at the mental health of public servants. The active involvement of these professionals deserves to be highlighted and should be considered as a central point in public policy strategies.

FINAL THOUGHTS

This research revealed that the implementation of public policies to mitigate mental illness in public servants requires an in-depth understanding of the Public Policy Cycle, especially in the implementation phase. Although the studies demonstrate a solid theoretical apprehension of this cycle, a critical gap was identified in the detailed analysis of the specific challenges faced during implementation, indicating the need for further study in this aspect. The strategies implemented and the allocation of resources were evaluated moderately, pointing to the importance of a more detailed analysis to identify effective approaches.

The active involvement of civil servants also demands prominence, suggesting that their active participation is key to the success of these policies. In light of this, the conclusion highlights the complexity in the implementation of these policies, emphasizing the importance of personalized and context-sensitive approaches in order to build healthy and sustainable work environments throughout the career of public servants.



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APPENDIX A

Table 2: Application of the *Checklist* in selected articles

number	Criterion Analyzed	Rating Scale (0 to 3)
Article 1		
1	Incorporation of the Public Policy Cycle	3 (Consider Completely)
2	Identification and Detailing of Implementation Challenges	2 (Identify moderately)
3	Analysis of the Effectiveness of the Strategies Implemented	2 (Perform moderately)
4	Detailed Consideration of Resource Allocation	1 (Partially discusses)
5	Active Involvement of Servers in Implementation	3 (Fully Stand Out)
No.	Criterion Analyzed	Rating Scale (0 to 3)
Article 2		
1	Incorporation of the Public Policy Cycle	2 (Consider moderately)
2	Identification and Detailing of Implementation Challenges	3 (Fully identify)
3	Analysis of the Effectiveness of the Strategies Implemented	2 (Perform moderately)
4	Detailed Consideration of Resource Allocation	2 (Discuss moderately)
5	Active Involvement of Servers in Implementation	1 (Partially Stands)
No.	Criterion Analyzed	Rating Scale (0 to 3)
Article 3		
1	Incorporation of the Public Policy Cycle	2 (Consider moderately)
2	Identification and Detailing of Implementation Challenges	2 (Identify moderately)
3	Analysis of the Effectiveness of the Strategies Implemented	1 (Partially perform)
4	Detailed Consideration of Resource Allocation	1 (Partially discusses)
5	Active Involvement of Servers in Implementation	2 (Moderately highlighted)
No.	Criterion Analyzed	Rating Scale (0 to 3)
Article 4		
1	Incorporation of the Public Policy Cycle	1 (Partially considers)
2	Identification and Detailing of Implementation Challenges	2 (Identify moderately)
3	Analysis of the Effectiveness of the Strategies Implemented	3 (Fully performs)
4	Detailed Consideration of Resource Allocation	2 (Discuss moderately)
5	Active Involvement of Servers in Implementation	3 (Fully Stand Out)
No.	Criterion Analyzed	Rating Scale (0 to 3)
Article 5		
1	Incorporation of the Public Policy Cycle	3 (Consider Completely)
2	Identification and Detailing of Implementation Challenges	1 (Partially identifies)
3	Analysis of the Effectiveness of the Strategies Implemented	2 (Perform moderately)
4	Detailed Consideration of Resource Allocation	1 (Partially discusses)
5	Active Involvement of Servers in Implementation	2 (Moderately highlighted)

Source: The Authors (2024)

DNA extraction from strawberry (*Fragaria ananassa*) as a practical tool for teaching genetic content

 <https://doi.org/10.56238/sevned2024.010-044>

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ABSTRACT

Genetics is an important curricular component of the Biological Sciences discipline and a great study tool for scientists. The aim of this study was to verify the existence of DNA molecules in strawberry. To carry out the practice, DNA extraction was performed from the strawberry. A tangle of white strands can be seen between the solution and the alcohol, forming a 3-phase mixture. It can be concluded that DNA extraction from the strawberry is an easy practice to perform.

Keywords: Genetics, Plants, Botany.

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INTRODUCTION

The origin of experimental classes dates back more than a hundred years, influenced by the work developed in universities, with the objective of improving the learning of scientific content, since students learned the theory, but did not know how to apply the learned content in practice. Thus, learning does not take place only by being a listener in a classroom and written in the notebook, but by a theoretical-practical relationship, not only for comparison purposes, but also to arouse students' interest, generate discussions, and improve their performance in class (ALMEIDA, MANNARINO, 2021).

For the teaching of Genetics content as part of the Biology discipline in high school, there is a greater difficulty in reconciling practical classes, since it often requires advanced and expensive equipment.

DNA (deoxyribonucleic acid), whose structure model was published by the American biologist James Dewey Watson and the English physicist Francis Harry C. Crick (1952), is formed by two parallel chains of nucleotides joined in sequence, forming a double helix. Each nucleotide is formed by the combination of three components: phosphate, nitrogenous base (puric: adenine and guanine; pyrimidics: thymine and cytosine) and the sugar deoxyribose (FRANÇA, AUGUSTO, 2021).

Fragaria ananassa (strawberry) is of European origin, it is soft and easy to homogenize, it also produces pectinases and cellulases, which are enzymes that degrade pectin and cellulose (respectively), present in the cell walls of plant cells.

Nowadays, there is a lot of praise for DNA extraction in various researches, being of paramount importance for biotechnology, medical and forensic areas. In view of this, it is important to inform and bring to the forefront of society, with this study, the relevance of DNA extraction, the way it is present within the daily life of the population and to what extent it influences and reflects on the life of each individual, in addition to being essential in the scope of citizens in the globalized society, in which science and technology play an increasingly important role.

In view of the above, the present study aimed to verify the existence of DNA molecules in strawberries (*Fragaria ananassa*) through visualization with the naked eye and to understand and describe the physical and chemical transformations that occur at the end of the experiment, in addition to evaluating the feasibility of performing this practice in the school context.

THEORETICAL FRAMEWORK

GENETICS

Since the dawn of humanity, there have been questions about the similarities between puppies and their parents; diseases present in the parents and that have appeared in the children; the



emergence of plants through seeds, and so on. As an explanation, the theory of mixture was presented, since it responds to the combination of factors to form a single compound (GRIFFITHS, 2019).

However, this theory was gradually becoming scarce to answer all the questions. It was then that Gregor Mendel, an Austrian monk, began his experiments in the cross-pollination of pea seeds, where he identified that the factors (today, known as genes) do not mix, but rather, are passed on intact from generation to generation. (GRIFFITHS, 2019).

In the experiment, Mendel proposed that each pea had two copies of the factor that controls the color of the flowers, which would be somatic cells. But when it enters the reproductive mode, forming gametes (eggs and sperm), only one copy of the gene enters these reproductive cells. At the end, there is a new individual formed, which has two copies of the flower color gene in each cell (GRIFFITHS, 2019).

In addition, Mendel identified two gene variants, the recessive and dominant alleles, which are responsible for the genetic combinations and possibilities of individuals. Even with an incredible discovery, Mendel's work of 1865 was forgotten for a long time, and it was only in 1900 that the British biologist William Bateson came into contact with the copy of the article, studied it and was enchanted by the discovery of the deceased. In 1905, he introduced the term genetics, which means the study of genes, as well as providing an advance for the subject, which to this day remains with incessant discoveries with the help of increasingly advanced technologies (GRIFFITHS, 2019).

PRACTICAL METHODS FOR TEACHING GENETICS

Genetics is the field of Biology characterized by the study of heredity, as well as the structure and functions of genes, that is, it studies the genetic material, its components and the way in which the transmission of hereditary characteristics occurs over generations. Thus, it elucidates how the characteristics present in each organism are transmitted to its successors (GRIFFITHS, 2019).

Genetics is a subject that involves mathematics, text interpretation, logic, among other areas, that is, it is a transdisciplinary content. As a result, many students see Genetics as something difficult, especially in the first experiences, and also in many cases point out difficulties in the process of learning such content. In addition, the themes within Genetics address many representations that seek to characterize the processes that take place in nature. These representations can cause a distancing from reality, affecting the appropriation of the content by students (BORGES *et al.*, 2020).

Several studies have been carried out with the purpose of analyzing what knowledge and perception young people have about genetics at the end of the years of compulsory schooling and how they perceive the issues that have been generated by the application of new genetic technologies

in different contexts. However, the results achieved are worrisome, as they show that, many times, not even the basic notions of genetics are understood (GAMBIN; SCHEID; LEITE, 2021).

Similarly, studies that seek to identify the adversities encountered by teachers, both at the beginning of their teaching work, during initial training, and during their professional careers, present as problematic the issues related to the teaching of genetics and its technologies (OLIVEIRA NETO *et al.*, 2018).

These inquiries lead to a reflection on the development of the training of Biological Sciences teachers. Probably, one of the obstacles in the teaching-learning process is the positivist view of science, still very present, which imprints a technical rationality that makes the teacher responsible for the possession of discovered truths, which leads to their students as ready, unquestionable (OLIVEIRA NETO *et al.*, 2018).

The History of Science, framed in scientific education, may provide an opportunity to guide students in the appropriation of a conception of science as a human exercise, built on the interaction between the knowing subject (capable of knowing), the object to know and the "state of knowledge". In this way, the teacher can act as a mediator between historians of science and students by using History and Science as a tactic to problematize conceptions and content of science (TAKAHASHI, 2018).

Ludwik Fleck's conception becomes proficient in the interpretation of reports on the evolution of scientific knowledge that culminated in the proposition, for example, of the double helix model for the DNA molecule and its acceptance by the scientific community (TAKAHASHI, 2018).

In this sequence, Fleck, based on considerations about the understandings and practices established by medical science, introduces the concepts of style of thought and collective of thought, stating that the act of knowing is an activity that is unified to the social and cultural conditions of the subject belonging to a collective of thought. This collective can be understood as a community of individuals who share practices, conceptions, traditions, and guidelines. It is worth noting that each collective of thought has a unique way of seeing the object of knowledge and relating to it, determined by the style of thought it has (TAKAHASHI, 2018).

That said, the inclusion of the History of Science, that is, the history of the construction of knowledge, can be a facilitator of scientific education, when the assumption is the dynamic aspect of scientific knowledge. When it is used in the teaching of genetics, it should lead the student to conceive that science is a socio-historical-cultural construction. From another perspective, it can also help in the understanding of the fundamental concepts of the discipline. (TAKAHASHI, 2018).

In view of this, the recommendation that the History of Science should be incorporated into teacher training courses contributes to a new way of conceiving science as dynamic knowledge, produced by human beings with limitations, using devices that are not always so perfect, because "a

scientific fact cannot be understood outside the context of the history of thought and results from a determined style of thought" (RODRIGUES *et al.*, 2020).

By allowing the exploration of a more adequate view of the production and evolution of scientific knowledge, the History of Science will be able to bring important contributions to the area of scientific education, especially in the area of genetics, which is in a rapid process of knowledge renewal. It is also worth emphasizing that, most of the time, the contents are presented without connection to the students' daily lives in a fragmented and decontextualized way, compromising the quality and effectiveness of the teaching and learning process (SIMÃO, 2018).

Following the example of the lack of understanding of the relationship that exists between the gene (as a fragment of DNA with a specific location on the chromosome) and the transmission of the genetic information that this gene transmits (which determines the precise information of the gene product), the effective understanding of topics related to inheritance within the teaching of Genetics is inaccessible (GAMBIN; SCHEID; LEITE, 2021).

Consequently, it is difficult for the student to understand the concept of alleles and their direct connection in the transmission of characteristics between individuals, leading students to disconnected ideas and the understanding of the whole process would be compromised. Therefore, for the understanding of the general concepts of genetics, it is essential to have a prior and concrete understanding of what a gene is; where it is located (physical location – tissue – organ – cell – DNA) and the expression of the information contained in these genes (GAMBIN; SCHEID; LEITE, 2021).

Thus, the use of didactic models as a methodological resource for the teaching of Genetics in the initial training of teachers becomes of paramount importance, as they enable that from the instrumentalization of knowledge about the methodology and its possibilities, the graduates can make use of these resources in their practice.

DNA: STRUCTURE AND REPLICATION

The structure of DNA consists of Watson and Crick's model, which postulates that DNA is composed of an antiparallel double helix, nucleotides, and four nitrogenous bases: adenine, cytosine, guanine, and thymine. This structure suggested that the nucleotide sequences present in the two strands of DNA were responsible for the standardized formation of an organism and the idea of complementarity showed that the sequence of one strand determines how the sequence of the other will be. Thus, the genetic data present in DNA can pass from the mother cell to the daughter cell, so that each strand will serve as a template for the replication of a new double-stranded DNA (GRIFFITHS *et al.*, 2019).

The nitrogenous bases present in DNA (adenine, thymine, cytosine and guanine) are composed of puric and pyrimidic bases, so adenine and guanine chemically derive from the purine



substance and their structures form two aromatic rings. Whereas thymine and cytosine originate from pyrimidine and make up only one aromatic ring. Thus, it was observed that DNA was composed of bonds between nitrogenous base, deoxyribose and phosphate. These bonds are made from the so-called hydrogen bonds and the phosphodiester bond, and from there, the nucleotides bond with each other until they form DNA (MENCK, 2017).

Based on these precepts, rules were established that were related to the composition of the DNA double helix. The first provided that the total amount of purine bases would be equal to the total amount of pyrimidic bases. The second showed that the amount of adenine and thymine would always be equal, since one was bound to the other, and the amount of cytosine and guanine would also be equal, because they also did, although it would not be necessary for the amount of adenine + thymine to be equal to the amount of cytosine + guanine, and vice versa (MENCK, 2017).

Regarding DNA replication, the accepted hypothesis is the semiconservative model, which was also proposed by Watson and Crick. This replication model conceptualizes that the DNA double helix is unwound and each strand serves as a template for the assembly of new complementary bases that follow the rule of binding between adenine and thymine, guanine and cytosine. This conception of semi-conservative replication was due to the fact that the new double helix is formed from a conserved strand of the previous double helix, so in each replication, one strand will be conserved and a new one will be generated from it (GRIFFTHS *et al.*, 2019).

DNA replication in eukaryotes happens with the help of some enzymes, so the one responsible for recognizing the origins of replication and assisting in the binding of the helicase is called ORC (origin recognition complex), after which comes the helicase, responsible for breaking the hydrogen bonds of the DNA. After unwinding the double helix, the single strand of DNA is stabilized by replication factor A, then topoisomerase removes the kinks that arise on the strand. After that, the synthesis of RNA primers begins, which are made by the DNA polymerase delta-primase complex and thus inserts the DNA polymerase that elongates the DNA. The next step is the removal of the RNA primers and in their place the DNA bases are added, this process is carried out by the enzyme FEN1, while DNA polymerase replaces the RNA primers with DNA. Finally, DNA ligase I binds Okazaki fragments, which are fragments of spaces formed after the removal of primers (GRIFFTHS *et al.*, 2019).

EXTRACTION OF DNA FROM PLANTS

Much has been used of proposals for practical activities to facilitate the teaching of genetics, as in the work of Gonçalves (2021) who used simple and low-cost materials for the extraction of DNA (deoxyribonucleic acid) from the cells of common fruits on the Brazilian table, such as tangerine (*Citrus reticulata*) and mango (*Mangifera indica*).



According to Moreschi *et al.* (2021), the practice of extracting DNA from vegetables, as it is low-cost, was chosen to be worked on by the teachers, due to the possibility of students being able to reproduce the practice at home, using the fruit and the onion bulb, presenting the chemical reactions and steps, such as maceration, density, separation of liquids and solids, and finally, the definition of what DNA is.

For the creation of innovative and diversified methodologies, aiming at the promotion and construction of knowledge, Santos *et al.* (2020) developed a pedagogical workshop called "Playing geneticist: discovering DNA" with the objective of identifying and recognizing the DNA molecule of two vegetables: bananas and strawberries, in addition to understanding the importance of this molecule for life and stimulating the search for concepts and allowing students from public schools and low-income to have the opportunity to have an active attitude towards the learning process.

To make the class more participatory on the part of the students, through the methodology of teaching by research, in order to understand the contents of genetics, Fagundes *et al.* (2022) proposed an activity in which they could set up their own DNA extraction experiment, where they were able to relate the importance of genetics in its broadest sense, within the reality of each one to show that DNA is in all forms of life (FAGUNDES *et al.*, 2022)

Aiming at access, democracy and inclusion, Ferreira *et al.* (2021) proposed a natural sciences workshop in a remote environment, through the Moodle platform, the application of the investigative method for teaching what life is, explaining concepts such as DNA and pigments, aimed at students of Elementary School II and High School, and one of these experiences was the extraction of DNA from plants in general, through manipulative actions by the students themselves. Low-cost materials were used and guidance was provided through the platform to help students in the process of building knowledge.

The authors stated that, with these activities, they aim to give students the opportunity to create hypotheses, discuss among other students, develop solid and convincing argumentation and the ability to recognize errors, in addition to taking photos of the experiment and sharing it in the presentation forum (FERREIRA *et al.*, 2021).

Matta *et al.* (2020) carried out an intervention in a public school in Natal-RN, developing experimental DNA extraction classes and finally, created and developed a *Quiz* to collaborate in the teaching-learning of these students, in addition to stimulating the taste for experimentation and the development of scientific thinking. Five stages were carried out, namely: the first, a questionnaire to survey previous knowledge; the second, the dialogue and discussion of the theme and explanation of the activity; the third, the extraction of the DNA itself, from the tomato fruit; the fourth, a learning verification questionnaire and the fifth, and last, the development of questions asked by the students themselves in the *Kahoot application*, showing that the students had a great commitment to the

proposed activities and were able to discuss the reagents taught and the results obtained, thus requiring the use of activities that make the knowledge more meaningful.

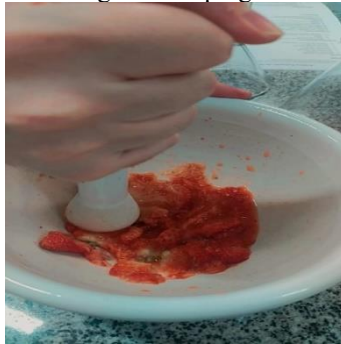
MATERIAL AND METHODS

The practice was developed at the Cytogenetics and Mutagenesis Laboratory (LABCIM) of the University Center of Patos de Minas, present in block M. 6 strawberries were used to perform the experimental procedure; 100 ml of distilled water; 5g of NaCl (table salt); 60 ml of alkylbenzene sulphonate (neutral detergent) and 100 ml of ice-cold 70% ethyl alcohol. The equipment used was: crucible and pistil, used in the maceration process; 100 ml beaker and cylinder, used to measure and store the contents. On the other hand, the use of the stick, the filter paper and the glass funnel served to assist in the management of some solutions and filtration. While the water bath at 60°C was used to heat the liquid acquired from the extraction of the strawberries with the solution of alkylbenzene sulfonate and NaCl and the styrofoam box with ice, to assist in the cooling of the filtrate.

Magalhães and Muller (2022) developed a project to apply active methodologies for teaching and learning Science in Elementary School, in which one of them was the extraction of DNA from a vegetable, done at the student's home, during the COVID-19 pandemic. The students posted photos of their experiments, showing the DNA precipitated between the alcohol and the filtered material, with the pectin in the supernatant. This work became, according to the authors, the most attractive classes, generating satisfactory results in the teaching-learning process and favoring engagement around science, research and studies.

Based on Magalhães and Muller (2022), the development of the experiment followed the following steps: 1- cut and macerate the strawberries (about 6 units) with the help of the crucible and pistil (figure 1); 2- prepared the solution of NaCl and alkylbenzene sulfonate, both of which were dissolved in a beaker containing 100 ml of distilled water (Figure 2); 3- added the strawberries to this solution; 4- put this mixture in a water bath for 15 timed minutes (Figure 3); 5- removed the solution from the bain-marie and added it to the Styrofoam with ice at the same time for 5 minutes (Figure 4); 6- filtered this solution with the aid of filter paper and a glass funnel in a 250 ml Erlenmeyer (Figure 5); 7- passed this filtered solution to a glass beaker of approximately 250 ml (taking into account the amount, in ml, that it was possible to filter); 8- added 100 ml of ice-cold 70% alcohol to this solution, slowly and along the walls of the beaker, observing the result (Figure 6); 9- With the help of the clean stick, circular movements were made in this solution and the phases that were formed were mixed; 10- The acquired content was observed and the analyses were performed.

Figure 1: Cutting and steeping of strawberries.



Source: Authors

Figure 2: NaCl and alkylbenzene sulfonate solution.



Source: Authors

Figure 3: Mixtures in a water bath.



Source: Authors

Figure 4: Mixtures on ice.



Source: Authors

Figure 5: Solution filtering.



Source: Authors

Figure 6: Addition of 100ml of ice-cold 70% alcohol.



Source: Authors

RESULTS AND DISCUSSION

At the end of the experiment, the strawberry DNA was obtained in a solution with three visible phases, the most precipitated being the aqueous solution, the medial phase the DNA and the most superficial phase containing the alcohol. This is because ice-cold alcohol is less dense than aqueous solution and DNA is also less dense than aqueous solution, but denser than ethanol (Figures 7, 8 and 9).

The strawberry needs to be macerated to increase the contact surface and homogenize the plant tissue. On the other hand, the addition of detergent (alkylbenzene sulfonate) is due to the emulsification of lipids, destructuring the lipid bilayer and disrupting the plasma membrane of the cells. Regarding the fact that it heats the solution, it is due to the increase in temperature that provides an increase in kinetic energy, the rupture of membranes and the denaturation of proteins and enzymes, such as histones and DNAs, inhibiting their interaction with DNA.

Thus, the addition of sodium chloride to the solution, which is due to the contribution of Na^+ cations to neutralize phosphate groups in DNA and Cl^- anions to neutralize histones, favors DNA agglutination. There is also the importance of the water bath and the sudden drop in temperature leading the solution to ice, which is due to the aid in the maintenance of the proteins in their denatured character, disfavoring their interaction with the DNA molecule. Regarding filtration, it is important to carry it out so that there are no cellular debris, except for DNA. Regarding alcohol, it is



understood that the colder it is, the less soluble the DNA is in the solution, since DNA is not soluble in ethanol.

Silva (2018) performed the DNA extraction of *Allium cepa* (onion) and discussed the importance of the practical class for learning the concepts of genetics. With the onion, he had the same result with the whitish strands representing the DNA, between the cold alcohol and the filtered compound, not forming pectin in the supernatant, since this compound is common in fruits such as strawberries and bananas. With the practical class, the students showed interest and presented good performance in the processes, being encouraged to bibliographic research and reading the content.

Cavalcante *et al.* (2018) performed the DNA extraction of *Aloe vera* (aloe vera) in order to carry out a differentiated and innovative class. The DNA was extracted in a simple, adapted and easily accessible way, forming a kind of "white cloud", which was pulled to better visualize the deoxyribonucleic acid of the aloe vera, making the extraction of this DNA an important didactic resource for genetics classes and attractive to the student, thus facilitating the teaching-learning in Biological Sciences.

Fagundes *et al.* (2022) carried out five activities, in which the third was the extraction of DNA with different fruits, such as papaya, banana, tomato, lemon, among others, and the students would bring from home what they were going to assemble and explain, contributing to the students attributing new meanings to scientific knowledge and practices. As a result, the students had good performance, good interest, full participation and full integration with what was proposed.

Santos and Pereira Júnior (2019) went further, in a public school in Cametá-PA, performed DNA extraction using alternative materials and extracted DNA from tomatoes, onions, and the saliva of volunteers to carry out the practice. The authors were able to conclude that experimentation in Science represents an excellent tool for students to make a connection between theory and practice, making them more apt to solve problems that arise during their school life, in addition to leading teachers working in the classroom to a new way of teaching. Even in a public school, with needy students and few resources to carry out a practical class.

Figures 7, 8 and 9: DNA extracted from strawberry in three phases, the densest of aqueous solution, the intermediate of DNA and the least dense of ethyl alcohol.



Source: Authors

CONCLUSION


In the experimental conditions outlined in this study, it can be concluded that the DNA was visualized in the intermediate phase of the final solution, identifying its characteristics during the experiment and the reactions between the substances. In addition, it was noticed that this practice can be carried out in public schools lacking physical resources or even in the students' own homes, since the materials used can be easily found.

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Interrelation between periodontal and Alzheimer's disease: Integrative review

 <https://doi.org/10.56238/sevned2024.010-045>

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ABSTRACT

Introduction: Studies point to a two-way relationship between Periodontal Disease (PD) and Alzheimer's Disease (AD), based on the inflammatory reaction, since these pathologies have a similar systemic inflammatory profile. The link between PD and AD can be explained by the spread of infectious or inflammatory agents that migrate from the oral cavity to the brain. **Objective:** To understand the relationship between Periodontal Disease and the development of Alzheimer's Disease. **Methodology:** A bibliographic search was carried out in the MEDLINE databases (PubMed), without restriction of dates, with text in English and Portuguese, applying the descriptors "Alzheimer's disease"; "Periodontal Disease"; "Microbiota"; "Alzheimer disease"; "Periodontal disease"; "Microbiota" isolated or combined using the Boolean operators "and" and "or". **Results:** 35 publications were obtained, using the keywords presented in the work. Following inclusion and exclusion criteria, 21 studies were used for careful reading and categorization. **Conclusion:** The literature supports the existence of a bidirectional relationship between periodontal disease and Alzheimer's disease, which occurs through the presence of a similar inflammatory mechanism. However, it is pertinent to develop new, more rigorous clinical studies to better understand the association of these diseases, which is essential for the development of more effective prevention and treatment strategies for patients suffering from both conditions. Early identification of these interrelationships can lead to a better quality of life for patients and a reduction in associated health conditions.

Keywords: Alzheimer's disease, Periodontal Disease, Microbiota, Neuroinflammation, Brain-mouth connection.

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INTRODUCTION

The terminology "Periodontal Disease" (PD) encompasses the pathologies Gingivitis and Periodontitis, which affect, respectively, the gums and the periodontal ligament. These diseases are multifactorial in nature and among their causes are bacteria, which are part of the natural microbiota of the subgingival biofilm. The products of the metabolism of these bacteria induce the gingival epithelium to release cytokines and chemokines, which act as signals, attract the defense cells of the human immune system and trigger an inflammatory process. The study of these pathogenic bacteria present in injured periodontium has been the focus of recent research, since they may be associated with other systemic diseases, such as Alzheimer's (Silva *et al.*, 2015).

According to Castellani, Rolston and Smith (2010), Alzheimer's Disease (AD) is a progressive neurodegenerative disorder, whose most characteristic symptom is the loss of recent memory, which can drastically affect daily activities and, depending on the stage in which it is, can lead to more serious systemic complications. This is a disease that mainly afflicts the senile population, with its highest prevalence of involvement after the age of 65. Alzheimer's, according to its progression, can affect the individual's body in several ways, and one of them is in relation to the immune system and inflammation mechanisms.

Studies point to a bidirectional relationship between Periodontitis and Alzheimer's, based on the inflammatory reaction, since these pathologies have a similar systemic inflammatory profile (Noble *et al.*, 2024). The link between PD and AD can be explained by the spread of infectious or inflammatory agents that migrate from the oral cavity to the brain (Ranjan; Abhinay; Mishra, 2018; Ashraf *et al.*, 2019). According to Miklossy and McGeer (2016), a seven-fold higher density of oral bacteria is found in the brain tissue of deceased AD patients compared to controls. In particular, *Porphyromonas gingivalis*, the main pathogen of periodontitis, is significantly identified in the brains of patients who have died from AD (Dominy *et al.*, 2019).

However, a broader understanding of the relationship between PD and AD still needs further study. Thus, this study is an integrative review of the literature on the interrelationship between PD and AD, with the objective of better understanding the bidirectional relationship that involves them, through their common inflammatory and immunological reactions, in addition to seeking ways to contribute to the health of the population affected by these pathologies.

METHODOLOGY

This work was an integrative literature review, with a quantitative descriptive character, conducted according to the Preferred Reporting Items For Systematic Reviews and Meta-Analyses (PRISMA, 2020). According to Souza, 2010, the integrative review provides a synthesis and practical implementation of the studies, promoted by the Evidence-Based Practice (EBP),

constituting a broader perspective by allowing the use of the integration of experimental and non-experimental studies, associating theoretical and empirical data. Thus promoting data analysis of research necessary for the development of critical thinking.

Searches for scientific literature were carried out in the MEDLINE database (PubMed), applying the key terms, alone or combined through the Boolean operators "and" and "or". The descriptors used for the research were: "Alzheimer's disease"; "Periodontal Disease"; "Microbiota"; "Neuroinflammation"; "Brain-mouth connection"; *Alzheimer's disease*; *Periodontal disease*; *Microbiota*; *Neuroinflammation* and *Brain-mouth connection*.

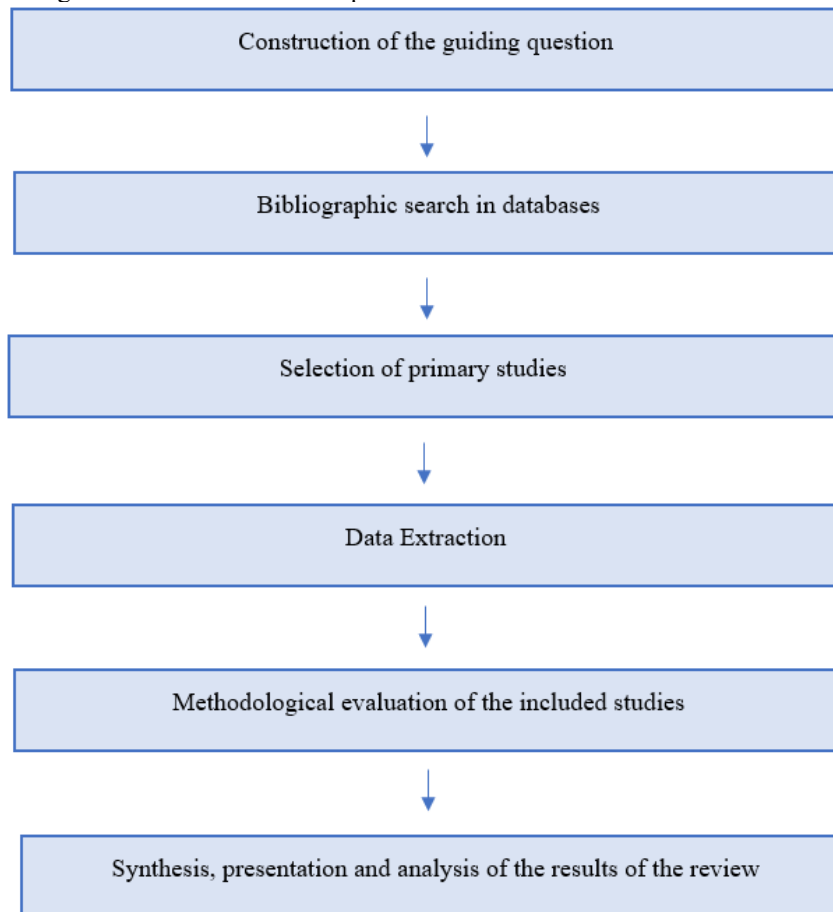
As an inclusion strategy, articles and books published without date restriction were selected, resulting from the recent discussion of the theme, in English and Portuguese. Subsequently, duplicates, papers with titles and abstracts that diverged from the theme of this study, as well as articles that did not have free and full access, were excluded.

For the organization and analysis of the data, a table was presented that summarizes the articles used, including the author's name, year of publication, title and conclusion.

Thus, the following steps were followed: construction of the guiding question; bibliographic search in the databases; selection of primary studies; data extraction; methodological evaluation of the included studies; synthesis, presentation, and analysis of the results of the review (PAGE *et al.*, 2021). The guiding questions were: How is the relationship between Periodontal Disease and Alzheimer's established? How can the inflammatory system be related to the development of dementia?

The cataloging, management, reading, identification of duplicate articles, creation of a virtual library, standardization of references and filing of articles were done using the Mendeley Desktop software (Windows 10 - version 1803).

Figure 1. Flowchart of the steps followed for the elaboration of the article



Source: Authors

THEORETICAL FRAMEWORK

PERIODONTITIS

PD is a chronic inflammatory disease induced by bacterial biofilm attached to tooth structures that has the potential to induce a systemic response by the host, presenting bacterial antibodies in plasma serum and elevated inflammatory cytokines (Noble *et al.*, 2014). According to Bui *et al.* (2019), PD is one of the most common oral diseases in adults, affecting billions of people worldwide, and is considered a pandemic by the US Centers for Disease Control and Prevention, with the potential to generate a reduction in quality of life, speech impairment and low self-esteem in patients.

Based on the assumption defended by Dioguardi *et al.* (2020), *Aggregatibacter actinomycetemcomitans* (Aa) is a pathogen that has its direct action by activating the secretion of pro-inflammatory cytokines by microglia, with cytokines being responsible for periodontal destruction. The authors Kwno, Lamter and Levin (2021), argue that subgingival microbial infection occurs by Gram-negative anaerobic pathogens, among which are *Porphyromonas Gingivalis*, *Tannerella Forysthia* and *Treponema Denticola*, the lipopolysaccharides of these pathogens act by inciting macrophages and other inflammatory cells of the host to produce a series of pro-inflammatory cytokines.

Pro-inflammatory cytokines (TNF- α , IL-1, INF- γ and PGE2) can be found in the periodontal pocket, which is a source for inflammatory intermediates to be released, thus representing a risk for the development of systemic diseases (Dioguard *et al.*, 2020).

ALZHEIMER'S DISEASE

AD is an irreversible progressive neurodegenerative disorder that culminates in loss of memory, thinking, and reduced learning capacity, with the potential to progress to death (Bui *et al.*, 2019).

The brain has distinct inflammatory processes, which contributes to the development of AD, with complement activation and expression of cytokines and chemokines (Bui *et al.*, 2019). In the new AD research framework, developed in 2018, it was established that AD is defined based on evidence from biomarkers of β -amyloid (A β) and tau pathology (Jack *et al.*, 2018).

Jeong, Sangyun (2017) draws attention to the two types of AD development, the familial early-onset (EO-FAD), which constitute less than 5% of cases, and the sporadic late-onset (LO-SAD), which in most cases is due to multiple genetic susceptibilities and environmental factors.

According to Mila-Alomà *et al.* (2020), pathophysiological events begin to be identified in early stages, with neural and axonal damage, synaptic dysfunction, neuroinflammation and glial response, and co-pathology of α -synuclein or TDP-43. They are neuropathologically characterized by neuritic plaques, neurofibrillating tangles (NFTs), β -amyloid peptides, and hyperphosphorylated tau (pTau) (Sangyun Jeon, 2017).

According to Dioguardi *et al.* (2020), the deposition of β -amyloid is neurotoxic, causing disturbances in calcium hemostasis and free radical production. The β -amyloid hypothesis suggests that the deposition of insoluble A β in the brain is the main cause of AD, however, the severity and advancement is correlated with pTau at abnormally high levels (Sangyun Jeon, 2017).

PERIODONTITIS - ALZHEIMER'S INTERRELATIONSHIP

Periodontal pathogens not only have the ability to invade the periodontium, but also to overcome the epithelium of the periodontal pocket, being able to percolate into the bloodstream and promote the release of pro-inflammatory toxins with significant potential to reach the brain (Licardo *et al.*, 2020).

According to Dominy *et al.* (2019), among the pathogens found in PD, *Porphyromonas gingivalis* and *Gingipains* stand out. *Porphyromonas gingivalis* is essential for the development of CP and a risk factor for the development of β -amyloid (A β) plaques, while the toxic byproduct of the bacterium "*Gingipains*" has been found in the brains of AD patients, which is related to detrimental effects on pTau. Hading; Singhrao (2011) reported on the performance of autopsy in AD patients, in

which the presence of two histological markers was observed, A β plaques and intraneuronal neurofibrillary tangles; the presence of these markers was a characteristic of AD.

Noble *et al.* (2014), argue that periodontitis is related to cognitive impairment and dementia. The authors describe the systemic inflammation profile of AD and CP as similar, and a relationship was identified between high serum IgG to the pathogen *Porphyromonas gingivalis*, and the decay of cognitive tests in a patient >60 years of age in the Third National Health and Nutrition Examination Survey (NHANES-III). In addition, it was observed that the level of TNF- α (Tumor Necrosis Factor Alpha) combined with periodontal IgG titers are different between AD patients and patients with normal cognitive functions.

However, the understanding of the bidirectional relationship between AD and PD is problematized based on the principle that patients with Alzheimer's disease have a higher incidence of periodontal disease with longitudinal manifestations than patients who do not have it (Harding; Singhrao, 2021).

The relationship between the two comorbidities can be explained by changes in the behavior of people affected by AD, such as frequent memory lapses (Harding; Singhrao, 2021). In this context, periodontitis becomes even more common, since the advancement of AD reduces the ability to care for oral hygiene, facilitating the accumulation of plaque and the onset of periodontal disease (Ide *et al.*, 2016).

RESULTS AND DISCUSSION

In the search, 21 articles were obtained, using the keywords described in the present study. According to the inclusion and exclusion criteria, 27 publications were included in the final for careful reading and categorization.

Chart 1 shows a summary of the articles selected to be used in the discussion, respectively in terms of authors/year, article title, and conclusion.

Chart 1 – Categorization of articles selected for discussion.

AUTHOR/YEAR	TITLE	CONCLUSION
Abbayya <i>et al.</i> , 2015	Association between Periodontitis and Alzheimer's Disease	Abbayya <i>et al.</i> , 2015, presented inflammation as a link in the relationship between PD and AD, caused by the infiltration of inflammatory mediators into the systemic circulation, which leads to the worsening of systemic disease.
Borsa <i>et al.</i> , 2021	Analysis of the link between periodontal diseases and Alzheimer's disease: a systematic review	The study by Brosa <i>et al.</i> , 2021, presents the link between Alzheimer's and periodontal diseases. It establishes that patients with AD have a lack of oral hygiene and a greater predisposition to periodontitis, as well as periodontal bacteria have been found in AD patients, contributing to higher risks of incidence/mortality.
Bui <i>et al.</i> , 2019	Association between periodontal pathogens and systemic disease.	In the study, it was observed that individuals with poor oral health and chronic periodontitis (CP) had a higher prevalence of brain injury than those who had periodontal health.
Domyni <i>et al.</i> , 2019	<i>Porphyromas gingivalis</i> in brains with Alzheimer's disease: evidence for the cause of the disease and treatment with small molecule inhibitors	The analysis carried out by Domyni <i>et al.</i> , 2019, determines the relationship between periodontitis and Alzheimer's disease, in addition to pointing to the use of the potent Kgp inhibitor to reduce <i>P. gingivalis</i> infection in the brain, in order to prevent and delay neurodegeneration in AD patients.
Hajichengallis A. Savakis (2021)	Local and Systemic Mechanisms Linking Periodontal Disease and Inflammatory Comorbidities	In the investigation carried out by Hajishenfallis and Chavakis, microbial clinical markers of periodontitis associated with Alzheimer's mortality were presented. An increase in endothelial permeability was suggested, which would allow hemocephalic installation and, as a consequence, an increase in β -amyloid ($A\beta$) plaques.
Jiang <i>et al.</i> , 2021	Association Between Chronic Periodontitis and Alzheimer's Disease Risk: Combination of Text Mining and GEO Dataset	In their analysis, Jiang <i>et al</i> established the core function of the research candidates' enriched genes and signaling cascade. They concluded that there is a strong probability of a correlation between CP and AD, which favors the establishment of the diagnosis and treatment of Alzheimer's in patients with chronic periodontitis.

Licardo <i>et al.</i> , 2020	Potential bidirectional relationship between periodontitis and Alzheimer's disease	In their research, Licardo <i>et al.</i> , concluded the coexistence of periodontitis and AD. However, it draws attention to the need to know which of the pathologies is the predecessor, since people with periodontitis have a high risk of developing AD and patients with Alzheimer's have poor oral health, making them more prone to the development of periodontitis. At the same time, it emphasizes the need for oral hygiene care to avoid an extra-neural source of inflammation and to prevent the onset of neurodegeneration.
Noble <i>et al.</i> , 2014	Serum levels of IgG antibodies to the periodontal microbiota are associated with incident Alzheimer's disease	In the study, Noble <i>et al.</i> , 2014, affirm the association of serum IgG levels of the periodontal microbiota with the risk of developing AD.

Source: Authors

The bidirectional relationship between PD and AD is a topic that, although relatively recent, has attracted the attention of many researchers. Due to its importance, increasingly controlled research is being carried out in order to reach a consensus on the supposed relationship between the two pathologies.

Bui *et al.* (2019) in their study, observed that individuals with poor oral health and chronic periodontitis (CP) had a higher prevalence of brain injury than those who had periodontal health.

Licardo *et al.* (2020) argue that periodontal pathogens are not restricted only to the periodontium, being able to reach the brain through the bloodstream. Domyni *et al* (2019) reinforce this claim when they say that a toxic byproduct of the bacterium *Gingipains* has been found in the brains of AD patients. Noble *et al.* (2014) contribute by stating that periodontitis and Alzheimer's have a similar systemic inflammatory profile. This information leads the scientific community to believe in evidence that points to a consistent relationship between CP and AD.

It is also worth remembering that AD can be considered a predisposing factor for PD for another reason besides the inflammatory mechanism: senile individuals affected by Alzheimer's have greater difficulty in oral hygiene. Which, in turn, through the mechanisms that have already been discussed, can lead to Periodontal Disease. Therefore, oral hygiene strategies should be discussed with the responsible medical team, in addition to family caregivers. All this while avoiding any extra-neuronal source of inflammation, which could aggravate the patient's systemic condition (Liccardo *et. al.*, 2020).

Also according to Liccardo *et al.*, 2020, oral treatment in general greatly helps the levels of inflammatory mediators in the body, which consequently helps to combat or at least relieve the symptoms arising from other systemic diseases that are also mediated by inflammatory mechanisms.

Jiang *et al.*, 2021 report that in addition to the involvement of inflammatory mediators in periodontitis in their study, CP may be a product of gradual neural degeneration in the aging process. Suggesting as a method of AD progression, to prevent or delay chronic inflammatory diseases.

According to the research of Hajishengallis and Chavakis (2021), *P. gingivalis* (one of the main ones involved in Periodontitis) was found in significant quantities in the brains of cadavers diagnosed with Alzheimer's. This pathogen is believed to have the ability to increase vascular endothelial permeability, which may grant it passage through the blood-brain barrier.

Abbayya *et al.*, 2015, point to the involvement of the bacteria *Chlamydia pneumoniae* and *Treponema* and the spirochete *Borrelia burgdorferi*, which were found in the blood and cerebrospinal fluid of Alzheimer's patients, in addition to the presence of *Treponema* in the trigeminal glands, supporting the invasion of microorganisms by neural pathways. It was also found that glial and neural cells in contact with *Borrelia burgdorferi* synthesized β APP and P-Taus. Therefore, the involvement of periodontal bacteria in the development of neuroinflammation, caused by the invasion of these bacteria in the brain both by the systemic circulation and by the peripheral nerve pathways, is suggested.

In addition, there is evidence that presents the association of patients with AD and PD with exacerbated cognitive decline, in addition to presenting an increase in the pro-inflammatory state and a reduction in the anti-inflammatory state. It was found that the load of the bacterium *Fusobacterium nucleatum* (Fn) is substantially higher in patients with AD, in addition to the fact that AD is higher in people with high levels of IgG antibody to *Actinomyces neasludii* (An), which is even more evident when there are high levels of *Eubacterium nodatum* (En) (Bossa *et al.*, 2021).

So far, evidence indicates that there is indeed a bidirectional relationship between the two diseases, with periodontitis bacteria being responsible for triggering/aggravating the dementia process and, therefore, the dementia process interfering with oral hygiene habits, aggravating periodontitis. However, it is necessary to carry out more studies on the subject, with long-term follow-up of clinical cases, so that this relationship can be better established.

CONCLUSION

The literature currently seems to converge on the affirmation of the link between periodontal diseases and Alzheimer's disease, through the sharing of a similar inflammatory mechanism. However, new clinical trial studies, better constructed and more rigorous in the diagnostic criteria of the pathologies studied, are essential to try to better understand the association between AD and PD.




A better understanding of it will allow the implementation of effective prevention and even treatment measures. Thus, PD therapy may represent a lever in a global strategy for the management of the prevalent and disabling disease that is AD.

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Identity: "Goat marked for death"

 <https://doi.org/10.56238/sevened2024.010-046>

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ABSTRACT

This work analyzes the problem of peasant identity in Paraíba, from a dialogue with cinematography. The text was anchored both in authors who discuss the theme of peasant identity, as well as in images in visual resources. The complete research is being developed together with the doctoral program in History at the University of Passo Fundo – UPF.

Keywords: Identity, Peasant, Cinema.

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INTRODUCTION

The invention of the peasant in the Northeast reveals itself as a complex process, rooted in the intricate historical and social webs that have shaped the region over time. This social construction, which goes beyond a mere occupational categorization, is marked by particular dynamics that reflect the interaction between economic, political and cultural factors.

By observing the Northeastern context, it is possible to perceive the emergence of the peasant as a distinctive social figure. This is not just a product of agricultural activities, but a social creation that develops in response to a complex set of circumstances. The relationship with the land, the struggle for survival in often adverse conditions, and the interaction with political systems shaped the identity of the peasant in the Northeast.

The historicity of this invention lies in the resistance and resilience of these communities in the face of historical challenges, such as drought and social inequalities. The figure of the peasant emerges not only as a rural worker, but as a protagonist in the narrative of resistance, adaptability, and preservation of local cultures.

Moreover, the invention of the peasant is inseparable from the economic dynamics of the region. The relations of production, often marked by forms of exploitation, shaped the identity and position of the peasant in the social structure. Its invention is intrinsically linked to the economic transformations that marked the history of the Northeast.

In the midst of these complexities, it is critical to understand the invention of the peasant as a dynamic phenomenon, subject to change and adaptation over time. Their identity is forged not only by historical conditions, but also by constant interaction with other social and political spheres.

Thus, the invention of the peasant in the Northeast transcends the simplification of an occupational category. It represents a social construct that encapsulates the richness of experiences, resistances and adaptations over time, contributing to a deeper understanding of the complexity of rural life in the region.

In the heart of Paraíba, a scenario is drawn where cultural roots are intertwined with the land, forging the rich Brazilian peasant ideals. In this region, the lives of peasants transcend mere agricultural activity, transforming into a living narrative of resistance, resilience and a deep connection to the land they cultivate.

Peasant wisdom, passed down from generation to generation, is a testament to the intricate relationship between the people and the rural environment. Oral traditions, ancestral agricultural practices, and reverence for nature converge to create a unique cultural fabric where knowledge of the countryside is as valuable as the soil that sustains crops.

The apparent simplicity of peasant life in Paraíba hides a rich complexity. The peasants, for the most part, personify the figure of the family farmer, whose daily life is permeated by natural



cycles and the unpredictability of the seasons. However, this apparent simplicity is a reflection of the deep understanding these individuals have of land, plants, and community relationships.

Solidarity is a cornerstone of the Paraíba peasant ideal. In rural communities, cooperation is an intrinsic necessity for survival. The sharing of knowledge, resources and efforts becomes a way of life, strengthening social bonds and consolidating the unity that permeates these communities.

The relationship with the earth is not only economic, but spiritual. The stories told in the shade of the trees, the celebrations that coincide with the seasons, and the reverence for natural cycles testify to a spirituality deeply rooted in peasant life. Every planting is an act of faith, every harvest a celebration of the sacred connection between man and nature.

However, this peasant ideology is not without its challenges. Modernization and changing weather patterns pose threats to the stability that these communities have traditionally enjoyed. The struggle for the preservation of traditions, for agrarian justice and for the recognition of the vital importance of peasants in the construction of Brazilian identity thus becomes a constant battle.

In Paraíba, peasant ideals are more than a cultural expression. It's a living narrative, rooted in the fertile lands and the lives dedicated to cultivating them. This narrative, loaded with stories of resistance and hope, echoes not only in the fields, but in the soul of the people who shape and are shaped by the peasant tradition (DURVAL, 2003).

Durval (2003) chooses to approach a narrative with a male perspective, considering it a historiographical territory that has been little explored. Its intention is to highlight the mistaken assumption that history, over time, has predominantly been the history of men. The justification for her analytical approach lies in the theoretical critique directed at a part of historiography that neglects the excluded, women, and sexuality. This critique is influenced by the currents of Marxism, psychoanalysis and the phenomenological existentialism of Sartre and Simone Beauvoir, which exclude man from the historiographical scenario.

The use of excerpts that intertwine the discourses on the masculine and feminine, covering themes ranging from the rural and urban to the empire and republic, public and private, industry and agriculture, mill and mill, nature and society, within the context of modernity and progress that characterized the twentieth century, specifically between 1920 and 1940 (DURVAL, 2003).

When Durval (2003, p. 21) states that "if everything is men's history, then it does not exist", he clearly establishes the purpose of his research. This is not a comprehensive narrative about the history of humanity as a species, but focuses on the study of the male gender. Unlike part of historiography that, influenced by Marxism, categorizes the masculine and feminine genders as separate and homogeneous realities, the author does not adhere to this dichotomy. This critical approach extends to the historiography of women, the excluded, sexuality and even gender.

Albuquerque Júnior's book does not fit into the perspective that presupposes the existence of a "female psyche" as opposed to a "male psyche", with asymmetrical experiences between a rational, pragmatic and utilitarian "male self" and an irrational, sentimental and fanciful "female self", as proposed by authors such as Nancy Chodorow, Joseph Pleck and David Lisak. Moreover, he does not submit to the dichotomy between public and private sphere, often imposed by theorists such as Habermas.

The book does not adopt a victimizing or masculinist discourse, which would confer on men the status of victims of psychic and social factors. This stance, which has found adherents in Brazil, as exemplified by Sócrates Nolasco, is not embraced by the work in question.

It is, therefore, a thorough investigation that required at least four years of work and its main objective is the analysis, from a gender perspective, of the historical and cultural construction of the identity of the Northeast. This identity is transmitted to the present day through representations such as "male goat", "plague goat", symbol of virility and strength, "bully" and brave, among others. The author, Albuquerque Júnior, who holds a PhD in Social History from the State University of Campinas and a post-doctorate in Education from the University of Barcelona, seeks to deconstruct the image that has been outlined and redrawn throughout an extensive cultural and intellectual production since the beginning of the twentieth century.

After the publication of previous works, including "The Invention of the Northeast and Other Arts" (Cortez/Massangana, 1999) and several books and articles, many of them centered on the theme of the male gender, Albuquerque Júnior presents his most recent contribution: "Northeastern: an invention of the phallus – a history of the male gender (Northeast – 1920/1940)".

In the first chapter, the author, based on the work "Order and Progress" by Gilberto Freyre and on material from writers of the *Diário de Pernambuco*, reconstructs a traditionalist discourse that saw the social changes in the Northeast, between the end of the nineteenth century and the 1940s, as a process of feminization of society. The transformations that pointed to the breakdown of social hierarchies, the advance of modernity, the rise of the Republic and the progressive victory of the city over the countryside were described in terms that referred to gender meanings, suggesting a feminization of society. This discourse used metaphors that embodied the historical changes in the feminine, representing women who challenged the traditional role of men, the role of father and patriarch, observing with anguish an era in which men lost their virility. This process, as described by Gilberto Freyre, has been identified as the decline of patriarchal society.

The author exposes how in male discourses gender boundaries seemed to be blurring: women adopted haircuts *à la garçon*, while men abandoned their beards. On the one hand, the demands of fashion and the refinement of modern life led men to adopt a delicacy in their words, gestures, and attitudes, resulting in a transformation that made them less rigid and seemed to weaken their virility



and potency (p. 49). On the other hand, there was a significant increase in the participation of women in the public sphere, especially in the field of letters, generating anxiety among men.

Frequently, male discourses sought to reaffirm the supposed intellectual superiority of men over women, indicating, in the author's view, a growing insecurity among men on this point. These changes show a process of horizontalization of customs, in which verticality and hierarchy were being threatened by the advancement of the feminine in society. This phenomenon was accompanied by the dissolution of the boundaries between ethnicities and races after Abolition, by the progressive entry of previously excluded sectors into politics with the arrival of the Republic, and by the fall of the society that previously called itself patriarchal.

The prevalence of urban social interactions to the detriment of rural ones resulted in the imposition of artificiality and masculinization on the female body. By contrast, bachelors were characterized by their paleness, thinness, and slumped shoulders, even though they were considered intelligent. Both cases illustrate the blurring of the boundaries between masculine and feminine.

In the context of marriage, the ideas of transformation, with the tendency to break down hierarchy and horizontalize relationships, are rooted in romanticism. This movement proposes that couples would no longer be united by economic interests, but rather by love, becoming an instrument that would allow women to choose their suitors. This poses a threat to the realization of traditional marriages, marking a feminization of relationships.

Another relevant aspect is the transition from the Empire to the Republic. With the Republic, a secular religion emerges that worships women and exalts love, an "ideal type of Mary", promoting an egalitarian sisterhood and a paternalistic hierarchical breakdown. Republican intellectuals were associated with feminine subtlety and delicacy. The change in the balance of power between men and women is undeniable, reflecting the trend towards equality and horizontalization in urban life, bringing women into the spotlight in the public sphere and questioning the decay of rural life and the patriarchal model.

In the urban environment, the transformations brought about by factories have impacted food customs, abandoning the tradition of good cuisine. This posed a threat to masculinity, leaving men more vulnerable and prone to health problems such as increased suicides and alcoholism. Community life was reduced to rare moments, contributing to the homogenization of cities, which came to resemble young people who did not belong to traditional families.

The author points out that the construction of the identity of the Northeastern man aims to replace the society based on the bloodline, where gender codes were predominantly private, with a configuration of sociabilities centered on the individual. In this context, gender identity increasingly becomes a personal choice. However, the author points out that social codes become more rigid and practices more vigilant, subject to detailed description and analysis.

The author's conclusion points out that around the twenties of the last century, a northeastern identity emerged, elaborated in the discourse of the elites, later internalized as a defining element of identity for the entire population of the region. This identity is characterized by stereotypes such as that of the Northeasterner, associated with a rural type, resistant to modern transformations, reactive to social changes and representative of an agrarian and patriarchal society. The author highlights the image of the exacerbated male who opposes social changes associated with the feminization of society.

In this context, the male world seems self-sufficient, excluding women not only from this world, but also from the region itself, where the "male woman" is perceived as a natural requirement. The author argues that this concept of the Northeast is a point of convergence of several historical events and results from a set of operations that construct a regional historical subject, playing a significant role in the political and cultural history of Brazil.

Thus, the work is important for the discussion of gender by contributing to the understanding of masculine and feminine not only as essentialized poles, but as elements that need to be thought about in their subjective multiplicities and in other possible ways of being man and woman. The author proposes to question the social legitimacy beyond the stereotype of the male and his submissive companion.

In view of this, the tense and violent climate in the rural area of Paraíba, from the 1950s onwards, was intense, to the point of becoming a documentary film. Thus, this article addresses some questions related to the relevance of the memory and identity of those people and, based on the documentary film directed by filmmaker Eduardo Coutinho, which was based on the life of João Pedro Teixeira and the Peasant League of Sapé. To this end, the text was discussed by Joël Candau, a theorist who addresses the issues of memory and identity.

In this way, the agrarian question has always existed in Brazil, generating endless disputes, especially those dealing with peasants and landowners in republican times. When we go back to the 1950s, we have the fuse of this crisis, mainly caused by the changes that occurred in the countryside, due to mechanization, to what we call the modernization of agriculture.

Another aggravating factor of the crisis occurred with the implementation of sugarcane cultivation on several fronts, with the Northeast region, the former place of sugarcane cultivation, being the pivot. Thus, the evictions of the peasants from the land took place, due to the *foro*, a system that used the exchange of cultivating the land, while paying a fixed amount in kind to the owner of the land.

There were several mobilizations in the countryside, among them, the creation of charitable associations, with the purpose of providing and serving the most needy, those whose work was linked to the land. With this, it was possible to make demands, because there was still no Rural Worker

Statute, created only on March 2, 1963, although it did not meet the real needs faced by those workers at the time.

Faced with these scenarios of violence in the countryside, having together with it the creation of the Peasant League of Sapé, which referred to the memory of the first leagues that were created in 1940 by the communists and, in this context, the death of one of the leaders of those people, João Pedro Teixeira, occurred, it is in this context that the filmmaker Eduardo Coutinho, Inspired by the tragedy, he had the happy idea of creating a documentary film that would be based on the life and murder of the peasant leader entitled: "Goat Marked for Death".²

SO DOES THE STORY BEGIN?

He had been warned that they were going to persecute him. He had once witnessed, with his wife, a sinister round of their home. Perhaps he knew everything, but he had learned from the revolutionary poetry of the world that it is better to die knowing than to live deceived. [...] An idealist, he never understood in his agile intelligence and his correct reasoning, how all the lands of the Várzea da Paraíba belonged only to owners who could be counted on their fingers and hands. And so many landless men, and so many afflicted men, and so many hungry men! He had dreamed of agrarian reform, but he did not think of revising the statutes of the land wielding a sickle or a blunderbuss, the attitude of the desperate. He appealed only to the organization of peasant opinion, of the opinion of the countryside, because in organized opinion of the people, everything else would be disorganized. [...] Dreamed. He would pay for the crime of having dreamed. His dream was a dangerous vision of freedom. The landlords cannot understand that the hearts of the humble can nest beautiful dreams. (A UNIÃO NEWSPAPER, April 5, 1962).

It is at this moment that we resort to Joel Candau's theory, since, when we talk about João Pedro Teixeira and the cinematographic production, we refer to the memory and identity of a people, of a place, however, although we do not deny the struggle of the peasants of Paraíba to exercise the right over the land, we have to remember the construction of this memory and identity. Thus, when they fought for rights, as in the case of the peasants, they sought to find answers in a past, a memory, a place in which they idealized.

For Joël Candau, identity and memory are essentially inseparable in their social and cultural relations:

Memory, at the same time that it shapes us, is also shaped by us. This perfectly sums up the dialectic of memory and identity that come together, mutually nourish each other, and support each other to produce a life trajectory, a story, a myth, a narrative. (CANDAU, 2021, p.16).

² We emphasize that part of the introduction can be recognized in the research of Juliana Alves. ALVES, Juliana Ferreira. 40f. The documentary "Goat marked to die" and the construction of the history of the peasant league of Sapé. [manuscript]. Final paper (Graduation in History) State University of Paraíba. Guarabira - UEPB, 2014 [...] "Which approaches the Peasant League of Sapé from a process of construction of a historical memory for the movement, which began in the 1960s and was interrupted by the military coup in 1964, being reopened in 1980".

In the face of this, the peasant is the fruit of a memorable time, the Marxist struggle or Marxist paradigm of the present, which seeks to intervene in the society of its time, to change its place of speech and memory, to produce a new identity history, the mill of revolution is the transformation of the peasant deprived of property into a hero of struggle. The figure of the oppressive landowner of the times of colonial Brazil was still rooted in the memory of those people, oppressed in their impoverished origin by the representation of the former plantation owner, now the landowner.

When we work with memory, we must look at the history of the writing of the producers of History, so we have as an example the work of Manuel Correia de Andrade, while writing the preface to the work of Fernando de Azevedo in the 1980s, refers to the 1950s and 1960s and demonstrates the spirit of that time:

The oppression of rural workers, especially peasants in Brazil, has developed since the colonial period, with the humble resisting direct dispossession in their *tabas* - indigenous -, organizing black quilombos or transforming themselves into bandits - analysis of Lampião's epic - or fanatics - episodes of straws and cauldron, among others. They were spontaneous revolts, without a well-defined ideology, although always with respect for social justice, which were repressed with violence and refinement of perversity³.

So, it is the fabrication of the peasant hero, João Pedro Teixeira that becomes the memory and identity of the struggle, it was necessary to have a trigger, a fracture in time, the appropriate space for the construction of that unfortunate story, for the filmmaker Eduardo Coutinho to understand the guiding thread of his filmic script, the activist leader, dead under the oppression of the landowner, now he gave life to the documentary "Goat marked to die".

The activist and leader becomes the representation of monumentality and martyrdom executed, now the peasant movement has a reference, something that could cling to in that moment of pain. The documentary film conceived by Eduardo Coutinho is the expression of pain transformed into a representative figure of the charismatic leader, and can refer us to what Le Goff (1996) states to be:

The monument, in the traditional sense, is a work built to go beyond the present and transmit to posterity the memory of a person or fact. If we look for the philological origins, we will see that monument is a noun that comes from the verb *monere* which means "to make remembrance", "to make remember". [...] "The monument is a sign of the past, [...] The monument is everything that can evoke the past, perpetuate the memory", the construction of individuals-monuments represents a privileged object in the study of the constitution of contemporary collective memory⁴.

³ ANDRADE, Manuel Correia apud AZEVEDO, Fernando Antônio de. *The Peasant Leagues*. Rio de Janeiro: Ed. Paz e Terra, 1982. p. 12.

⁴ LE GOFF, Jacques. *History and Memory*. 4 a Ed. Campinas/SP: Editora da Unicamp, 1996. p. 535.

The monumentalist and filmic memory created around the representation of João Pedro Teixeira is the object of worship of those suffering people and, now, being transformed into a documentary vision and with scripts, it allowed the memory of pain to bring encouragement to suffering and the possibility of building a history in those lands of latifundia.

LIGHT, CAMERA, ACTION

The fiction film, begun in 1964, shot in 35mm, black and white, without simultaneous sound recording, with non-professional actors, predominance of fixed shots and hieratic staging, would be resumed as a documentary, in 16mm, color, with direct sound, camera in hand, and agile style close to that of a ⁵reportage.

The 1960s, the revolution was knocking on the door, encompassed an artistic production increasingly marked by this perspective. The novelty of the set is not the thematic angle itself. The novelty was, rather, the presentiment that there, in the struggle for land, in the exploitation of labor in the countryside, in extreme misery, was the main point of tension in Brazil, and that, consequently, the future would be born from there – as suggested by the striking verse reiterated in *God and the Devil in the Land of the Sun* (1964): "the hinterland will become the sea/ the sea will become the hinterland". The geographical, social, and historical fraction focused on the works gained the status of a reduced image of the country – whether its face of perpetual barbarism, or the horizon of transformation that our class struggle sprang from the earth⁶ presented.

The biennium was 1963-1964, a period that marked cinema in the country. Among these we find at least four decisive films that were being gestated and produced in the short time leading up to the coup d'état of April 1964. The interesting thing to think about is that all of them were interested in a critical figuration of the recondite margins of Brazil, in which the geography of the hinterland, extreme misery, class struggle, messianism and spasms of revolt for the land coalesced into a mass of their own and, at that moment, unavoidable to understand the boiling land that the country had become (TOLEDO, 2021).

We have the *break* (pause) consequence of the military dictatorship of 1964, and the recordings of the film "Goat marked to die" are interrupted, due to the fierce persecution that those people would face for that hard blow that the nation suffered. Now, it was time to flee! An escape no longer from the conditions that plagued those places, but from the persecution of the military, who attributed to these peasant leaders as communist revolutionaries, the Cuban guerrillas of the Paraíba hinterland.

⁵ ESCOREL, Eduardo. Triumph and torment. In: OHATA, Milton (org.) Eduardo Coutinho. São Paulo: Cosac Naify, 2013, p.486.

⁶ TOLEDO, Paulo Bio. Modes of popular connection in pre-1964 Brazilian cinema: considerations on *Vidas secas*, os fuzis e o unfinished *Cabra marcado para morrer*. Journal of the Institute of Brazilian Studies, Brazil, n. 80, p. 55-67, dec. 2021, p. 57

Although the abrupt interruption of the film's recordings caused the dispersion of the main actors, such as Elizabeth Teixeira, who would play herself, widow of João Pedro Teixeira, other times were being prepared, as in the speeches written by João Pedro Teixeira, emerging in the midst of two distinct temporalities, that is, the 1960s, stolen by the military dictatorship, and then in the 1980s, the recent past.

In the 1960s, its emergence was linked to the politics of production of the peasant subject and in the 1980s, its history began to be written again and had the function of serving as a means of promoting a rescue of the past, a term that historians do not like to use, as well as a possibility of bringing the history of the Peasant Leagues back. re-elaborating forms of continuity⁷.

In 1981, Eduardo Coutinho meets Marta in a bar in the Baixada Fluminense in Rio de Janeiro, she is one of Elizabeth Teixeira's daughters, and he had already recovered the material that was seized in 1964, from the first recordings, and sees again the possibility of resuming them. Thus, we could say, the survivors of that period, such as Elizabeth Teixeira herself, who lived in hiding in Rio Grande do Norte using the false name of Marta.

The emotion is born from this parallel: the interrupted film completes itself against winds and tides, in a way coincides with the woman of fiber who, after eating the bread that the devil kneaded, meets her family again, reassumes her real name and reaffirms her conviction⁸.

And, now returning to the period of 1981, Eduardo Coutinho returns to the unfinished material to conduct what is perhaps his most important documentary, talking about the death of João Pedro Teixeira, the "Goat marked to die", and which premiered in 1984.

At the beginning of the film, fragments of the 1963 script are projected. It is possible to notice, in the passages of the text, an epic-popular structure, also derived from the poem, such as the presence of a narrator, noted as "cantador". He is an internal narrator of the film, who was the one who would probably make the connections between the fictional and documentary perspectives. There is no record of this narrative structure operating, that is, scenes in which this "singer" appears have not been recovered. Its insertion in the script, however, gives clues to the inventiveness that that project contained (TOLEDO, 2021).

MOVIE SCENES: "GOAT MARKED FOR DEATH" – 1964/1984

⁷ MUNIZ, Roberto Silva. 200f. The Making of João Pedro Teixeira: as the Peasant Hero. Dissertation (Master's Degree in History) - Federal University of Campina Grande, Humanities Center — Campina Grande, 2010, p.24.

⁸ SHWARZ, Roberto. The thread of the skein. In: OHATA, Milton (org.). Eduardo Coutinho. São Paulo: Cosac Naify, 2013, p.460

1 – Scenes from the Movie (1964)



Elizabeth Teixeira and her children in the film *Cabra marcado para morrer*, by Eduardo Coutinho. This is one of the scenes recorded in 1964, as foreseen in the original script that the IMS now releases in e-book, and included in the documentary released in 1984. Eduardo Coutinho Collection/ IMS⁹

2 – Photographs (1984)



Peasant memories and identities.

Filming began in February 1964. Coutinho intended to tell the story of João Pedro Teixeira, leader of the peasant league of Sapé, in Paraíba, who was murdered in 1962. He didn't want professional actors: for the characters to be played by the peasants themselves. Seventeen years later, Coutinho returns to the region, manages to find Elizabeth, through the eldest son, Abraão, investigates the fate of the other ten children and all those involved in the project. It shows the originals filmed so long ago, the peasants rejoice with their faces, younger, live the emotion of recognition and the game of identifications. Twenty years later, Coutinho concludes his film, an epic told with clarity, patience and perseverance, by someone who trusts in work and days. An original experience in Brazilian cinematography. (ROBERTO MELLO, *Jornal do Brasil*, Jan.1985).

⁹ "The film imagined back then survived both in the shot scenes (it is estimated that 40% of the text was filmed, and some scenes were included in the documentary released in 1984), as well as in the script typed by machine and with handwritten notes by the filmmaker." IMS. Available at: <https://ims.com.br/2022/09/30/ims-lanca-roteiro-original-de-cabra-marcado-para-morrer/>. Accessed on: Aug 06. 2023.



CONSIDERATIONS

Embarking on a final journey in search of Elizabeth Teixeira's children scattered in different places throughout Brazil - as payment for the price of militancy - Eduardo Coutinho's documentary film builds the memory and identity of those people, does what seemed to be impossible: it further expands the mosaic of the agrarian question now not only in the Northeast, created in the monumentality of representations around João Pedro Teixeira, "Goat marked to die" allowing us to see other regions of Brazil.


The documentary film places us as true accomplices in this search, we find ourselves discovering new nuances for the story of Elizabeth Teixeira, and of her entire generation, understanding in a broad way what all the discussion that the documentary film and the characters propose means, and what are the real consequences of this.



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Innovations in virtual and augmented reality: Transforming organizational culture management for the 21st century

 <https://doi.org/10.56238/sevened2024.010-047>

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ABSTRACT

The application of Augmented Reality (AR) and Virtual Reality (VR) in management and organizational culture is emerging as an innovative strategy to increase efficiency, collaboration and employee engagement. This study aimed to investigate the impact of these technologies on organizational management, highlighting the benefits, challenges and best practices for their implementation. The justification is based on evidence that AR and VR can significantly improve knowledge retention and employee productivity, as demonstrated in studies by PwC (2020) and Deloitte (2021). As a methodology, a mixed approach was adopted, combining qualitative and quantitative methods. In the qualitative phase, semi-structured interviews were carried out with managers and experts from companies that use AR and VR, revealing topics such as improving the integration of new employees and increasing operational efficiency. In the quantitative phase, a questionnaire was applied to 233 employees, evaluating satisfaction, engagement and productivity after implementing these technologies. The results indicate that 78% of employees reported greater job satisfaction, and 82% felt more engaged and motivated. Additionally, 65% of participants saw an increase in productivity. Statistical analysis revealed significant correlations between the use of AR/VR and improvements in organizational performance indicators, with linear regression explaining 48% of the variation in productivity ($R^2 = 0.48$, $p < 0.01$) and ANOVA showing significant differences in job satisfaction work ($F = 7.62$, $p < 0.01$). In conclusion, it was found that the integration of AR and VR in organizational management provides a series of benefits, including greater efficiency and employee engagement. However, successful implementation requires strategic investments in infrastructure and ongoing training to overcome initial challenges and maximize long-term benefits.

Keywords: Augmented reality, Virtual reality, Organizational culture, Human Resources, Technology.

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INTRODUCTION

Rapid technological evolution has reconfigured organizational culture management in modern companies, especially with the adoption of technologies such as Virtual Reality (VR) and Augmented Reality (AR). These technologies not only improve the way employees interact with the work environment, but also have the potential to transform training, onboarding processes, and internal communication.

Virtual Reality creates immersive environments that replicate real situations, allowing employees to experience and learn in a safe and controlled environment. According to a study by PWC (2020), the use of VR in training can increase knowledge retention by up to 75% compared to traditional methods. Additionally, VR facilitates the development of practical skills without the risks associated with the real world, making it extremely useful in industries such as healthcare and manufacturing.

Augmented Reality, on the other hand, overlays digital information onto the real world, improving the efficiency and accuracy of tasks. Companies that implemented AR for training and technical support reported a 40% increase in productivity and a significant reduction in problem-solving time (DELOITTE, 2021). AR also fosters more effective collaboration between geographically distributed teams, allowing for real-time visualization of projects and more fluid communication.

According to Accenture (2021), 63% of companies that have adopted these technologies have seen a significant improvement in employee collaboration and engagement. Evidence suggests that integrating VR and AR can not only improve operational efficiency but also strengthen organizational culture, fostering a more innovative and collaborative work environment. Given the potential impact of these technologies, it is crucial for businesses to understand how to implement them effectively in order to maximize their benefits.

The combination of these technologies in organizational culture management can offer numerous benefits. For example, onboarding programs for new employees can use VR and AR for complete immersion in corporate culture, making it easier to internalize values and practices from the start. Additionally, simulations of complex scenarios can improve collaborative decision-making and problem-solving, fostering a culture of innovation and adaptability.

Thus, the present study aims to analyze the impact of Virtual Reality and Augmented Reality on the management of organizational culture, exploring how these technologies can be used to improve integration, training and collaboration among employees.



LITERATURE REVIEW

HUMAN RESOURCE MANAGEMENT CONCEPT

Human Resource Management (HRM) refers to a set of practices, policies, and systems that influence employee behavior, attitudes, and performance within organizations.

According to Armstrong (2016), HRM involves managing people strategically to increase organizational performance. This includes recruitment and selection, training and development, performance management, compensation and benefits, and labor relations. Dessler (2017) points out that HRM's main objective is to align the needs of employees with organizational goals, promoting a productive and satisfactory work environment.

EVOLUTION OF HUMAN RESOURCE MANAGEMENT

HRM has undergone several transformations over time, evolving from a purely administrative function to a strategic function crucial to organizational success. As follows:

Classic Era: Initially, HRM was known as personnel administration and focused primarily on administrative tasks such as payroll and compliance with labor laws (TAYLOR, 1911). This phase was characterized by a mechanistic and task-centered approach.

Age of Human Relations: With the Hawthorne studies conducted by Elton Mayo in the 1930s, the importance of the human factor and interpersonal relationships in the workplace was recognized. This led to a greater focus on employee welfare and improving working conditions (MAYO, 1933).

Human Resources Era: In the 1960s and 1970s, personnel administration evolved into human resource management, with a more comprehensive focus. This period saw the development of training and development practices, as well as the implementation of performance management systems (McGregor, 1960).

Strategic Era: Starting in the 1980s, HRM began to be seen as a strategic function. The integration of HR strategy with business strategy has become essential for the achievement of organizational goals (PORTER, 1985). Talent management and strategic HR planning practices have become prevalent.

HUMAN RESOURCE MANAGEMENT PRACTICES

Human Resource Management (HRM) practices play a crucial role in organizations, helping to attract and retain the right talent with the technical and behavioral skills needed to achieve organizational goals. This is done through effective recruitment and selection processes, reward systems, and appropriate competency development (SOUSA *et al.*, 2006).

Also according to Sousa *et al.* (2006), such practices also have the function of promoting behaviors aligned with the organization's long-term strategic objectives, through skills and career development plans that provide employees with a clear vision of their professional growth (Sousa *et al.*, 2006). Remuneration systems are, therefore, linked to the development of competencies and the individual and collective performance of the members of the organization (Sousa *et al.*, 2006).

Delaney and Huselid (1996) point out that HR practices such as employee participation, empowerment, work redesign, training, teamwork and compensation systems are associated with better levels of organizational performance. From this perspective, Huselid in 1995 introduced the concept of High Performance Work Practices, which aims to acquire and develop skills and knowledge necessary to achieve organizational goals. These practices include training, internal recruitment, internal communication, and compensation systems, associated with lower turnover rates, higher productivity, and improved organizational performance (HUSELID, 1995).

Bilhim (2004) suggests that there is a conflict between Human Resource Management and Organizational Culture, considering that culture can be seen both as a consequence of HRM and as an artifact of it. From this point of view, the management of an organization is determined by the installed culture, and human resources practices depend directly on the characteristics of this culture (BILHIM, 2004).

To be effective and impactful, HRM practices must be developed according to cultural requirements, and may reinforce or modify the existing organizational culture (BILHIM, 2004).

Among the various HRM practices, Armstrong (2014) highlights some essential ones:

- a) **Planning:** A fundamental process that ensures the presence of people with the right skills in the right places at the right times, aligning with short- and long-term organizational objectives.
- b) **Recruitment and Selection:** Recruitment is the process of finding and engaging the right people based on the needs of the organization. Selection, in turn, is the choice of these people to fill specific positions.
- c) **Creation of the Value Proposition and Employer Branding Strategies:** The value proposition is used to attract candidates with potential by highlighting the advantages that the organization offers. Employer branding strategies aim to create a favorable image of the organization to attract and retain talent.
- d) **Onboarding and Disengagement:** Onboarding involves the reception and integration of new employees, while disengagement can occur due to redundancy, dismissal, or retirement.

- e) **Career Management:** This involves attracting, identifying, developing, retaining, and relocating employees with high potential, providing opportunities for growth and development.
- f) **Training and Development:** Ensures that employees develop the knowledge, skills, and competencies necessary to perform their duties efficiently.
- g) **Performance Management:** Continuous process of identifying, measuring and developing employee performance, aligning it with the organization's strategic objectives (AGUINIS, 2005).
- h) **Well-being:** Creating a balanced work environment, stress management, work-life balance, and employee support programs.
- i) **Health and Safety:** Protection of employees from occupational hazards.
- j) **Labor Relations:** Management of labor relations and the psychological contract, including methods of communication between employees and top management, both individually and collectively.

ORGANIZATIONAL CULTURE

HRM practices are closely linked to Organizational Culture, which influences and is influenced by HR practices.

Organizational culture is a fundamental concept in business management, evolving from a historical understanding to a strategic approach in contemporary organizations. This essay reviews the existing literature on the development and application of organizational culture, from its origins to its strategic role today.

HISTORICAL CONCEPT OF ORGANIZATIONAL CULTURE

The concept of organizational culture emerged in the academic literature in the 1970s and 1980s, with authors such as Edgar Schein and Geert Hofstede laying the theoretical groundwork. Schein (1985) defined organizational culture as a pattern of shared basic assumptions, which the group learned as it solved its problems of external adaptation and internal integration. According to the authors already cited, these patterns are taught to new members as the correct way to perceive, think, and feel about these problems.

Geert Hofstede (1980), in turn, highlighted the influence of national cultures on organizational cultures. In his pioneering study, he identified cultural dimensions that vary across countries, impacting the way organizations operate and structure themselves. Hofstede argued that organizational culture is a reflection of national culture, shaping behaviors and practices within companies.



EVOLUTION TO A STRATEGIC CONCEPT

Over time, organizational culture has moved from a merely descriptive concept to an essential strategic tool. Kotter and Heskett (1992) were pioneers in suggesting that a strong organizational culture can be a source of sustainable competitive advantage. They demonstrated that companies with strong cultures, which align their values and practices with their business strategies, tend to perform better financially.

Barney (1986) also contributed to this view by stating that organizational culture can be a valuable, rare, and difficult resource to imitate, providing a sustainable competitive advantage. For Barney, organizational culture should be considered when formulating strategies, as it directly influences an organization's ability to successfully implement its strategies.

ORGANIZATIONAL CULTURE AND ORGANIZATIONAL PERFORMANCE

The relationship between organizational culture and organizational performance has been widely studied. Deal and Kennedy (1982) suggested that a strong culture can improve organizational performance by providing a sense of identity and commitment among employees. According to Peters and Waterman (1982), successful companies are those that manage to align their culture with their strategic goals, creating a cohesive and motivating work environment.

Denison (1990) proposed a model that relates organizational culture to four main traits: mission, consistency, involvement, and adaptability. He argued that these traits are important indicators of organizational effectiveness, and that an organization's ability to align its culture with these traits can lead to better performance.

PRACTICAL APPLICATIONS AND CHALLENGES

In practice, organizational culture management involves defining values and beliefs that guide employee behavior, effectively communicating those values, and creating reward systems that encourage behaviors that align with the desired culture. Collins and Porras (1994) highlighted the importance of building a "culture of excellence" that permeates all levels of the organization.

However, managing organizational culture is not without its challenges. Resistance to change is a common obstacle, especially in organizations with deep-rooted cultures. According to Kotter (1996), cultural transformation requires strong leadership and a systematic approach to altering existing habits and beliefs.

Organizational culture has evolved from a descriptive perspective to an essential strategic tool in modern organizations. Its effective management can provide a sustainable competitive advantage by improving organizational performance and aligning employee behaviors with the company's

strategic goals. The literature reviewed highlights the importance of understanding and managing organizational culture to achieve long-term success.

VIRTUAL AND AUGMENTED REALITY: DEFINITION AND APPLICATIONS

Virtual Reality (VR) and Augmented Reality (AR) are immersive technologies that are revolutionizing various industries, including organizational culture management. VR creates a completely digital environment in which users can interact and explore, offering a complete sensory experience (Schroeder, 2008). AR, on the other hand, superimposes digital elements on the real world, providing a mixed interaction and enriching the physical environment with additional information (Azuma, 1997).

The rise of new technologies, including Virtual Reality (VR) and Augmented Reality (AR), is transforming HRM in significant ways.

In recruitment and selection, VR and AR technologies are being used to create immersive experiences that attract and engage candidates. VR tools can simulate the work environment, providing candidates with a realistic view of the company and the position (MANROOP, 2017).

In Training and Development: VR enables the creation of highly realistic training scenarios that improve knowledge retention and develop practical skills in a safe environment. According to a study by PwC (2020), the use of VR in training resulted in a 75% higher knowledge retention compared to traditional methods. AR, in turn, can be used to provide real-time instructions and technical support while performing tasks (Deloitte, 2021).

Performance Management: AR tools can be used to monitor employee performance in real-time, providing immediate and personalized feedback. This improves the accuracy of performance appraisals and helps employees proactively correct issues (ACCENTURE, 2021).

Engagement and Communication: VR and AR technologies facilitate communication and collaboration between teams, especially in remote work environments. They allow employees to participate in virtual meetings and collaborate on projects in a more interactive and effective way (Schroeder, 2008).

VIRTUAL REALITY IN ORGANIZATIONAL CULTURE MANAGEMENT

VR has been shown to be a powerful tool for training and competency development. According to a study by PwC (2020), training conducted with VR resulted in significantly higher knowledge retention than traditional methods. In addition, VR allows for the simulation of complex and potentially hazardous scenarios in a safe environment, which is crucial for sectors such as healthcare and heavy industry (JERALD, 2015).



In the organizational context, VR can be used to onboard new employees in an immersive way. Onboarding programs that use VR allow new employees to experience the company's culture in a practical way, experiencing organizational values and practices in a virtual environment before they even enter the workplace (BAILENSEN, 2018). This initial immersion can speed up adaptation and increase engagement from day one.

AUGMENTED REALITY IN ORGANIZATIONAL CULTURE MANAGEMENT

AR, by enriching the physical environment with digital information, has valuable practical applications in the management of organizational culture. A study by Deloitte (2021) showed that implementing AR in technical training increased productivity by 40%. AR allows instant access to data and instructions by overlaying this information directly onto the user's field of vision, which facilitates the execution of complex tasks and improves operational efficiency (KIM & DEY, 2009).

Additionally, AR can be used to promote collaboration and communication between geographically dispersed teams. AR tools allow collaborators in different locations to work together on shared projects, viewing and manipulating 3D models in real time (PEDDIE, 2017). This ability to collaborate remotely is particularly valuable in an increasingly globalized and connected world.

INTEGRATION OF VR AND AR INTO ORGANIZATIONAL CULTURE

The integration of VR and AR in organizational culture management can create a synergy that enhances the benefits of both technologies. For example, while VR can be used for complete immersion in training and simulations, AR can offer continuous, contextual support while performing daily tasks. This combination can promote continuous and adaptive learning, adjusting to the specific needs of employees in real time (MILGRAM & KISHINO, 1994).

Companies that have adopted these technologies have reported significant improvements in several performance indicators. According to Accenture (2021), 63% of companies that have implemented VR and AR have seen an increase in employee engagement and efficiency of operations. This data suggests that the adoption of these technologies can not only improve productivity, but also strengthen the organizational culture, promoting a more innovative and collaborative work environment.

CHALLENGES AND CONSIDERATIONS

The rise of new technologies, including Virtual Reality (VR) and Augmented Reality (AR), is transforming HRM in significant ways. Follows:



Recruitment and Selection: VR and AR technologies are being used to create immersive experiences that attract and engage candidates. VR tools can simulate the work environment, providing candidates with a realistic view of the company and the position (MANROOP, 2017).

Training and Development: VR allows for the creation of highly realistic training scenarios that improve knowledge retention and develop practical skills in a safe environment. According to a study by PwC (2020), the use of VR in training resulted in a 75% higher knowledge retention compared to traditional methods. AR, in turn, can be used to provide real-time instructions and technical support while performing tasks (DELOITTE, 2021).

Performance Management: AR tools can be used to monitor employee performance in real-time, providing immediate and personalized feedback. This improves the accuracy of performance appraisals and helps employees proactively correct issues (ACCENTURE, 2021).

Engagement and Communication: VR and AR technologies facilitate communication and collaboration between teams, especially in remote work environments. They allow employees to participate in virtual meetings and collaborate on projects in a more interactive and effective way (Schroeder, 2008).

Despite the benefits, the implementation of VR and AR in organizational culture management presents challenges. The need for significant investments in technological infrastructure and training is one of the main obstacles (MEZGHANI & AYED, 2018). In addition, adapting employees to these new technologies may require a significant cultural change within the organization.

To overcome these challenges, it is essential for companies to adopt a strategic and gradual approach, starting with pilot projects and expanding as technology becomes integrated into the organizational culture (Kaplan & Haenlein, 2019). Ongoing training and technical support are key to ensuring that employees use these technologies effectively and safely.

VIRTUAL REALITY (VR) EQUIPMENT

Virtual Reality (VR) involves creating a fully immersive three-dimensional environment in which the user can interact in a realistic manner. To experience VR, several types of equipment are required:

a) **Headsets de Realidade Virtual (HMD - Head-Mounted Display):**

Oculus Rift S: One of the most popular headsets, developed by Oculus VR. It offers an immersive experience with high resolution and accurate tracking of head movements.

HTC Vive: Known for its high image quality and support for room-scale VR experiences. Includes manual controls for more natural interaction.

PlayStation VR: Developed by Sony for use with the PlayStation 4 and 5, offering a VR experience integrated with console games.



Valve Index: Known for its high-performance specifications, such as a high refresh rate and a wide field of view.

b) Hand Controllers:

Oculus Touch Controllers: Used with the Oculus Rift and Quest, they allow users to interact with the virtual environment using natural gestures.

HTC Vive Controllers: They provide haptic feedback and enable precise manipulation of objects in the virtual environment.

Valve Index Controllers: Also known as "Knuckles," allow for individual finger tracking, providing a more intuitive and detailed interaction.

c) Motion Sensors:

Base Stations (Lighthouse): Used with the HTC Vive and Valve Index, they track the user's movements in a 3D space.

Oculus Sensors: Used with the Oculus Rift for high-precision positional tracking.

d) High Performance Computers:

Computers equipped with powerful graphics cards (such as NVIDIA GeForce RTX or AMD Radeon) are necessary to render complex graphics and ensure a smooth VR experience.

AUGMENTED REALITY (AR) EQUIPMENT

Augmented Reality (AR) overlays digital elements onto the real world, enriching the perception of the physical environment. AR equipment includes:

a) Smart Glasses:

Microsoft HoloLens: One of the most advanced AR devices, used in a variety of industrial and educational applications. It includes motion-tracking sensors and a transparent screen that overlays digital graphics onto the real world.

Google Glass Enterprise Edition: Focused on enterprise applications, it provides contextual and hands-free information to the user through a small prismatic screen.

b) Smartphones e Tablets:

iPhone and iPad: Apple has been investing heavily in AR with its ARKit, allowing iOS devices to deliver high-quality AR experiences.

Android devices: Utilizing ARCore, Google's AR platform, enabling AR experiences on a wide range of Android devices.

c) Controllers & Accessories:

AR Handheld Controllers: Some AR systems use specific hand controllers to interact with digital elements.



Motion Sensors: Some AR devices include additional sensors to improve motion tracking and interaction accuracy.

APPLICATIONS & BENEFITS

Education and Training: Realistic Simulations: VR equipment is used for training simulations in areas such as medicine, aviation, and military operations, allowing for practice without real risks.

Interactive Lessons: AR is used to create interactive learning experiences, such as viewing anatomical models in 3D or exploring historical sites virtually.

Health: Exposure Therapies: VR is used in the treatment of phobias and anxiety disorders, allowing patients to face their fears in a controlled environment. **Surgical Assistance:** AR helps surgeons by overlaying vital information and anatomical models during surgical procedures.

Operational Training: AR is used to train employees in the operation of complex machinery by overlaying instructions directly on the equipment.

Technical Assistance: Technicians can use smart glasses to receive detailed, real-time instructions during equipment maintenance

METHODOLOGY

This study aimed to investigate the impact of Augmented Reality and Virtual Reality on management and organizational culture, highlighting the benefits, challenges and best practices for its implementation. This methodology details the research and analysis process on the application of Augmented Reality (AR) and Virtual Reality (VR) in management and organizational culture.

The study aimed to explore how these technologies can be integrated to improve efficiency, collaboration, and employee engagement within an organization. The approach combines qualitative and quantitative methods to provide a comprehensive and rigorous view on the topic, the selected companies were from various segments, health, safety, industry, recruiters. As a method, the research will be conducted in two main phases: a qualitative exploratory phase and a quantitative phase.

PHASE 1: QUALITATIVE EXPLORATORY

Literature Review: a comprehensive review of the existing literature on AR and VR, focusing on their applications in organizational management. Sources include scholarly articles, in databases such as EEE Xplore Digital Library, ACM Digital Library, ScienceDirect, SpringerLink, Google Scholar, books, case studies and industry reports. Primary references include works by authors such as Milgram and Kishino (1994) on AR and Jerald (2015) on VR.

Semi-Structured Interviews: Interviews were conducted with managers and technology specialists of the companies studied, such companies have already implemented AR and VR to a

greater or lesser extent. The interviews aimed to understand the motivations, challenges, implementation strategies and results obtained.

Sample: 10-15 managers and specialists from companies recognized for their technological innovation.

PHASE 2: QUANTITATIVE RESEARCH

Development of a Questionnaire: A questionnaire based on the findings of the qualitative phase was conducted. The questionnaire was designed to gauge employees' perceptions of the use of AR and VR in their organizations. Variables measured include job satisfaction, engagement, productivity, and training effectiveness.

Data Collection: The questionnaire was applied to a target audience of employees who work in companies that use AR and VR. Data collection was carried out through online platforms to maximize reach and convenience, samples were collected from 233 employees.

Data Analysis: Statistical techniques were used to determine quantitative data. Tools such as SPSS and R were used to perform descriptive and inferential analyses. Specific analyses included linear regression to assess the impact of AR and VR on productivity and analysis of variance (ANOVA) to compare satisfaction between different groups.

ETHICAL PROCEDURES

Informed Consent: All research participants were informed about the study objectives, procedures, risks, and benefits before giving their written informed consent.

Confidentiality: The confidentiality of the data collected was guaranteed, using coding to anonymize the participants' responses.

Approval by the Ethics Committee: Approval by a research ethics committee was approved before starting data collection.

LIMITATIONS OF THE STUDY

Generalization of Results: The sample was not representative of all companies and regions, limiting the generalization of results.

Self-Report Biases: The use of questionnaires can introduce self-report biases, where participants may not answer in a fully honest or accurate manner.

RESULTS AND DISCUSSIONS

According to the objective of the research, which was the investigation of the impact of Augmented Reality (AR) and Virtual Reality (VR) technologies on management and organizational



culture, the results were obtained from qualitative interviews with managers and technology specialists, as well as a quantitative survey with employees of several companies that use these technologies. Combined qualitative and quantitative data analysis was performed which provided a comprehensive understanding of the benefits, challenges, and best practices associated with the application of AR and VR in organizations, as follows:

In the literature review stage, the efficacy of AR and VR in various organizational contexts was highlighted. Studies indicate that VR can increase knowledge retention by up to 75% when used in training, while AR can increase productivity by 40% when providing real-time technical support (PWC, 2020; DELOITTE, 2021).

Regarding the interviews with Managers and Specialists, they revealed several recurring themes; Regarding Employee Onboarding and Training, managers reported that the use of VR for onboarding programs resulted in faster and more effective onboarding of new employees. A manager at a technology company said, "VR allows new employees to experience the company culture and understand their responsibilities in a more immersive and hands-on way."

Regarding the items Productivity and Efficiency, the AR experts reported that the implementation of AR in operational tasks significantly reduced errors and increased efficiency, these presented as an example, a maintenance supervisor highlighted that "AR offers step-by-step instructions directly in the field of vision of technicians, which reduces troubleshooting time and improves task accuracy."

Regarding the challenges in Implementation, respondents also identified challenges, such as the need for significant upfront investments and resistance to change among some employees. "Initial adaptation can be difficult, but with proper training, the long-term benefits are substantial," commented one human resources director.

Regarding the quantitative results: Satisfaction and Engagement questionnaire, was answered by 233 employees from several companies that use AR and VR. The results showed:

Job Satisfaction: 78% of respondents indicated an increase in job satisfaction after implementing AR and VR. Employees reported that these technologies made their work more interesting and challenging.

Employee Engagement: 82% of respondents said they feel more engaged and motivated to learn new skills using AR and VR. One employee commented, "VR allows me to practice new skills in a safe and fun way, which increases my interest in training."

Productivity: 65% of respondents reported an increase in productivity, highlighting that AR provides real-time, contextual information that makes it easier to get things done. "With AR, I have immediate access to the information I need without having to search through manuals or ask colleagues," said one production line operator.



Data analysis revealed significant correlations between the use of AR/VR and improvements in organizational performance indicators. Linear regression showed that the implementation of these technologies explains 48% of the variation in employee productivity ($R^2 = 0.48$, $p < 0.01$). In addition, ANOVA indicated significant differences in job satisfaction between groups that use and do not use AR/VR ($F = 7.62$, $p < 0.01$).

CONCLUSION

Considering the objectives outlined in this study, the results of the research confirm that AR and VR have a positive impact on management and organizational culture. The integration of these technologies provides a more effective training experience, improves productivity, and increases employee engagement. However, successful implementation requires a strategic approach, infrastructure investments, and ongoing training programs to overcome initial challenges and maximize long-term benefits.

Resistance to change and upfront costs are significant challenges, but they can be mitigated through clear communication of benefits, practical demonstrations, and ongoing support to employees during the transition phase. Management must be committed to leading by example and fostering a culture of innovation and continuous learning.

The application of AR and VR in management and organizational culture offers a number of benefits that can transform the way companies operate and engage their employees. The results of this research provide clear evidence that these technologies not only increase efficiency and productivity but also promote a more satisfying and engaging work environment. Organizations that embrace these innovations are well-positioned to meet the challenges of the future and seize the opportunities that come with digital transformation.




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Microstructural and mechanical analysis of GMAW short-circuit welding on dual phase DP1000 steels for automotive applications

 <https://doi.org/10.56238/sevned2024.010-048>

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ABSTRACT

The article investigates welding methods applied to Dual Phase (DP) steels, with emphasis on the DP1000 class, aimed at the automotive industry. DP steels, known for their high mechanical resistance due to their specific microstructure, are attractive for manufacturing lighter, stronger and safer vehicles. The welding method chosen was GMAW by conventional short circuit, due to its efficiency and low cost. The characterization used advanced optical microscopy techniques, scanning electron microscopy with EDS, EBSD, in addition to tensile and hardness tests. Microstructural analyzes using optical microscopy (OM), scanning electron microscopy (SEM) and EBSD confirmed the presence of ferrite, martensite and, occasionally, austenite in the base metal, as specified by the DP1000 steel manufacturer. The molten zone (ZF) showed variations in hardness, with values close to the thermally affected zone (TAZ) due to decarburization and the presence of alloying elements in the steel. Microstructural analysis of the weld beads by SEM identified proeutectoid ferrite, martensite and retained austenite. The changes in the microstructural and mechanical properties observed did not compromise the essential characteristics of the material, confirming that the short-circuit GMAW process proved to be suitable for applications in the automotive industry.

Keywords: GMAW, Microstructure, Conventional Short Circuit, DP1000, Welding.

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INTRODUCTION

Climate change has intensified in recent decades, mainly due to human activities. This phenomenon, known as global warming, results in an increase in the average temperatures of the planet and oceans. The intensification of the greenhouse effect, caused by the higher concentration of gases such as carbon dioxide, methane, and nitrous oxide in the atmosphere, is the main cause of global warming (INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, 2018).

Emissions of these greenhouse gases reached new records in 2017, as reported by the U.S. National Oceanic and Atmospheric Administration (NOAA) and the American Meteorological Society (AMERICAN METEOROLOGICAL SOCIETY, 2018). In Brazil, vehicle emissions have increased significantly over the past two decades, with a growth of 192% between 1994 and 2014. According to a survey by the Institute of Energy and Environment in 2015, it is estimated that the car fleet in the country will double by 2030, reaching 88 megatons of carbon dioxide equivalent per year.

Faced with these challenges, the automotive industry has been looking for solutions to reduce the environmental impact of its products. The development of new metal alloys, such as Advanced High Strength Steel (AHSS), plays a crucial role in this mission. These steels, which combine high strength, good toughness, ductility, and formability, are ideal for the manufacture of lighter and safer vehicles (WORLD AUTO STEEL, 2017).

Fierce competition in the automotive industry means that material selection is driven by both cost and safety. Between 1980 and 2010, the percentage of steel used in vehicles increased from approximately 53% to 55% by weight, and today, about 60% of the materials in light vehicles in the North American industry are steel (TAMARELLI, 2017). This growth reflects the ability of AHSS steels to meet the performance and sustainability requirements of the industry.

Dual-Phase (DP) steels are especially valued in the automotive industry because they allow the reduction of vehicle mass, reducing the thickness of the plates and/or the specific densities, which contributes to the reduction of pollutant emissions at an affordable cost (SAMEK & KRIZAN, 2012). In addition, these steels offer excellent impact absorption, increasing passenger safety in the event of a collision (SHOME & TUMULUTU, 2015).

Despite the advantages, there are still challenges related to the weldability of DP steels, which need to be overcome for their wide application in the automotive industry. Non-standard welding parameters and the need to maintain strength and toughness in welded regions are critical issues (SHOME & TUMULUTU, 2015). The GMAW welding process, widely used for its high productivity, requires strict control of the parameters to ensure the quality of the welded joints (RODRIGUES, 2012).

Thus, this study aims to investigate the microstructural and mechanical changes of welded joints of Dual-Phase micro alloyed steel (DP1000), using the GMAW short-circuit welding process.



It seeks to ensure that the welded joints have good mechanical and metallurgical characteristics, adequate to the requirements of the automotive industry.

THEORETICAL FRAMEWORK

ADVANCED HIGH STRENGTH STEEL (AHSS)

Technological advances in processes such as continuous casting and thermomechanical processing have allowed the creation of advanced high strength steels (AHSS). These steels are characterized by their complex microstructures, which include hard islands of martensite, bainite and/or residual austenite dispersed in a ductile ferrite matrix. The combination and proportion of these phases are adjusted to produce the desired mechanical properties (Chatterjee & BHADSHIA, 2006).

AHSS steels are classified into different categories, each with specific characteristics that cater to diverse industrial applications. According to Keeler, Kimchi, and Mooney (2017), the main classes of AHSS include:

Dual Phase (DP) Steels: They combine ferrite and martensite, offering an excellent combination of ductility and strength.

Complex Phase (CP) steels: These contain a mixture of martensite, bainite and small amounts of residual austenite and ferrite.

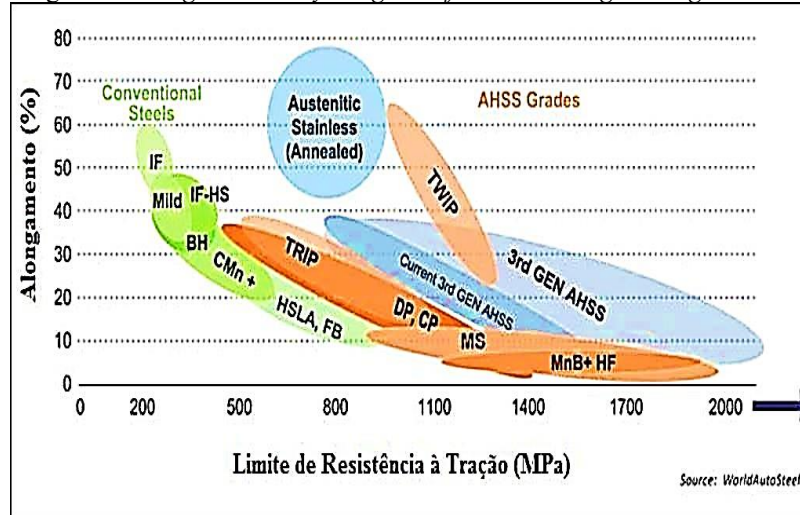
Transformation Induced Plasticity (TRIP) steels: These include ferrite, bainite and residual austenite that transforms to martensite under deformation, increasing ductility and strength.

Martensitic Steels (MS): Composed mainly of martensite, they provide high strength and are used in safety components that require high energy absorption.

AHSS has a higher tensile strength than HSLA (High-Strength Low-Alloy) steels, while maintaining the same ductility. Hardening mechanisms in AHSS include solid solution hardening, precipitation, grain refinement, and austenitic to martensitic phase transformation (BLECK, 2004). This makes AHSS ideal for automotive applications, especially in the production of shock-resistant structures where strength and energy absorption are essential (TASAN et al., 2015).

The multiphase microstructure of AHSS, composed of a ferrite matrix and islands of martensite, bainite, austenite and/or retained austenite, allows the fabrication of thinner sheets without compromising structural rigidity. Figure 1 shows the classification of strength levels as a function of elongation for the wide variety of grades of advanced high-strength steels.

Figure 1: Strength- Ductility Diagram of Advanced High Strength Steels.



Source: Adapted from Keeler and Kimchi (2017).

DUAL PHASE STEELS - DP

According to Kou (2020), Dual Phase (DP) steels are named based on their yield stress and tensile strength limit. For example, the DP500/800 grade indicates a steel with 500 MPa yield strength and 800 MPa tensile strength. Generally, these steels are classified by tensile strength limit and are commercially available in the range of 600 to 1200 Mpa.

The specific properties of DP steels are mainly attributed to their microstructure, which consists of martensite islands, a hard phase, embedded in a ferrite matrix, which is soft and ductile (CALCAGNOTTO *et al.*, 2011). The martensitic phase imparts strength, while the ferritic phase provides ductility. The volumetric fraction of martensite determines the strength level of the material, allowing these steels to achieve a tensile strength range between 500 and 1200 MPa (FONSTEIN, 2015).

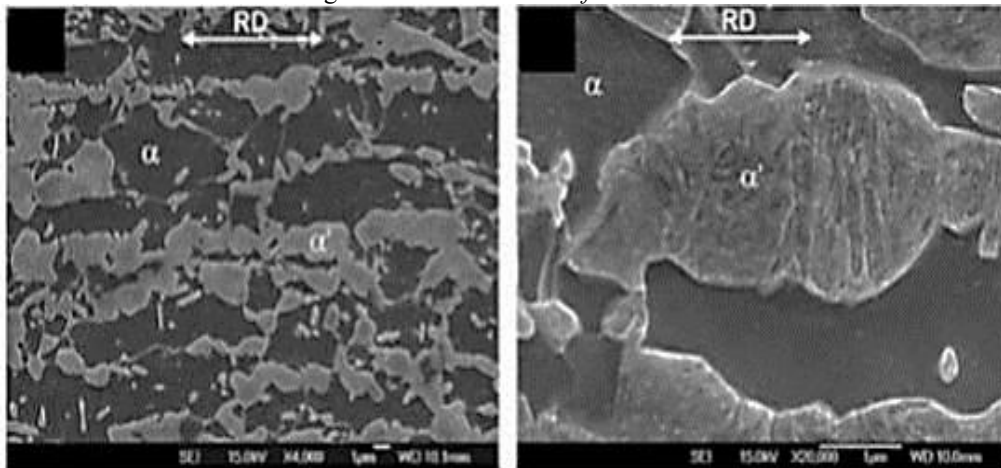
In addition to the traditional martensite and ferrite phases, other microstructural arrangements, such as bainite, austenite, and carbides, may be present, depending on the thermal processing route and chemical composition of the alloy (SEYEDREZAI *et al.*, 2014; GHASSEMI-ARMAKI *et al.*, 2014).

A wide range of mechanical properties can be adapted in DP steels by controlling factors such as martensite volumetric fraction, average carbon content and its distribution in martensite, ductility, martensite distribution, ferritic grain size, and alloying element content (ZHANG *et al.*, 2016).

Fonstein (2015) in his research comparing HSLA (High-Strength Low-Alloy) steels, DP steels contain more than 1% alloying elements. Its chemical composition varies, but the main alloying elements include carbon, manganese, and silicon. Other elements, such as aluminum, nitrogen, phosphorus, and sulfur, may also be present in smaller amounts. Dual Phase steel in general has additions of Mn and Si. Figure 2 shows the microstructure of a DP steel, where ferrite (α) is the darkest and lowest relief, while martensite (α') is the lightest phase and has the highest relief.

The martensitic regions promote hardening by dispersion following the law of mixtures, i.e., the higher the proportion of martensite, the more accentuated the generation of discordances in the ferrite around the martensite and the greater the mechanical strength of the material (KRAUSS, 2005). These discrepancies are generated by the shear and volume change associated with the transformation of austenite into martensite.

Figure 2: Microstructure of a DP steel.



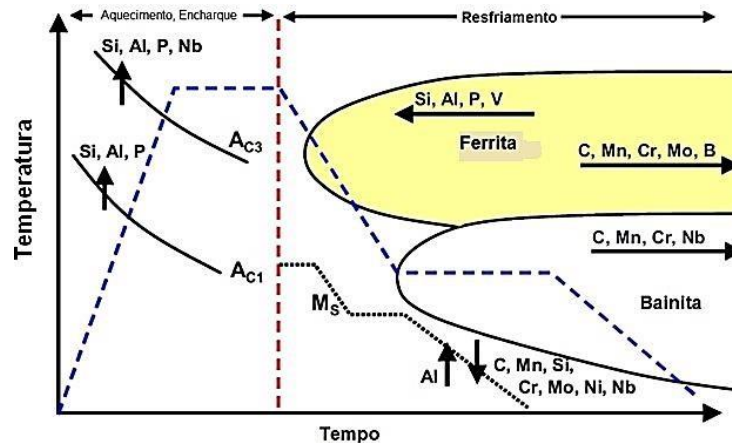
Source: Fonstein, et. al., 2015.

ALLOYING ELEMENTS OF DP'S STEELS

In DP's steels to acquire microstructures aiming at optimal mechanical properties, alloying elements are inserted, such elements control the volumetric fraction of martensite, which is formed after heat treatment of quenching and increase the strength of the steel by means of hardening mechanisms by solid solution and precipitation. Figure 3 shows the diagram of the effect of the insertion of alloying elements on the kinetics of phase transformations for advanced high-strength steels. It is verified that alloying elements can accelerate or slow down the transformation reactions and, in this way, influence the final microstructure of the material (ALLAM, 2015).

In terms of chemical composition, two-phase steels contain a carbon content in the range of 0.06-0.15% by weight (TASAN et al., 2015). This element has the function of hardening the martensite and stabilizing the austenite, delaying the transformation of ferrite and bainite, which allows slower cooling rates to obtain martensite, as can be interpreted by the analysis of figure 3. In addition, a low carbon content significantly improves the weldability and toughness of the material (SHI et al., 2014).

Figure 3: Schematic drawing of the effect of alloying elements on the temperature and kinetics of the phase transformation of AHSS



Source: Adapted from Allam (2015)

Typical manganese contents employed in two-phase steels range from 1.5 to 3% by weight. It is employed to delay the onset of austenite transformation and thus allow the use of slower cooling rates during quenching treatment. Manganese diffusion is substantially slower in austenite than in ferrite (Kuang et al., 2008). Therefore, if during intercritical annealing the soaking time is short, a concentration of manganese may occur in the austenite grain contours, which increases local hardening after heat treatment, as shown in figure 4.

Figure 4: Manganese-enriched region within a martensite particle



Source: Adapted from Kuang et al. (2008)

The use of microbinders such as vanadium, niobium and titanium aims to favor the precipitation hardening mechanism and promote the grain refinement of the microstructure. To increase hardenability, chromium and molybdenum can be added to the steel. These elements also decrease the transformation temperature of the bainite, thus limiting its formation.

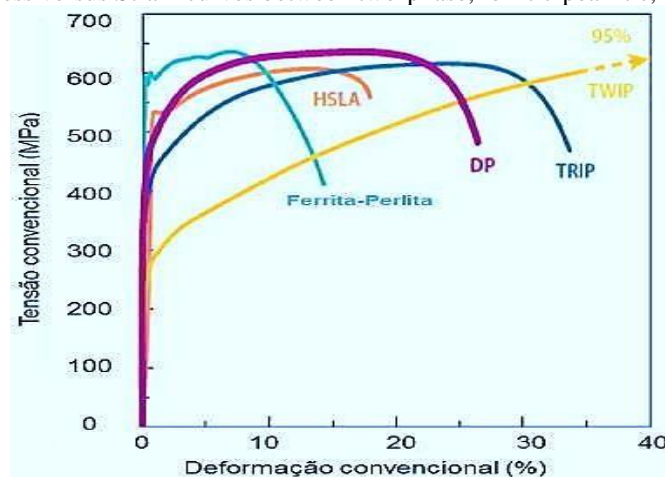
MECHANICAL PROPERTIES OF DP'S STEELS

Mechanical performance is the main factor driving the development of two-phase steels, as

these materials have good characteristics of mechanical strength, formability, continuous flow (absence of Lüders bands), high initial hardening rate and ductility (WANG *et al.*, 2013). It is these mechanical characteristics that allow two-phase steels to be increasingly used by the automotive industry to meet the demands of weight reduction and high crash resistance.

Tasan *et al.* (2015), established a comparison of the tensile properties between two-phase steels with ferritic-pearlitic, high-strength low-alloy (HSLA), TRIP and TWIP steels, as shown in Figure 5. In relation to the other steels analyzed, the two-phase steels demonstrated a unique behavior due to their microstructure being composed of a soft matrix of ferrite and martensite particles with high hardness. Although the newer advanced high-strength steel (AHSS) grades exhibit higher ductility, TRIP and TWIP steels, for now, have limited their use in the automotive industry due to factors such as: manganese segregation, high alloy cost and low weldability.

Figure 5: Comparison of Stress versus Strain curves between two-phase, ferritic-pearlitic, HSLA, TRIP and TWIP steels



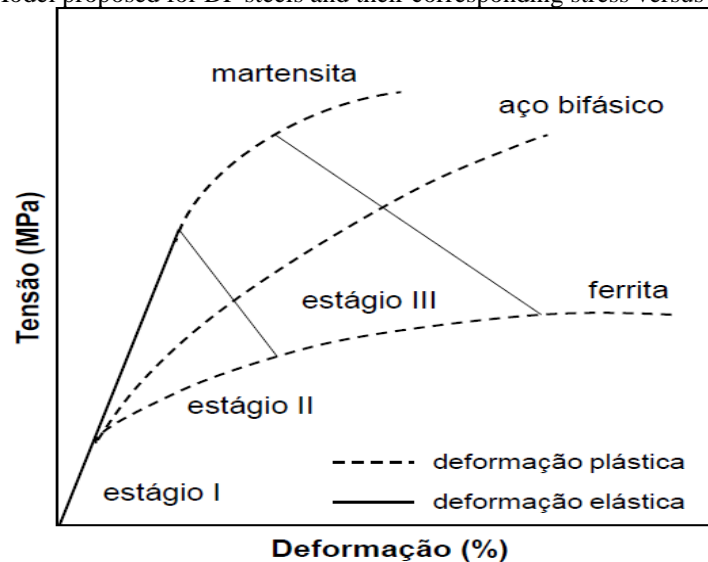
Source: Adapted from Tasan, et al. (2015)

DEFORMATION IN DP'S STEELS

Regarding deformation, Fonstein (2015) concluded that the behavior of two-phase steels is analogous to heterogeneous alloys that contain phases with substantially different mechanical properties and, therefore, can be considered composite materials. Thus, its mechanical properties are determined by the individual properties of the phases and their stereological parameters.

Figure 6 represents a deformation model diagram proposed for DP steels, which considers the individual behavior of the phases in relation to the deformation. According to Han *et al.*, (2011), the stress versus strain curve can be divided into three distinct stages. Stage I corresponds to the region in which ferrite and martensite deform elastically. In stage II, ferrite begins to undergo plastic deformation, while martensite continues to deform elastically. In stage III, the two phases deform plastically.

Figure 6: Model proposed for DP steels and their corresponding stress versus strain curves.



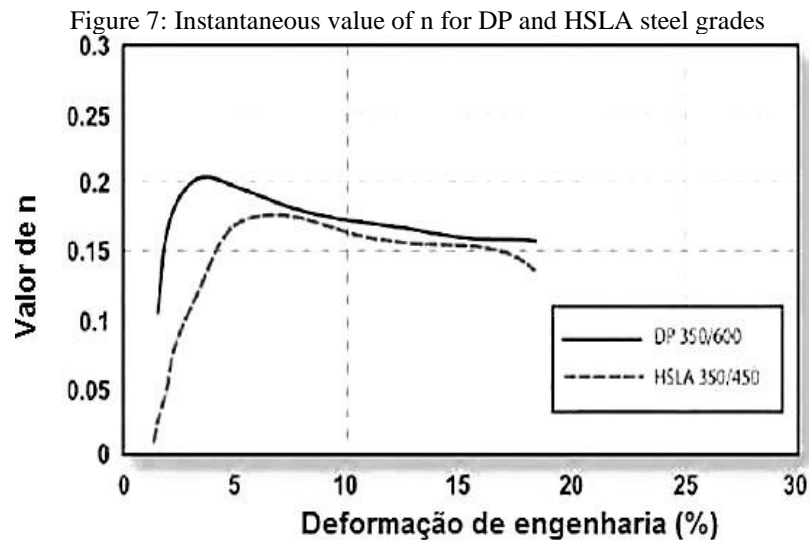
Source: Adapted from Han et al. (2011)

Initially, DP steels deform elastically up to the principle of continuous flow and high hardening rates, which determines the beginning of plastic deformation. As the plastic deformation continues, the hardening rate decreases until it reaches the resistance limit that determines the onset of plastic instability and, consequently, the rupture of the material.

HARDENING EXPONENT

The hardening exponent (n) is defined as the rate of increase in strength with plastic deformation. High n values are associated with good metal formability, since there is a more uniform distribution of deformations during the forming process, avoiding plastic instability and breakage. The main difference between two-phase (DP) steels and high-strength, low-alloy steels (HSLA) is that the former have high hardening exponent values and, therefore, are used in the manufacture of parts with more complex geometry for the automotive industry (DEMERI, 2013).

Conventional steels have a constant value for the hardening exponent as the deformations increase. Thus, n values were obtained in the strain range of 10 to 20%. Currently, some grades of advanced high-strength steels (AHSS) exhibit a hardening exponent that varies with deformation. Figure 7 shows the comparison of the n -value behavior between an HSLA 350/450 steel and a DP 350/600 steel. Two-phase steels are found to exhibit a high n value for small deformations. From deformations of the order of 7 to 8%, the values for the hardening exponent between two-phase steels and HSLA steels are approximated.



Source: Adapted from Demeri (2013)

The rapid hardening of two-phase steels can be attributed to three factors:

The residual stress generated during quenching heat treatment is relieved by plastic deformation;

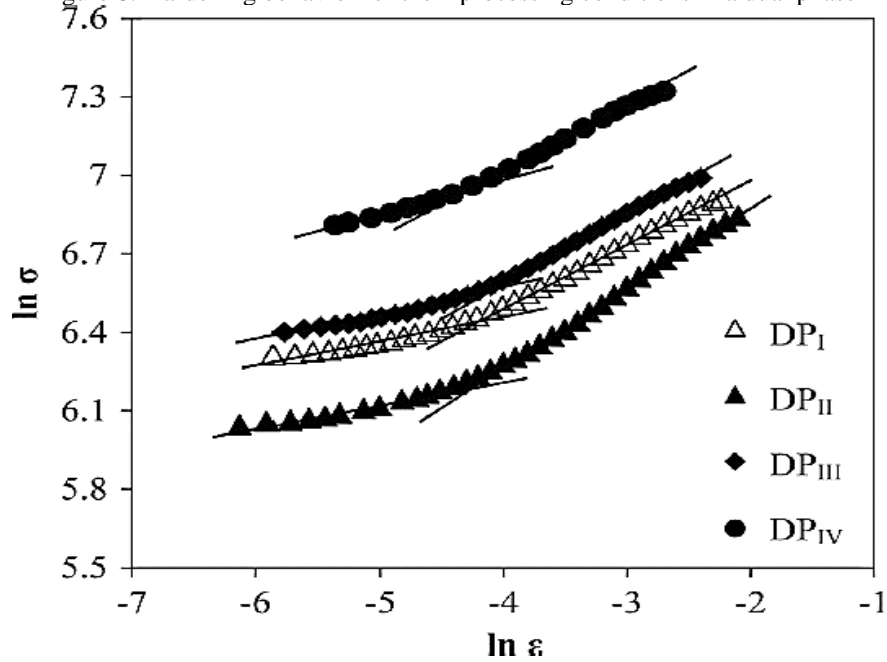
The increase in the density of disagreements in the ferritic matrix;

The plastic incompatibility between the ferrite and martensite phases causes compressive stresses in the ferrite, and these stresses restrict the displacement of the disagreements;

Figure 8 shows the hardening stages for a steel with a chemical composition of 0.17% C, 0.4% Si, 1.15% Mn and 0.95% Cr, with different thermomechanical processes analyzed by (MAZAHERI *et al.*, 2014).

In the DPI condition, the steel was initially heated to a temperature of 600°C for 20 minutes and cooled in water. It was then annealed at a temperature of 770°C for a period of 8 minutes and cooled in water. For the other three conditions, 600°C heating for 20 minutes was not applied. The intercritical annealing conditions used for these samples were: 770°C for a period of 8 minutes (DPII); 770°C for 10 minutes (DPIII) and 790°C for 8 minutes (DPIV). For all conditions, after annealing, cooling in water was carried out.

Figure 8: Hardening behavior for the 4 processing conditions in a dual phase



Source: Adapted from Mazaheri et al. (2014)

According to the author, the presence of different hardening stages in two-phase steels is related to the different activation mechanisms that occur for different strain intensities. In the first stage, with less inclination, the ferritic matrix deforms plastically while the martensite remains in the elastic regime. In the second stage, with greater inclination, the two phases deform plastically.

THE GMAW WELDING PROCESS

GMAW (Metal Arc Welding), also known as MIG/MAG (MIG – Metal Inert Gas) and (MAG – Metal Active Gas), is a welding process using an electric arc between the continuous feed wire-electrode and the weld pool. According to the American Welding Society – AWS (1991), the GMAW process uses an external gas shield without the application of pressure.

The welding process works with direct current (DC), in general it uses the wire on the positive pole (reverse polarity). In GMAW, welding currents from 50 A to 600 A, and welding voltages from 15 V to 32 V are commonly employed (SCOTTI & PONOMAREV, 2008).

According to Costa (2014), because it is a process that presents low current values during the open arc phase, and low voltage values, the heat transferred to the part is reduced, making the GMAW process suitable for applications that have as a requisite parts of small thickness, minimal distortion of the part, welding of tubular joints and stainless steels, that is, in operations that require low heat input.

With regard to direct polarity (wire on the negative pole) and alternating polarity, these are less used, as they require specific sources and techniques. Figure 9 shows an illustration of the GMAW soldering circuit:

Figure 9: GMAW Soldering Circuit



Source: Adapted from Lincoln Electric (2015a)

In the MIG/MAG welding process, different types of metals can be joined in different welding positions, in semi-automatic ways, or in mechanized/robotized/automated ways. API Standard 1104 (2010) conceptualizes mechanized welding as a process in which the parameters and orientation of the torch are controlled electronically or mechanically, but can be manually varied during welding to maintain the specified welding conditions.

With regard to semi-automatic welding, still according to API 1104 (2010), the equipment only controls the material feed and the welding progress is controlled manually. With automatic welding, the equipment is responsible for performing all operations without manual handling of the arc and welding speed, that is, without any interference from the operator, not depending on his manual skill.

Scotti & Ponomarev (2008) report that with respect to the use of an external gas shield, the appropriate flow for virtually all welding conditions is 10 to 16 l/min, and that values above these are usually inefficient. Regarding the thermal conductivity of the shielding gas, the temperature of the arc (plasma) influences its voltage, in the same way that it influences the thermal energy transferred to the pool, thus, the higher the thermal conductivity of the gas, the greater the welding voltage provided to sustain the arc, and with that, the greater the thermal energy. (FORTES, 2005).

In addition to pure shielding gases, mixtures are also commonly used. Additions of argon to carbon dioxide decrease the splash levels normally experienced with pure carbon dioxide. The mixture Argon + 21-25% CO₂ (C25) is universally known as the gas used in GMAW welding with short-circuit transfer. This mixture works well in high-current applications in thick materials, and can achieve good arc stability, weld pool control and bead appearance, as well as high productivity (FORTES, 2005).

METALLIC TRANSFER MODES

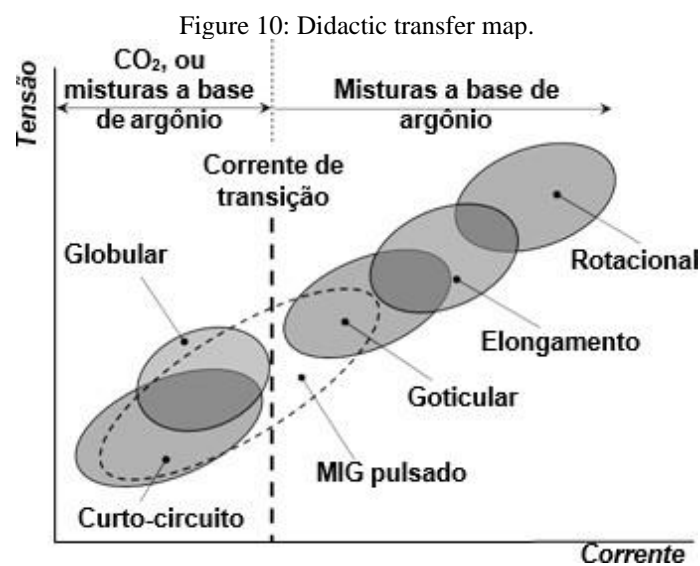
One of the main factors that influences the achievement of a good quality weld is the way the

material is transferred from the electrode (filler material) to the weld pool, that is, the mode of metal transfer (VILARINHO, 2007).

The modes of metallic transfer can be observed in the different welding processes, being associated with several factors, such as electrical parameters (voltage, type and polarity of the current), materials, gases, distance between the contact nozzle and the part (DBCP), specific characteristics of the power source, etc. (VILARINHO, 2007).

Scotti & Ponomarev (2008) subdivide the modes into two fundamental types of metal transfer in the GMAW process, the natural and the controlled mode. In natural transfer mode, metallic transfer varies "naturally" within a range of current and arc voltage levels. On the other hand, in the controlled transfer, the welding source is used to obtain current waveforms, so that the transfer "obeys" this controlled variation of the electrical parameters (VILARINHO, 2007).

The natural mode is classified into two transfer classes, short-circuit and free-flight (globular, goticular and explosive). In a more didactic way, it is possible to compile these transfer modes in a graph called a transfer map, as illustrated in Figure 10.



Source. Adapted from Vilarinho (2007)

In response to the technological advances in welding sources and control systems, the IIW (International Institute of Welding) has been proposing updates in the classification of metal transfer modes. Figure 10 represents the transfer modes according to the IIW classification for short-circuit transfer with increased current as one moves from modes A to E.

In short-circuit transfer, there is contact of the droplet with the puddle before its detachment. The main limitation of short-circuit transfer is the generation of spatter during the rupture of the liquid bridge between the electrode and the puddle by the Pinch Effect, which decreases the production capacity, either due to the loss of filler material or the need to spend resources for its removal (SOUZA, 2011). Good stability is obtained when using gases with CO₂ (lower cost and



higher thermal input) or Ar+CO₂ mixtures (lower splash level) (VILARINHO, 2007).

This short-circuit transfer mode is particularly useful for joining thin materials in any position, thick materials in the upright and overhead positions, and for filling wide openings. In short-circuit transfer welding, wires with diameters in the range of 0.8 mm to 1.2 mm are used, and small arc lengths (low voltages) and low welding currents are applied (FORTES, 2005).

In free flight transfer (globular, dropicular and explosive), the drop detaches before touching the pool, in which small drops of molten metal are detached from the end of the wire and projected by electromagnetic forces towards the weld pool (FORTES, 2005).

Globular transfer occurs when the molten metal droplets are too large and move towards the melt pool under the influence of gravity (FORTES, 2005). It is characterized by the use of low currents, but with a higher arc voltage and with a transfer frequency of less than 100 Hz (low and irregular). The weldments are limited to the flat position, with great arc instability, seriously limiting the use of this mode of transfer (VILARINHO, 2007).

Goticular transfer occurs when the current is increased above a level called transition current, seeking to maintain the same arc length. There will be a change in the mode of formation of the droplet in a small range of current (transition current), going from large drops at low frequency (globular) to small drops at high frequency (droplet), usually above 200 Hz (VILARINHO, 2007). It should be noted that the value of the transition current is a function of the material, diameter and length of the electrode, as well as the shielding gas and DBCP (VILARINHO, 2007).

METHODOLOGY

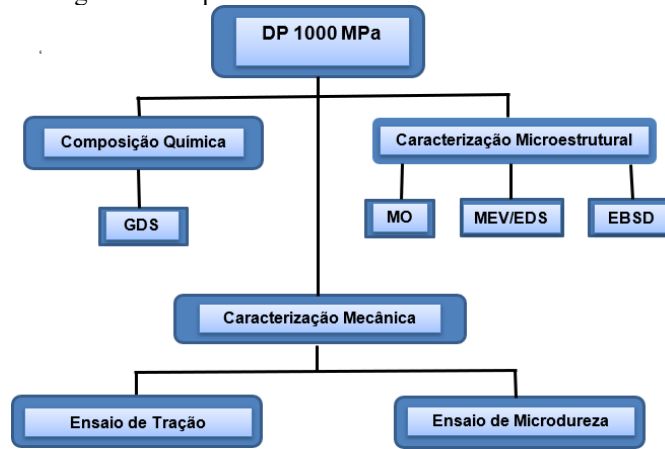
The purpose of this study was to investigate the microstructural and mechanical changes of Dual-Phase micro alloyed steel welded joints (DP1000), using the GMAW short-circuit welding process, ensuring that the welded joints presented microstructural and mechanical characteristics suitable for applications in the automotive industry. To achieve this goal, a methodology was adopted that included several stages.

Initially, experimental tests were carried out to characterize the base metal, aiming to understand its mechanical and microstructural properties. Then, the best parameters for the weld seams were selected, taking into account aspects such as welding speed and applied voltage. Based on these parameters, the final weld seams were made.

After the weld seams were made, they were subjected to qualification tests in order to verify their conformity with the required technical specifications. Finally, evaluations of the mechanical and metallurgical properties of the welded joints were carried out, using appropriate analytical techniques. Figure 11 shows the stages of characterization of the steel, used for the development of the research, such steps were carried out due to the need for more information on the base metal, as it

is a recently developed steel, and in figure 12, the stages of the experiments for analysis of the weld seams after welding are presented:

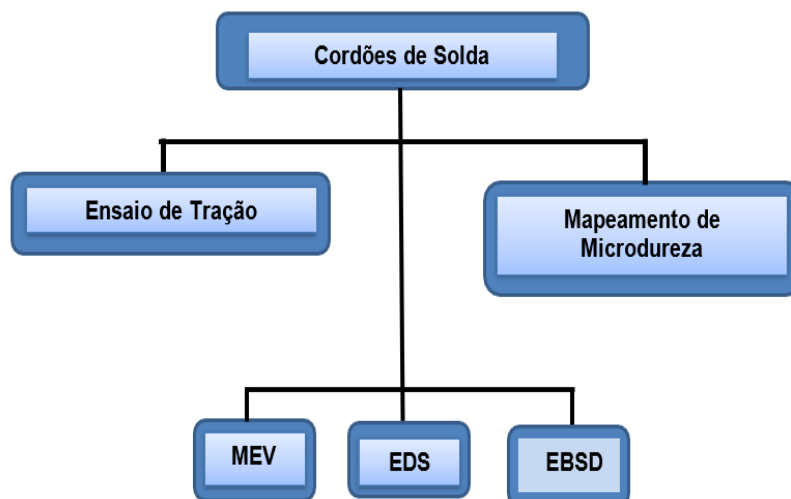
Figure 11: Steps for characterization of the base metal.



Source: Author (2024).

After the characterization stage of the base metal, a second stage was carried out aiming at the parameterization of the welding procedure, where carbon steel 16 was used as base metal, plate thickness of 1.50 mm, the welding speed parameter (V_s) was the preponderant factor for the choice of welding requirements, because it was sought a higher productivity in the process, Thus, as the result of macroscopic characterization to verify defects and possible points of improvement in parameterization.

Figure 12: Steps for characterization of Weld Beads.



Source: Author (2024).

RESULTS AND DISCUSSIONS

CHEMICAL COMPOSITION OF THE BASE METAL

The chemical composition of the Dual Phase 1000 Mpa resistance steel, performed by the Discharge and Gloss Spectrometer – GDS, is described in table 1, by percentage by weight of the chemical elements that compose them.

It was verified in the GDS analysis that the result obtained is in accordance with what is established for a Dual Phase microalloyed steel with resistance of the class of 1000 MPa, by the AHSS manufacturer's catalog.

Table 1. Chemical Composition of DP 1000MPa Steel (Percentage by Weight)

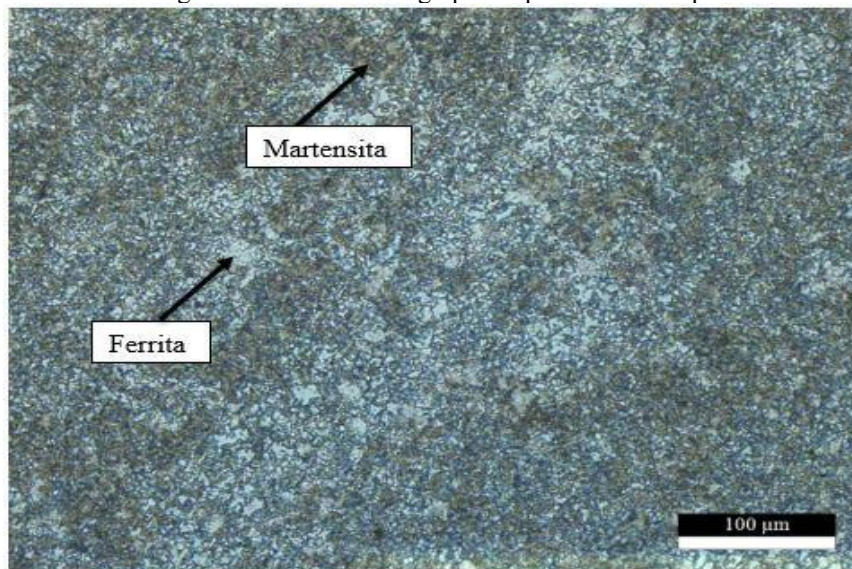
C	Oneself	Mn	P	S	Al	Cr	Mo	Nb	B
0,172	0,469	2,170	0,021	0,002	0,037	0,024	0,004	0,006	0,001

Source: Author (2024)

BASE METAL OPTICAL MICROSCOPY

In the optical microscopy analysis of DP 1000 steels, the presence of two predominant phases was verified, martensite (dark areas) and ferrite (light areas) phases, as shown in figure 7, these are in line with what is presented in the literature, which in general, defines DP steels as composed of a ferritic matrix with the presence of martensite islands (BLECK; PHIU-ON, 2009).

Figure 7: DP1000 Micrograph – Optical Microscope



Source: Author (2024)

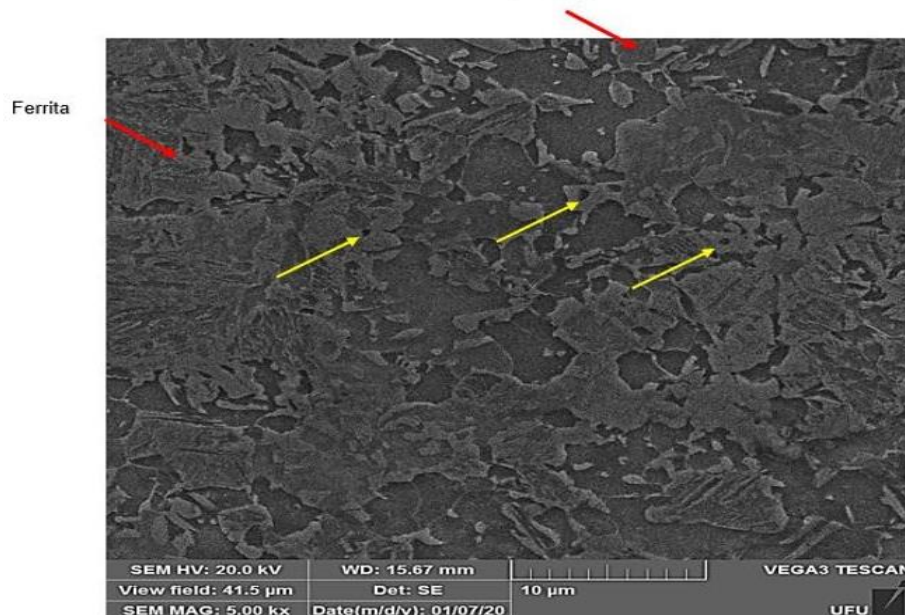
SCANNING ELECTRON MICROSCOPY AND ENERGY DISPERSIVE SPECTROSCOPY – SEM/EDS OF THE BASE METAL

In the SEM micrographs, a finer detail was observed in the distribution of martensite in the ferritic matrix, as shown in Figure 8. The distribution of martensite was not only limited to the

contours of the ferritic grains, but also to the grain contours, but also to the grain contours, and there were nucleation and growth sites of the previous austenite transformed into martensite on cooling. Particle-matrix interfaces are one of these preferred nucleation sites, as we can see for visible particles (FONSTEIN, 2015).

The distribution of martensite was not limited to the contours of the ferritic grains, as shown in figure 8, some ferritic grains showed martensite "islands" in their interior of different sizes and morphologies. It was verified that, in addition to the grain contours, there were nucleation and growth sites of previous austenite transformed into martensite on cooling. Particle-matrix interfaces are one of these preferred nucleation sites, as can be seen for visible particles (HUMPHREYS; HATHERLY, 2004). These visible particles can also be seen in Figure 8, represented by yellow arrows.

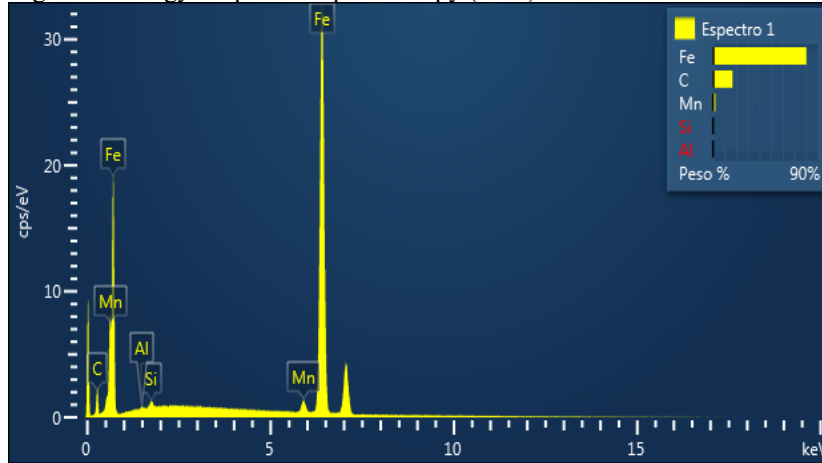
Figure 8: DP1000 micrograph, 5000x magnification – SEM
Martensita



Source: Author (2024)

The EDS analysis of the DP1000 samples showed that their results corroborated the GDS results, as shown in figure 9:

Figure 9: Energy Dispersive Spectroscopy (EDS) DP 1000 of the base metal.

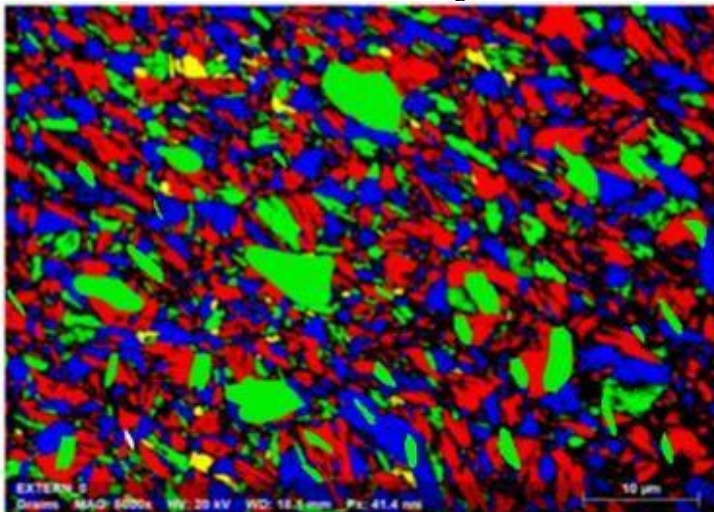


Source: Author (2024)

BACKSCATTERED ELECTRON DIFFRACTION – EBSD OF THE BASE METAL

The results of the EBSD analyses corroborate with the results of GDS, M.O, SEM and EDS, since they present, as shown in figure 10, the difference presented by the EBSD analyses is the detection of the presence of austenite microstructure, which was not possible to present in the M.O and SEM analyses, this can be justified by the equipment being more accurate in the detection of crystalline structures. Austenite is a solid solution of carbon in gamma iron, it is only stable at temperatures above 723 °C, unfolding by eutectoid reaction, at lower temperatures, in ferrite and cementite (CALLISTER & RETHWISCH. 2018).

Figure 10: EBSD DP1000



Phase Name	Raw	Norm
■ Austenite	5,32%	9,18%
■ Ferrite	58,37	83,9%
■ Martensite	6,81%	7,4%

Source: Author (2024)

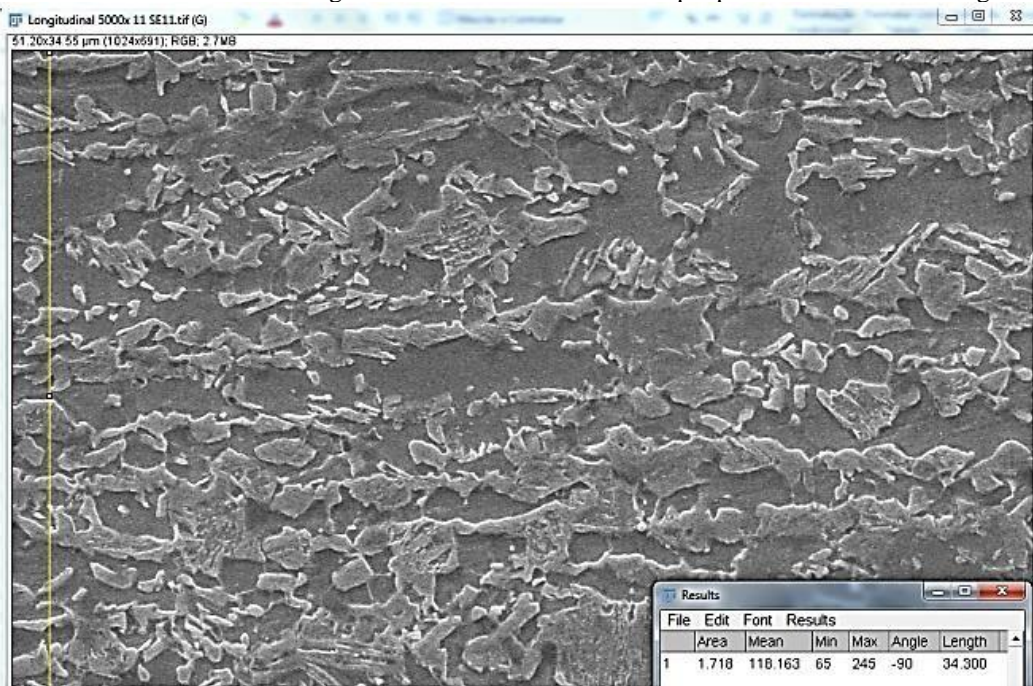
FERRITIC GRAIN SIZE ESTIMATION

The ferritic grain size estimate was performed according to the intercept method described in ASTM E112-13, as follows equation 1:

$$\text{Ferritic T.G.} = ((\text{test line length}) \times (\% \text{ ferrite})) / (\text{No. of grains}) \quad (\text{Eq. 1})$$

Using the free program ImageJ, a test line was drawn in the horizontal direction and its length was defined. To determine the size of the ferritic grain, the number of ferritic grains intercepted by this line was counted. Figure 11 follows. The process was repeated twenty times with the displacement of the constant-size test line over twenty regions of the image. At the end of this step, the same procedure is carried out now by creating a test line in the vertical direction.

Figure 11: Determination of ferritic grain size in a DP1000 steel sample photo SEM at 5000x magnification.



Source: Author (2022)

Table 2 shows the estimates of ferritic grain sizes for the three directions studied: longitudinal, transverse and face.

Table 2. Ferritic grain size estimation

Direction	Average (μm)
Longitudinal	1,78
Transverse	1,36
Face	1,56

Source: Author (2024)

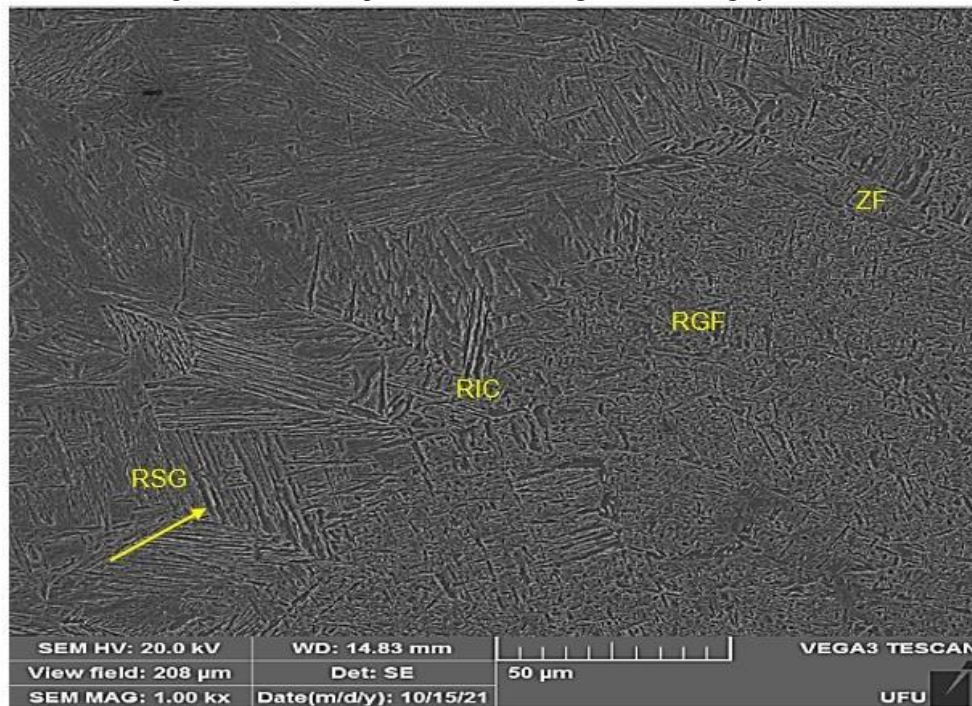
The ferritic grains are not equiaxial, so their average size is determined by the cube root of the product of the average size in each direction, according to equation 2, for the data in table 2, the average size of the ferrite grain was 1.56 μm .

$$\bar{l} = (\bar{l}_l \times \bar{l}_r \times \bar{l}_f)^{1/3} \text{ (Eq. 2)}$$

POST-WELDING SEM TESTS

The SEM analysis for the identification of microstructures was based on the Guide to the Light Microscope Examination of Ferritic Steel Weld Metals, prepared by IIW. Figure 12 shows the cross-section of the welded joint of DP1000 steel, an overview of the region mapped in the SEM, where it is possible to perceive the predominance of second-phase proeutectoid ferrite aligned in the ZF (molten zone), and in the initial position of the ZAC (RGF – fine-grained region). In the RIC zone, the presence of grain contour proeutectoid ferrite was observed, as well as the presence of martensite. In the RSG region, the predominance was of the proeutectoid ferrite microstructure with grain contour, and the presence of a smaller amount of acicular ferrite and martensite (yellow arrow) was also identified.

Figure 12: DP 1000 post-weld SEM image - 1000x magnification



Source: Author (2024)

CONCLUSION

Considering the objectives outlined in this study, the analysis of the GMAW process in DP1000 steel revealed the following conclusions:

Initial characterization of the materials revealed a ferritic matrix with martensite islands, as well as an average ferritic grain size of 1.56 µm and an average hardness of 313 HV. Microstructural analyses by M.O., SEM, and EBSD confirmed the presence of ferrite, martensite, and, in some cases,



austenite in the base metal. The results were consistent with the DP1000 steel manufacturer's requirements.

The experimental chemical composition was used to perform theoretical thermodynamic calculations of phase equilibrium and carbon equivalent. Thus, it was possible to determine the melting temperature for DP 1000 steel was 1512.31°C, the austenitization temperature (A1) was 928.81°C, and the carbon equivalent was 0.54, demonstrating that DP1000 steel has good weldability according to IIW.

The molten zone (ZF) showed variations in hardness, with some points close to the thermally affected zone (ZTA) showing similar values. This phenomenon can be attributed to the decarburization process and the presence of alloying elements in the steel. The SEM microstructural analysis of the weld seams revealed the presence of proeutectoid ferrite, martensite and retained austenite.

These conclusions highlight the feasibility of welding DP1000 steels using the GMAW process by conventional short circuit, highlighting that both the microstructural and mechanical properties have undergone modifications, however, these have not affected their primordial characteristics for use in the automotive industry.

ACKNOWLEDGMENT

I would like to thank CNPq for its support of the research; to the Federal University of Uberlândia – UFU for the opportunity for professional and intellectual growth; to Usiminas for having provided the material to be studied and made several experiments viable; to my advisor Prof. Dr. Louriel Oliveira Vilarinho for his support; and to my co-supervisor Prof. Dr. Ayrton de Sá Brandim for always believing in my potential.



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Comparative performance analysis of AIS and GIS substations: A case study

 <https://doi.org/10.56238/sevened2024.010-049>

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ABSTRACT

This work addresses the comparison between the performance of AIS and GIS Substations, in which a case study is used as a basis. The constructive aspects are highlighted when analyzing the characteristics of SF6 gas-insulated substations and conventional substations, detailing their structure and evaluating the performance of two real installations that fit into this context. The document presents a comparative analysis, in which parameters such as equipment downtime considering the repair of failures, incidence of occurrences and the defect presented in the equipment of each construction are raised. On the basis of the information obtained from the samples analysed, any conclusions will be drawn about the performance of these installations.

Keywords: SF6 Gas, Substations, GIS, AIS, Substation Performance.

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INTRODUCTION

According to the report by the International Energy Agency (IEA), there is a projected growth of 2% in global electricity demand this year, and projections for 2024 are 3.3% (BRASIL, 2023). Based on studies such as the IEA, it is understood that industrial expansion, global growth and other factors tend to drive the increase in electricity demand. Soon, the efficient and reliable transmission of electrical power became a concern. Substations are vital hubs of the power distribution network, they play a crucial role in ensuring the continuous flow of electricity from generating plants to end consumers. Among the various types of substations, Air Insulated Switchgear (AIS) and Gas Insulated Switchgear (GIS) substations emerge as two distinct technological solutions, each with its own set of advantages and limitations.

Throughout history, electrical substations have demonstrated durability, with many of them remaining unchanged from their original design. This scenario is even more evident when considering gas-insulated substations, as this technology, based on the use of SF₆ gas for electrical insulation, was developed in the 1960s and 1970s. However, in just five years after the research began, this technology was already adopted in approximately 20% of the new substations built in locations with spatial constraints. (DE JESUS, M; YOKOGAWA, R; DE OLIVEIRA, T, 2017)

Thus, this article proposes to explore and examine the multifaceted aspects of AIS and GIS substations, focusing on their performance and the inherent disparities between the two technologies, taking into account the case study on the comparison between SE A (AIS) and SE G (GIS). As the energy industry faces the pressing need to improve grid reliability, reduce environmental impact, and optimize resource utilization, it is imperative to critically evaluate these alternatives.

DEFINITION OF ELECTRICAL SUBSTATIONS

Electrical Substations are physical installations that have a set of equipment, which can be for maneuvering, transforming and compensating reagents, which have the purpose of guiding the flow of electrical energy in the power systems and enable the variability of alternative paths. As a result, they are equipped with protection instruments capable of identifying the various types of failures that may occur in the electrical system, in order to isolate the section to which the failure occurs (MONTEIRO, 2023).

CLASSIFICATION OF SUBSTATION TYPES

According to Monteiro (2023), substations have their types defined according to function and installation. Substations can have the function of being:

- **Transformer:** They raise or decrease the level of voltage, which is why they are called Elevator or Lowering Substation. The SE's close to generation centers are called step-up substations. The SE's in the vicinity of the load centers are step-downs.
- **Disconnecter, Maneuver or Switching:** These are substations that connect circuits to which they have the same voltage level and that can maneuver the flow of power, allowing the supply of energy to smaller stretches of the network.

As previously discussed, substations can be classified according to the installation, which can be:

- **Time Substations:** The equipment in these facilities is allocated to the weather, which is exposed to adverse weather conditions, which interfere with their properties, such as insulation quality and useful life.
- **Sheltered Substations:** In these the equipment is installed inside buildings, which can be a building or an underground vault. They can be built in metal cubicles or insulated by sulfur hexafluoride (SF6) gas.

According to Monteiro (2023), the choice of voltage of a substation can be estimated through equation (1):

$$V_{se} = 18 \times \sqrt{P_c} \quad (1)$$

V_{se} – nominal system voltage in kV;
 P_c – load power in MW

According to Mamede (2021), transformer substations have a subclassification according to their voltage level. Thus, it is possible to classify the installation as follows:

- **Level I medium voltage substation:** Whose voltage level is between 2.3 kV and 25 kV, with the vast majority of installations being 13.8 kV.
- **Level II medium voltage substation:** In these installations the voltage level is between 34.5 kV and 46 kV. They are more common in industrial and intermediate-sized enterprises.
- **High voltage substation:** The 72.5 kV and 145 kV substations are used in most of the distribution companies in the country while the 230 kV substations are used in the basic network of the SIN. These voltages are also used in the input substations of large industries, such as the oil and gas sector.
- **Extra high voltage substation:** These are substations with a voltage greater than 230 kV and have their highest composition in the basic network of the SIN. It also encompasses a voltage level of 800 kVdc.

When analyzing the types of installations based on the insulating medium of the equipment, the main focus of the work is the air-insulated substations (AIS) and the SF₆ gas-insulated substations (GIS).

AIR-INSULATED SUBSTATION (AIS)

The most widely employed substations are AIS, due to their reduced cost compared to other types of substations isolated by alternative insulating media. Generally, these substations occupy more extensive spaces compared to other types of substations (MAMEDE, 2021).

The standards of the Brazilian Association of Technical Standards (ABNT) contemplate temperature and altitude to determine the level of insulation of equipment arranged in AIS. The standardised insulation levels consider a temperature between -40° and 40° C, and an altitude of up to 1000 meters. (MUZY, 2012).

At high altitudes, the air has a lower density, thus decreasing the dielectric strength (electric field over the thickness of the insulating material). Therefore, technical standards tend to reduce the insulation rating at high altitudes, taking into account a correction factor for altitudes greater than 1000 meters. Since the air, it has a lower capacity to cool the equipment, which heats up due to pressure losses. (DE JESUS, M; YOKOGAWA, R; DE OLIVEIRA, T, 2017)

SF₆ ISOLATED SUBSTATION (GIS)

SF₆ GAS

Since the objective of this work is to compare the performance of an AIS and a GIS, it is necessary to understand what are the properties that SF₆ gas (sulfur hexafluoride) has, in order to understand why it is used in the electrical sector as an insulating material.

SF₆ gas, a synthetic material, is an octahedral molecule, made up of eight faces and six vertices, as shown in figure 2. Under normal pressure and temperature conditions it is a non-flammable, colorless, odorless, and non-poisonous gas. It is chemically stable, in addition to having an excellent insulating property, thus suppressing possible electric arcs. Its sublimation temperature is 63.8 °C and its liquefaction temperature is 50.8 °C, with a vapor pressure of 22.8 atm. and a dielectric constant of 1.002026 at 20 °C and 0.101 Mpa (MARQUES, 2023).

Dielectric strength refers to the ability to conduct electricity without showing conductivity, while dielectric strength indicates the ability to withstand high stresses without suffering damage. Electronegativity, in turn, represents the ability to attract free electrons, with fluorine being the most electronegative element recognized on the planet. As previously discussed, SF₆ contains six fluorine molecules that can dissociate from sulfur, capturing electrons during an arc and subsequently returning to their original state. The gas's pronounced electronegativity and high dielectric strength

are the reasons why it stands out as an insulating gas that is widely used in power transmission and distribution equipment. (MARQUES, 2023).

According to Marques (2023), when switching or opening an electrical circuit with more than 250 volts, as the contacts begin to separate, an arc forms between them. This arc can reach temperatures in excess of 2,000 °C (3,632 °F), which is enough to fuse and cause the metal contacts to bond. The ability of SF₆ gas to capture free electrons contributes to reducing the effects of arcing.

A negative aspect of the gas is that it was pointed out at the 1997 Kyoto conference as one of the six greenhouse gases, it has a great capacity to retain heat. (DE JESUS, M; YOKOGAWA, R; DE OLIVEIRA, T, 2017)

GIS

Relating SF₆ gas to the SE, according to Mamede (2021), compact installations housed with high voltage level (GIS) have high voltage equipment installed inside metal cylinders, which are filled with SF₆ gas, under pressure.

According to Muzy (2012), the maximum pressure levels for GIS metal cylinders are defined by substation standards, which are defined by design, cost, and through standard tests established by standards that differ according to the country of manufacture, the main ones being: IEC 603776, IEC 62271, IEC 60480, IEC 60068 and NBR 16902:2020.

Despite the cheapness in the construction of GIS over the last few years, it is still a more expensive technology to implement. Therefore, it should be installed in places where there is little space for construction, such as near large Metropolis. This theory is proven, since for his analysis, an AIS in a region farther from the metropolis is 97% cheaper than a GIS, while in the capital, GIS was 66.62% cheaper. (DE JESUS, M; YOKOGAWA, R; DE OLIVEIRA, T, 2017)

METHODOLOGY

The literature review is the activity of researching scientific works related to the area of objective of the work, researching scientific works and standards that were within the scope of the object of study, which are mentioned in the theoretical foundation. Books, articles, term papers and dissertations on substations, electrical equipment, SF₆ gas and regulatory sanctions were used. This material was used to point out the constructive and structural differences of the substations and the equipment present in them, in order to compare AIS and GIS.

Data analysis is based on the process of applying statistical and logical techniques to evaluate information. This process includes the inspection, investigation, storage and follow-up of information. In this study, an extraction was carried out in the asset management software of the company to which the case study is focused, more specifically in the maintenance module. As the

main objective of the work is to analyze the performance of a GIS substation and an AIS pointing out their differences, it was raised through the SAP – PM system, which according to the SAP company, responsible for its development and commercialization, is a module for maintenance management that encompasses all essential tasks, such as inspections, warnings, preventive and corrective maintenance, repairs and other actions to preserve the proper functioning of technical systems. SAP-PM has some transactions intrinsic to it, in which IH08 and IH03 were used to raise which problems happened that left the equipment unavailable and in which equipment they happened, respectively.

These data were concatenated in a database, which was used to generate the graphs through Microsoft Excel presented in the following sections.

CASE STUDY SUBSTATIONS

For this work, two substations belonging to a power distribution and generation company in Brazil were chosen. The choices were made taking into account some criteria. The first of these was the voltage level at which both companies work, both SE A and SE G, have 138 kV and 500 kV busbars. The second criterion was location, which facilitates the need to travel during any technical visits that may be necessary during the study. Another criterion taken into account was that both are in a similar climate, as well as the date of energization and manufacture of the equipment of both are close and finally the most important criterion, one is AIS (A) and the other is a GIS (G).

All these characteristics allow the equipment to be analyzed on an equal footing, and the main defects that apply in both are surveyed and analyzed.

STRUCTURAL ANALYSIS

SUBSTATION A:

The SE A shown in figure 1 is located in the state of Rio de Janeiro. It covers a total area of 321,677.63 m² (Measurement obtained by Google Maps), with the courtyard having 184,279.75 m² (Measurement obtained by Google Earth). It has a total of 1161 pieces of equipment (Information Taken from SAP-PM).

Figure 1 - Installation of *SE A*

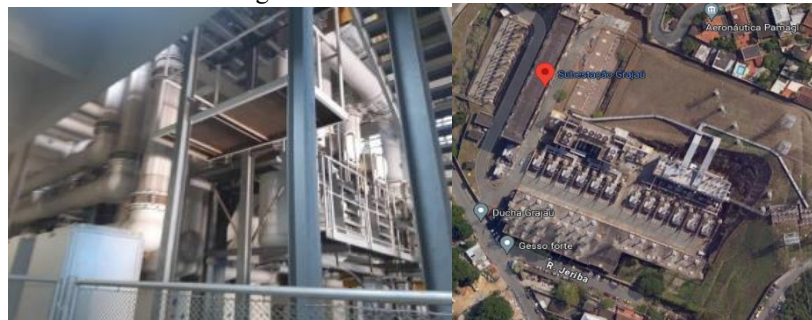


Source: Author

SUBSTATION G

The SE G presented in figures 36 and 37 is located in the city of Rio de Janeiro and in the state of Rio de Janeiro. It has a total area of 33,195.55 m² (Measurement obtained by Google Earth), with a total patio of 11,043.68 m² (Measurement obtained by Google Earth). Having a total of 834 pieces of equipment (Information Taken from SAP-PM).

Figure 2 - Installation of the *SE G*



Source: Author

When structurally analyzing, it can be seen that substation G has a much smaller area compared to substation A, as shown in table 1.

Table 1 - Structural Analysis of the Substations Studied

Substations	Patio Area (%)	Equipment (%)
<i>G</i>	18	70
<i>A</i>	100	100

Source: Author

- Yard Area (%):** Represents the ratio of the substation yard area to substation A.
- Equipment (%):** Represents the proportion of the number of equipment in substation G in relation to substation A. In this case, it is indicated that G has approximately 70% of the amount of equipment in A.

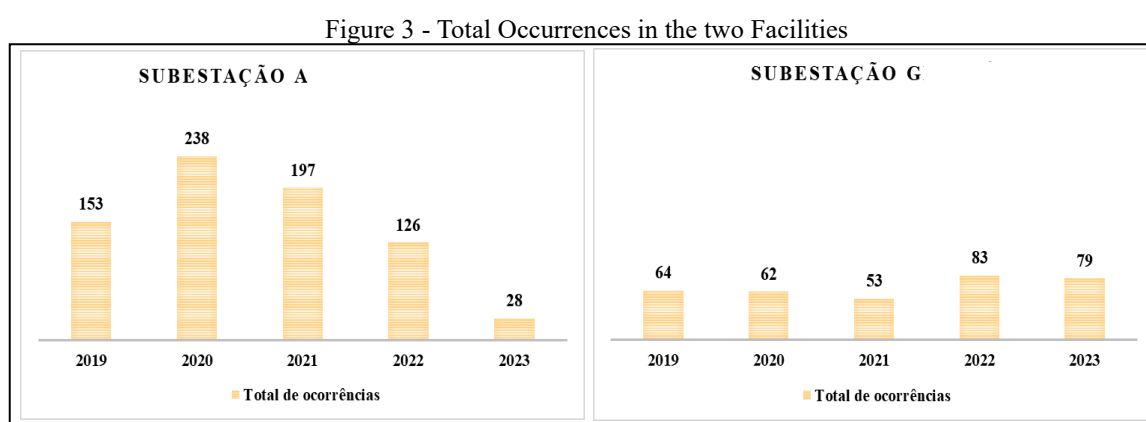
This disproportion between area and amount of equipment exists because of SF₆ Gas, since it allows more equipment to be installed in a smaller area.

This allows SE GIS to take advantage of aspects related to the footprint. Because it is smaller, it provides a lower visual impact.

ANALYSIS OF RESULTS

In order to determine the result, an analysis of the quantity referring to the annual occurrences related to the equipment to be unraveled in a following comparative analysis of the substations was carried out.

As a result, within the time horizon of 5 years, taking into account the cases raised until November 2023, the AIS substation presented a higher number of occurrences in all years compared to the G substation, as shown in the figure below.



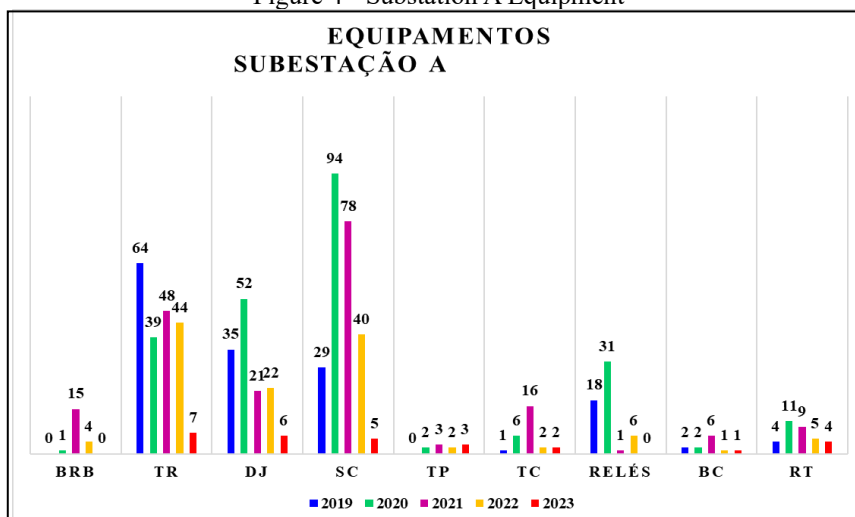
Source: Author

By deepening the analysis, it is necessary for this case study to identify the guiding equipment of these occurrences. For this purpose, the information from the data analysis was collected with the objective of unraveling the quantity referring to the number of occurrences of each type of equipment from the annual perspective previously analyzed of each substation.

Thus, the entities used for this analysis are: busbar (BRB), transformer (TR), circuit breaker (DJ), disconnect switch (SC), potential transformer (TP), current transformer (TC), synchronous compensator (CS), capacitor bank (BC), reactor (RT) and relays, as shown in figure 4. The distribution of this quantity by equipment is of paramount importance to identify the points to be taken into account in the performance of the substation and the existing performance.

From this perspective, when it comes to substation A, the criticality of the transformer (TR), circuit breaker (DJ), disconnect switch (SC) equipment is observed, with a jump in the disconnect switch (SC) in 2020, which boosted it to be the year with the highest number of occurrences if it is observed in an accumulated way in the previous graph.

Figure 4 - Substation A Equipment



Source: Author

It can be seen from the graph that in 2019 the transformer (TR) presented a marked number of occurrences, which decreased in the following year and remained stable in the two following years, unlike the disconnect switch (SC), which went the opposite way until it presented a considerable drop in 2022, but still with a relevant quantity.

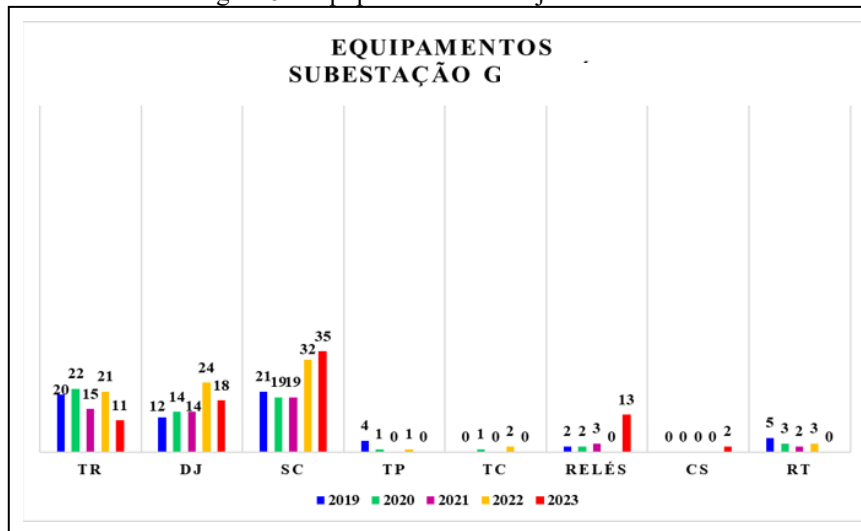
When it comes to circuit breakers (DJ), the number is accentuated in the years 2019 and 2020, which was later stabilized over the years.

The current transformer (CT) and the bus (BRB) in 2021 showed an atypical behavior related to the number of occurrences, and the same can be observed for the number of relays in the years 2019 and 2020.

However, when the analysis starts to encompass the results obtained by the study of the information related to substation G, it is observed that, according to the graph below, the busbar type equipment (BRB) becomes non-existent in the calculation of the quantity of occurrence.

When it comes to atypical years, unlike substation A in which the year 2020 presented non-linear results, in substation G 2022 was the year referring to the emergence of occurrences of increasing number, as shown in figure 5.

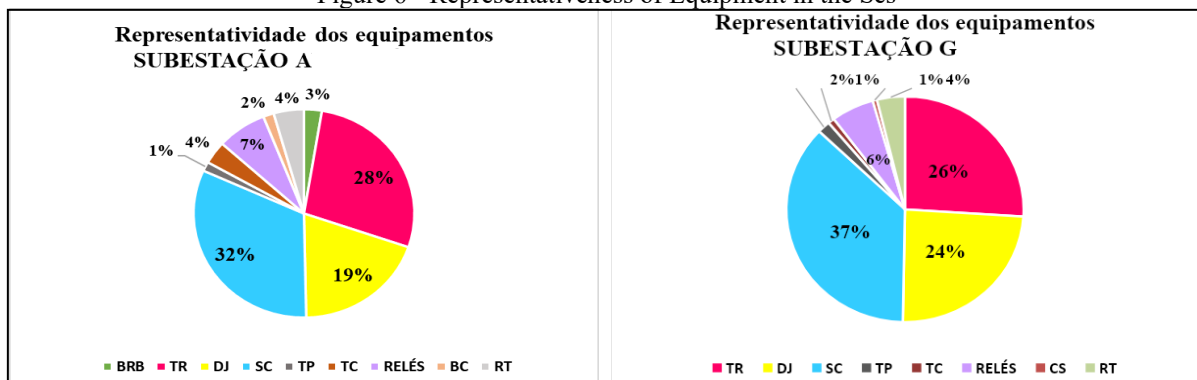
Figure 5 - Equipment of the Grajaú Substation



Source: Author

The equipment of transformer (TR), circuit breaker (DJ), disconnect switch (SC) as well as in substation A, in substation G were also the types in which most occurrences appeared. As below:

Figure 6 - Representativeness of Equipment in the Ses



Source: Author

Thus, it is necessary for the development of the case study to identify the main causes of unavailability of the occurrences of the equipment that most affected the substations.

With the help of the database worked, the author was able to study and perform analyses according to the transformer (TR), circuit breaker (DJ), disconnect switch (SC) equipment of both substations and identify the respective problems that affected the performance over the years, they are:

AIS A SUBSTATION:

Table 2 - Main Problems for the Performance of SE A

<u>Transformer (TR)</u>	<u>Disjuntor (DJ)</u>	<u>Chave Disconnect Saw (SC)</u>
Alarm Malfunction	Leaks (oil and air)	Failure to close the disconnecter contacts
Problems with the drain	Discrepancies measured between phases	Electrical control fault
Problems with the display	Low pressure in the stages	Deficiency of signage on the dashboard
Pump malfunction	System failure to accept commands	Hot spot
Oil leak	Alarms fail	Alarm Failed
Monitoring system failure	Problems with the led	X
Ventilation Failure	Low hydraulic oil level	X
Related Problems Insulating Oil Chromatography	X	X

Source: Author

GIS G SUBSTATION

Table 3 - Main Problems for the Performance of the SE G

<u>Transformer (TR)</u>	<u>Disjuntor (DJ)</u>	<u>Chave Disconnect Saw (SC)</u>
Problems in the chromatography of insulating oil	Close Command Failures	Low pressure of SF6 in equipment and phases
Faulty temperature monitor	Failures in the automatic control	Remote control failure
Faulty oil level monitoring	Faults in the operation command	Problems with Electrical Control Acceptance
Oil leak	X	X
Shorted lighting	X	X

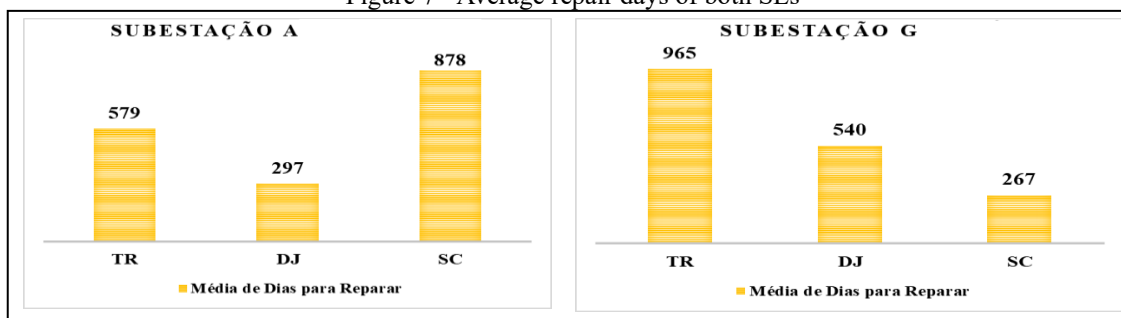
Source: Author

To understand how these problems are being taken into account and the appropriate actions to solve these causes and the impacts of the consequences on the substations, the author spoke with experts in the area in which they are assigned in the company responsible for maintaining the substations and providing services, who stated that strategic studies are being developed to mitigate these effects. to improve the service and reduce the number of occurrences, through preventive and predictive maintenance plans.

Although the current work does not discuss what these actions are, some examples to which the experts went were: reducing the periodicities between oil analysis in transformers, using special cameras to detect hot spots and SF6 leaks.

Another aspect that was analyzed was the average number of days that the problems take to be solved, taking into account the switches, circuit breakers and transformers for the two substations. Below is the figure which represents this:

Figure 7 - Average repair days of both SEs



Source: Author

As seen in the graphs, we have that the average number of days to solve the problems is relative, but as the average is being done, some problems were solved faster, while others took longer. It is observed that the average repair time for transformers and circuit breakers is shorter in SE A compared to SE G, this is due to the fact that the parts of SE G are of higher unit cost and more difficult to obtain, since it is a shielded substation and less common in relation to an AIS. The scenario is reversed for the disconnect switches, but this happens due to the large number of maneuvers that the disconnectors of the SE A make in relation to the SE G, this generates more problems and ends up causing a greater number of changes of such equipment.

CONCLUSION

In this work, two technologies related to electric power substations were compared. The AIS was addressed, which is the most commonly used substation in the SIN – National Interconnected System, to which the equipment is exposed to the weather and its effects. The second SE analyzed was GIS, in which the equipment is pressure-insulated in pipelines filled with SF6 gas.

Both were compared, verifying their equipment, arrangements and construction characteristics, defects that occur in the equipment, based on two real substations.

It was observed that regarding the constructive characteristics, the GIS substation needs a smaller area compared to the conventional one, since the insulating properties of SF6 gas allow this to be implemented in places that have little space. This has a constructive advantage over conventional ES. This characteristic makes it possible for GIS to provide less visual pollution and interfere less with the area around it.

Another aspect verified is the performance, throughout the study, it was noticed that, in general, the AIS SE studied presented a greater number of defects in relation to GIS, at a rate of 50% more over these five years studied. This is due to the fact that GIS is sheltered, and runs fewer risks related to factors external to the system, such as weather, pollution, or accidents. Another important point is that, as it was found throughout the study, the equipment that gave the most defects in both SE's were, Power Transformer, Circuit Breaker and Disconnecter. This is because the circuit breaker

and the disconnectors are switchgear and are constantly in use in order to make maneuvers for load control by the ONS – National Electric System Operator. Regarding the transformer, they work most of the time at their limit and often exceed their useful life, this means that the technical specifications to which they were built are no longer respected, since they are most of the time working under high stress and generate more problems. An example is the high level of problems detected from insulating oil chromatography tests. Finally, in order to verify their performance, the repair times were analyzed for these three main pieces of equipment that present failures, so that the defects can be corrected. It was observed that apart from the disconnector, the repair times for circuit breakers and transformers in substation G take longer to be corrected, since because they are part of the SF6 shield, it is more difficult and more expensive to obtain these parts in the market, this is a big problem, since the unavailability of some of this equipment can generate a loss in PV (Variable Plot) and possible fines.

Linked to the survey of the average time to correct defects in the main defective equipment, the major causes of unavailability of this equipment for the two substations in this five-year horizon were raised. It was found that oil leakage is a major problem for the transformers and circuit breakers of both facilities. As for the disconnectors, in SE A there were a large number of problems related to the closure of their contact, to solve a problem like this the company often needs a relative time, since it can be mechanical problems in the activation, which require the replacement of key components, for example. On the other hand, for SE G, the main cause of unavailability over this time was the loss of SF6 pressure, this is a problem that is often generated by another that appeared in the survey of unavailability, which is the leakage of SF6.


Therefore, it is observed that both installations have positive and negative points, which must be taken into account for their implementations.



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MIG – VP: Negative current effect and proportion of electrode negative on the penetration aluminium weld bead

 <https://doi.org/10.56238/sevned2024.010-050>

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ABSTRACT

The MIG (Metal Inert Gas) process with variable polarity (VP) is a relatively new process that can be applied in the welding process industry with high deposition rates and competitive costs. The process uses curves composed of pulses in positive and negative polarities and presents as main benefits in relation to the conventional process, a high melting rate, combined with low thermal input, smaller deformations, and better control of penetration and dilution. The objective of this work is to analyze the effect of the negative current (I_n) and the proportion of negative electrode (%EN), of the typical current curve of the variable polarity process, on the penetration of the weld beads. For the study, three levels of I_n of -70 A, -50 A, and -30 A and four levels of %EN percentages of 20%, 30%, 40%, and 50% were used, applying a fully crossed factorial experiment design. Weld beads were made in the flat position (1G), depositing aluminum ER5356 on the free surface of the Al5052-F sheet. It is suggested that for the negative electrode proportion (%EN), the value of the negative current should be considered, in order to obtain a closer approximation to the effects of I_n and %EN on penetration. The effect of I_n on penetration is 13.1%, however, the effect of %EN is 71.6%, also the interaction (I_n and %EN) is statistically significant contributing with 11.0%. It was concluded that a decrease in negative current in modulus causes a reduction in penetration. Likewise, increasing the proportion of the negative electrode causes a decrease in penetration into the weld bead.

Keywords: MIG variable polarity, Negative Current, Proportion of negative electrode, Penetration, Aluminum welding.

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INTRODUCTION

In manufacturing processes, after the consolidation of the large-scale production process, the need to join similar or dissimilar materials became imperative. In this context, welding technology has emerged as a great ally for the elaboration of projects and the creation of products that increasingly demand research and technology, especially in the area of metal joining.

Currently, in the industrial sector, there is a predominance in the use of electric arc welding processes, with the MIG/MAG process being the most widely used, both for coating and filling. The MIG/MAG process was patented in 1930 by Hobart and Devers and called GMAW (*Gas Metal Arc Welding*), according to (NASCIMENTO AND VILARINHO, 2006), and currently, it is widespread and widely applied, being the main welding method used, according to (MIRANDA AND FERRARESI, 2003). The MIG/MAG process has a range of advantages, such as a high deposition rate, a considerable and indisputable quality of the weld seam, combined with a moderate cost of production of the process.

Due to the constant increase in productivity demand, the need arose for the welding process to become more flexible and the optimization and constant improvement of the MIG/MAG process has made one of its variants the so-called Variable Polarity (PV) (MIG/MAG). This method is still not widespread in the production process and its main characteristic is the high rate of material deposition.

There is, on the other hand, a drawback in the MIG/MAG PV process, which is precisely the adjustment of the six parameters of the welding current curve, which generate weld seams in satisfactory conditions, this is basically done by the trial and error method until the point where a gap in parameter values that meet the desired characteristics is reached (DUTRA ET AL., 2015).

Particularly, in this work, the MIG/MAG Variable Polarity welding process was chosen to carry out the weld seams, since it allows the accurate control of the characteristics of the seam. This process provides the best penetration control, less dilution and, as an advantage, less distortion, according to (BAUMGAERTNER, 2017) and (TONG ET AL., 2001).

OBJECTIVE

Considering the complexity of the selection of parameters, this work aims to analyze the negative current and the negative electrode proportion (%EN), varying the time of the negative current, in order to understand the variation of the negative current when applying the formulas of the proportion of negative electrode on the penetration of the weld bead, using the fully crossed factorial design.

THEORETICAL BACKGROUND

MIG/MAG WELDING PROCESS VARIABLE POLARITY

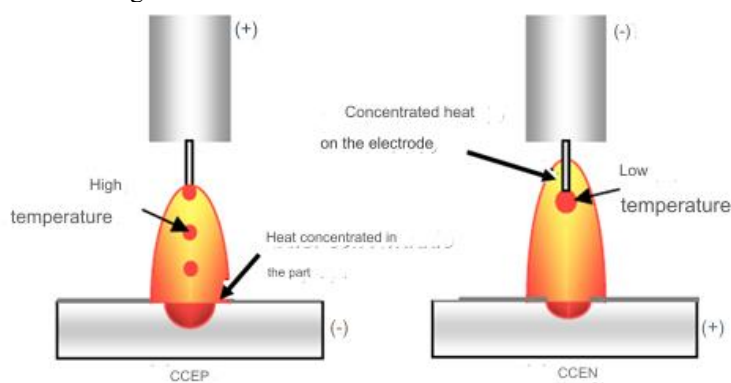
Currently, the MIG/MAG process is one of the most widely used welding processes for the production of weld seams in large extensions, such as surface coating, wear, corrosion, heat resistant, among others. However, some problems are usually found, especially in the coating made by welding, such as the high melting of the base metal that produces high dilution and distortions. The MIG/MAG welding process with the use of an alternating current would be ideal to solve some of the difficulties listed above, according to (TONG ET AL., 2001).

In the literature, two distinct nomenclatures are defined: pulsed alternating current (AC) or variable polarity (PV). (NASCIMENTO AND VILARINHO, 2006) mention that the two forms of nomenclature are related to the use of negative polarity in the welding process. However, the alternating current is linked to the sinusoidal waveform, where the positive and negative parts are very close, of equal magnitude. Therefore, the expression variable polarity is related to waveforms Rectangular with variation between the polarities, positive and negative in the welding current curve, and may contain greater time and intensity in its positive part, or, in the same way, in the negative.

The MIG/MAG Welding Process Variable Polarity (Figure 2) is used to describe rectangular waveforms (alternating in polarity) in which the ratio between the two polarities can be varied and used as a process parameter the "negative electrode ratio – %EN".

The negative polarity, direct current and negative electrode (CCEN), drastically alters the behavior of the MIG/MAG process, modifying the distribution of energies between the electrode and the part. In Figure 1 (KIM ET AL., 2007) they state that in the positive polarity, direct current and positive electrode (CCEP) process, the highest concentration of heat occurs in the part, consequently, the penetration is greater, and it is possible to work with several transfer modes. However, in negative electrode (CCEN), this situation is reversed, and a large part of the heat generated is concentrated in the electrode, and with this there is an increase in the melting rate, an increase in the voltage of the electric arc, a decrease in the temperature in the part and a reduction in penetration, it also affects the transfer mode, which in most cases is globular.

Figure 1 – Arc flash behavior in CCEP and ENCC.



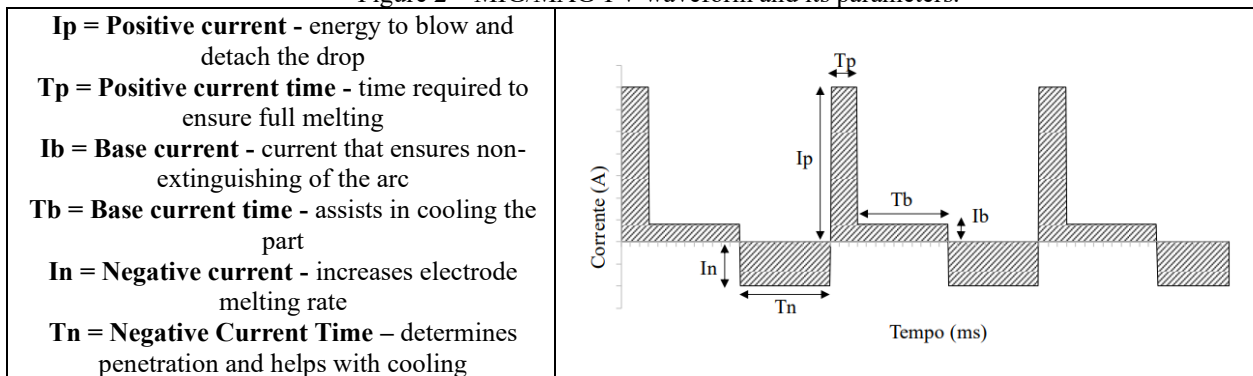
Source: Adapted from (KIM ET AL., 2007).

(TONG ET AL., 2001) conducted studies using CCEN compared to conventional MIG/MAG (CCEP), with CCEN showing lower temperature values in the specimen. As a result, they saw a reduction in the deformation of the final part, as well as less penetration and dilution. This benefit was also proven by (PARK ET AL., 2009), who verified the reduction in the temperature of the welded part with the increase in the use of the negative electrode.

In the MIG/MAG PV process, it is possible to obtain a higher melting rate, combined with the low temperature in the base metal, generating great instabilities in the electric arc and in the transfer of the metal from the tip of the electrode to the weld pool, in the vast majority of situations making it impossible to use CCEN in the MIG/MAG process. The instability is explained by (TALKINGTON, 1998), mainly by the mode of transfer of the metal, which is limited to the globular mode for NCCC. But in order to minimize the instability of the arc and thus use the benefits of the negative electrode, such as reduced penetration, reduction of temperature in the base metal, the positive electrode is applied to the process, which brings with it the stability of the electric arc. According to (JOSEPH, 2003), each polarity has a heat balance, but combined they allow the control of the heat of the part and electrode, as well as the control of penetration, and according to (DUTRA, 2015), this combination generates low temperatures combined with increases in the melt rate (productivity) in the welding process.

The current curve used in this work of the Variable Polarity MIG/MAG process has three parts: positive pulse, positive base and negative pulse. As shown in Figure 2, the waveform of the MIG/MAG PV welding process is formed by the positive part, which contains four parameters: peak current (I_p), peak time (T_p), base current (I_b), base time (T_b), and the negative part: negative current (I_n) and negative current time (T_n).

Figure 2 – MIG/MAG-PV waveform and its parameters.



Source: Author (2024).

According to (TONG, 2001), a positive base current lasting approximately 1.5 ms before or after the detachment pulse (positive peak current), recommended for welding aluminum, is a mechanism that allows the droplet to reach the weld pool free of repulsive forces, thus minimizing or avoiding splashing. The step of the base current, before and/or after the detachment pulse, helps to mitigate the rapid reversal of polarity and stabilize the electric arc, according to (NASCIMENTO, 2011).

NEGATIVE ELECTRODE RATIO (%EN)

Along with the use of the equation for the negative electrode ratio, the following authors: (FARIAS, 2005; MONTEIRO AND SCOTTI, 2013; NASCIMENTO, 2011; SO ET AL., 2010; TONG, 2001) use penetration as an object of study, seeking improvements in processes, for example, to improve root passes, closing openings between plates or welding for coating, where there is a need for greater control of penetration in the welding process. And the understanding of the effects of the negative electrode through only one factor (%EN), would facilitate the application of variable polarity at the industrial level.

The current curve in Figure 2 consists of rectangular pulses formed by six different parameters. The choice and understanding of these six different parameters make the process quite complex to parameterization, that is, the appropriate combination of parameter values for the desired response. For this reason, many authors use a factor that represents the percentage of negative polarity in relation to the total current curve, called the negative electrode ratio (%EN), which is used to understand the variation of negative polarity in relation to the variables of the welding process, such as penetration, dilution, temperature, etc. among others. The %NE ratio is found in the literature in two different forms of calculation according to the Eqs. (1) and (2).

A Eq. (1) considers only the times between polarities, having as a response the proportion of the negative current time (T_n) in relation to the total pulse period (T), which is the sum of the positive base current (T_b) and peak time (T_p) and the negative current time (T_n). This calculation

method was used by the following authors: (CIRINO, 2009; DUTRA ET AL., 2015; MONTEIRO AND SCOTTI, 2013; NASCIMENTO ET AL., 2008; NASCIMENTO, 2011; SANTOS, 2008; VILARINHO ET AL., 2009).

$$\%EN = \frac{T_n}{T_n + T_p + T_b} \times 100\% \quad (1)$$

However, a second way of calculating the percentage of negative electrodes can be found in the literature. The proportion calculated according to Eq. (2) Considers the time composition and the intensity of the negative current in relation to the total current wave in the period. In summary, the term '%EN' compares the area of the current curve as a function of the time (I x T) of the current in the negative part with respect to the total area of a pulse cycle. This type of calculation was used by the following researchers: (FARIAS, 2005; KAH, SUORANTA & MARTIKAINEN, 2013; KIM ET AL., 2002; KIM ET AL., 2007; PARK ET AL., 2009; SO ET AL., 2010).

$$\%EN' = \frac{I_n \times T_n}{(I_n \times T_n) + (I_p \times T_p) + (I_b \times T_b)} \times 100\% \quad (2)$$

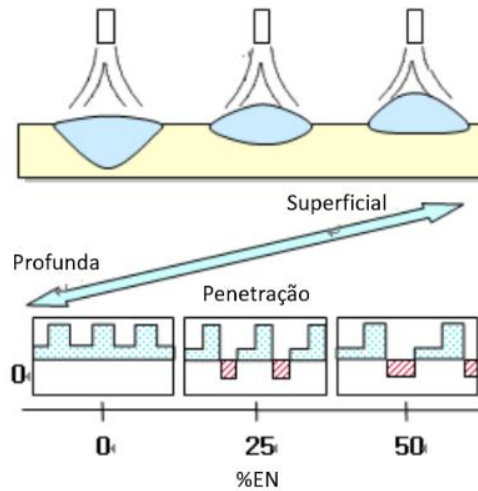
Essentially, the difference between the two forms of calculation is as follows: in Equation (1) only the times (Tn, Tp, Tb) of application of currents are considered and not their respective intensities (In, Ip, Ib), while in Eq. (2) The %EN is calculated considering the six parameters of the current curve. Considering an arbitrary set of values of these six parameters, depending on whether Eq. (1) or Eq. (2), different %EN values can be arrived at.

However, as presented by (FARIAS, 2005) and (KIM ET AL., 2002), who used Eq. (2), or as demonstrated by (NASCIMENTO, 2008), using Eq. (1), the higher the value of the negative electrode ratio (%EN), the lower the values obtained from penetration.

In general, the increase in the percentage of negative polarity in the current curve generates a reduction in penetration into the weld seam geometry. This condition is represented by (KIM ET AL., 2002) in Figure 3, where the increase in the percentage of negative polarity, considered by the %EN value between 0% and 50%, is illustrated, and in turn the effects on the penetration and characteristic of the weld bead.

Experiments were carried out by (KIM ET AL., 2002) with aluminum wires and pure argon shielding gas, on thin aluminum sheets of 1 to 2 mm thickness, varying the %EN between 5% and 40%, in order to control the penetration in the welding process. The results of the cross-sections of the weld seam show that increasing the electrode ratio reduces the penetration of the weld seam.

Figure 3 – Effect of %EN on Penetration.



Fonte: Adaptado de (KIM ET AL., 2002).

FULLY CROSS-FACTOR EXPERIMENT DESIGN

Experiment designs have had an important impact on manufacturing industries, including the design of new products and the improvement of existing ones, the development of new manufacturing processes, and process improvement.

Factorial designs have several advantages. They are more efficient than experiments performed by varying only one factor at a time. In addition, factorial planning is necessary when interactions may be present to avoid misleading conclusions.

Finally, factorial designs allow the effects of one factor to be estimated at various levels of the other factors, generating conclusions that are valid under a variety of experimental conditions.

According to Montgomery, 2009, the simplest types of factorial experiments involve only two factors or sets of treatments. There are factor A levels and B factor B levels, and these are arranged in a factorial design; That is, each replicate of the experiment contains all combinations of AB treatment. In general, there are n replicas.

The following is a general case of a two-factor factorial design, where y_{ijk} is the response observed when factor A is at the i th level ($i = 1, 2, \dots, a$) and factor B is at the j th level ($j = 1, 2, \dots, b$) for k -th replication ($k = 1, 2, \dots, n$). The sequence in which the abn observations are made is randomly selected for the treatments of the fully crossed factorial design.

Observations in a factorial design can be described by Eq. (3) By a model of effects:

$$y_{ijk} = \mu + \tau_i + \beta_j + (\tau\beta)_{ij} + \epsilon_{ijk} \begin{cases} i = 1, 2, \dots, a \\ j = 1, 2, \dots, b \\ k = 1, 2, \dots, n \end{cases} \quad (3)$$

Where μ is the overall mean effect, τ_i is the effect of the i th level of the line factor A, β_j is the effect of the j -th level of the column factor B, $(\tau\beta)_{ij}$ is the effect of the interaction between τ_i and β_j , and ε_{ijk} is a random error component.

MULTIPLE COMPARISON OF MEANS – TUKEY'S TEST

When ANOVA indicates that row or column averages differ, it is often interesting to make comparisons between individual row or column averages to find out the specific differences. There are several methods of multiple comparison, e.g., Scheffé's method, Fischer's method of least significant difference (LSD), Dunnett (1964), Duncan, and Tukey (1953) that are useful in this regard, according to (Montgomery, 2009).

In many practical situations, it is necessary to compare only pairs of averages. Often, it can be determined which averages differ by testing the differences between all pairs of treatment averages

When there is interest in comparing all the pairs of means of a treatment and the null hypotheses to be tested is $H_0: \mu_i = \mu_j$ for all $i \neq j$. There are several procedures available for this problem, but in this work the Tukey test will be applied.

Tukey's Test

Suppose that, after an ANOVA in which the null hypothesis of equal treatment means is rejected, the goal is to test all comparisons of paired means:

$$H_0: \mu_i = \mu_j$$

$$H_1: \mu_i \neq \mu_j$$

for all $i \neq j$. According to (MONTGOMERY, 2009), Tukey (1953) proposed a procedure for testing hypotheses for which the overall level of significance is exactly α when sample sizes are equal and at most α when sample sizes are unequal. Its procedure can also be used to construct confidence intervals on differences across all pairs of means. For these intervals, the simultaneous confidence level is $100(1 - \alpha)$ percent when sample sizes are equal and at least $100(1 - \alpha)$ percent when sample sizes are unequal. Tukey's procedure uses the error from the experiment at the selected level of α . This is an excellent data evaluation procedure when interest is focused on pairs of means.

Tukey's procedure makes use of distribution statistics:

$$q = \frac{\bar{y}_{max} - \bar{y}_{min}}{\sqrt{MQE/n}} \quad (4)$$

Where \bar{y}_{max} and \bar{y}_{min} are the highest and lowest sample means, respectively, of a group of p sample means. From the literature (MONTGOMERY, 2009), one can find values of $q_{\alpha}(a, f)$, the upper α percentage points of q , where f is the number of degrees of freedom associated with the mean square of the error term (MQE). For equal sample sizes, Tukey's test states that two means are significantly different if the absolute value of their mean differences exceeds the T_{α} value calculated by Eq.(5).

$$T_{\alpha} = q_{\alpha}(a, f) \sqrt{\frac{MQE}{n}} \quad (5)$$

Where, MQE : Mean Square of the Error term (from ANOVA); a : Number of treatments; f : Degrees of Freedom from Error; n : Number of repetitions; α : Level of significance.

MATERIALS AND METHODS

The experimental part was developed at the Laboratory of Welding and Related Techniques of the UFRGS Technology Center. The welding source used was the DIGIPlus A7 450. To drive the torch, a MOTOMAN robot (Yaskawa) was used to ensure the advance and speed control, as well as the maintenance of the contact nozzle-piece distance (DBCP), everything was properly aligned with the help of a level so that the system was horizontal.

IMC Welding's equipment, SAP4.01, was used for data acquisition, to collect instantaneous current and voltage values at a rate of 5000 samples per second. In SAP4.01 you can obtain graphs of the instantaneous values during the execution of the weld seam. Figure 4 shows the equipment used in the experiment.

The weld seams were deposited on AA5052-F aluminum sheets of dimensions 150x100x8 mm, the filler metal used was AWS A5.10: ER5356 of 1.2 mm diameter. The shielding gas was air with a flow rate of 18 l/min. The weld seams were deposited on the free surface (*bead-on-plate*) in the flat position (1G). The chemical composition of the base metal and that of the filler metal are described in Tables 1 and 2, respectively.

The variable polarity current curve used in this study (Figure 2) is composed of six (6) independent parameters (factors), of which two (2) were varied, I_n and T_n . From the variation of T_n it was possible to obtain the proportion of negative electrode (%NE). The other parameters I_p , T_p , I_b and T_b were kept constant for all weld beads.

In order to analyze the behavior of the negative polarity, the negative current (I_n) was varied in three levels: -70, -50 and -30 A, the proportion of negative electrode (%EN) in four levels: 20; 30; 40 and 50 % by varying the negative current (T_n) time between 1.5; 2,5; 3.9 and 5.8 ms, respectively.

The parameters kept constant in the experiment were: peak current intensity (I_p) of 280 A, positive peak time (T_p) of 1.8 ms, and for non-extinguishing of the electric arc, the base current (I_b) was kept constant at 65 A with a time of 4.0 ms, as shown in Table 3. With these values for each combination, electric arc stability was obtained by adjusting the wire feeding speed. The other parameters of the welding process were kept constant as shown in Table 4.

Table 1 – Chemical composition of the base metal (%) according to supplier.

Alloy	Oneself	Fe	Ass	Mn	Mg	Cr	Zn	To the
AA 5052F	0 - 0,25	0 - 0,40	0 - 0,10	0 - 0,10	2,20 - 2,80	0,15 - 0,35	0 - 0,10	Remainder

Source: Author (2024).

Table 2 – Chemical composition of the filler metal (%) according to AWS A5.10 – ER5356.

Material	Yes	Faith	With	Minutes	Mg	Cr	Zn	In	To the
ER5356	0,25	0,4	0,1	0,2	5,0	0,2	0,1	0,2	Rest.

Source: Author (2024).

Figure 4 – Welding equipment on the left, Motoman robot and data acquisition equipment, the IMC welding source and the wire feeder.



Source: Author (2024).

Table 3 – Variable Polarity MIG Process Current Curve Parameters

Parameters		Level			
Description	Symbol				
Negative Current (A)	I_n	-70	-50	-30	
Negative Electrode Ratio	%EN	20	30	40	50
Negative current time (ms)	T_n	1,5	2,5	2,9	5,8
Negative Electrode Ratio Eq. (2)	%EN'	18,6	13,3	8,9	5,6
Peak Running (A)	I_p	Constant = 280			
Positive peak time (ms)	T_p	Constant = 1.8			
Base Current (A)	One	Constant = 65			
Base time (ms)	T_b	Constant = 4.0			

Source: Author (2024).

Table 4 – Welding Process Parameters

Process Parameters	Symbol	Constant Values
Welding Speed (mm/s)	Vs	3,0
Torch Travel Angle (Pulling) (°)		+10
Distance of contact nozzle piece (mm)	DBCP	18
Shielding gas flow rate (l/min)		18

Source: Author (2024).

To study the effect of the negative electrode proportion, a fully crossover factorial design (multiple levels) was applied, with the following parameters and levels, the execution of the weld beads was according to the matrix of experiments in Table 5.

Design of Experiments Parameters (Fixed and Independent Factors)

- Three levels of Negative Current (A) – In: -70 -50 -30
- Four levels of the Negative Polarity Ratio (%) - %EN: 20 30 40 50

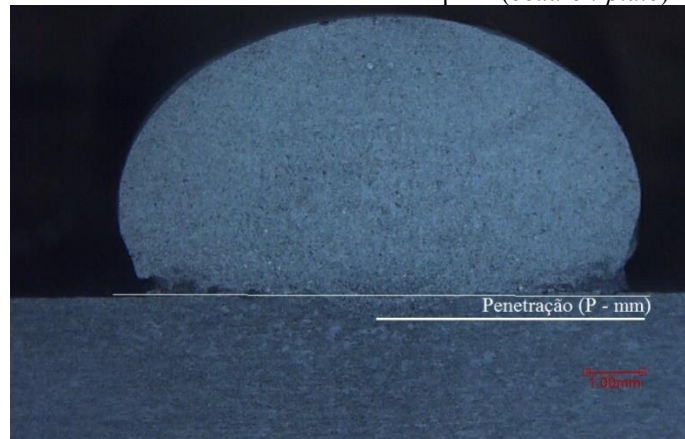
MATERIALS FOR CHARACTERIZATION OF WELD BEADS

Once the weld seams were finished, the process of generating and treating the samples began. The first step was to perform the cross-section of the beads with the use of the *cut-off* cutting machine, in order to obtain specimens of approximately 1.5 cm bead length. Next, the specimens were sanded at 120, 220, 320, 400, 500, 600 and 1000 grain sizes, making sure to start all samples in the same direction and rotate the specimen 90° at each sanding grain size change.

The cross-sections for the macrographs were attacked with the 10% HF (48%) + 90% H₂O reagent, according to ASTM E340-15, in order to obtain contrast between the weld metal and the base metal. All of the attacks were carried out in a chapel and with appropriate security equipment. The macrographs were obtained using a microscope with an 8x magnifying lens and analyzed using the free software ImageJ, with which the response variable: penetration (P – mm) was measured, as shown in Figure 5.

Table 5 shows the randomized welding sequence of the specimens according to the combination of the levels of the controllable factors and the response considered in this study: penetration (P – mm).

Figure 5 – Schematic of the weld bead on the free surface of the plate (*bead-on-plate*) and the response variable.



Source: Author (2024).

RESULTS AND DISCUSSION

Table 5 shows the randomized welding sequence of the specimens according to the combination of the levels of the controllable factors and the penetration response (P – mm).

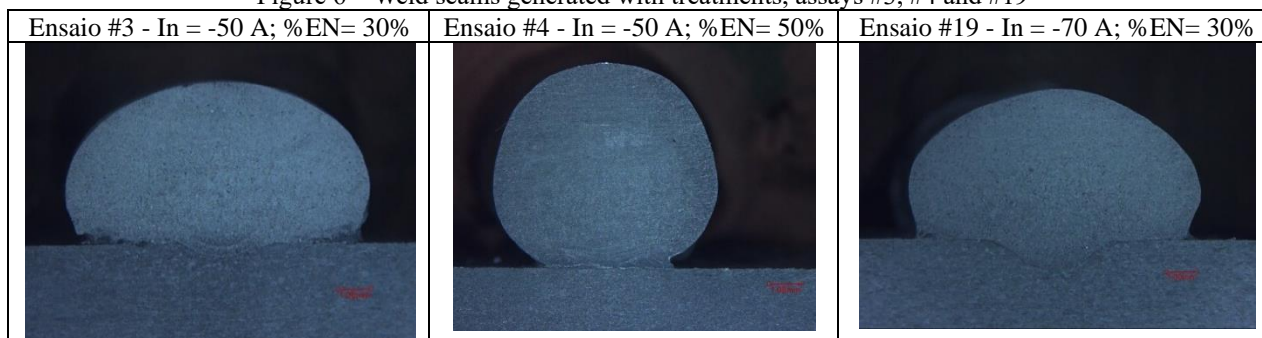
Figure 6 shows the images corresponding to trials #3, #4 and #19 of the 24 strands generated by the fully crossed factorial design. The visual aspect of essays #13 and #23 can be seen in Figure 7.

Table 5 – Sequence (randomized) and combination of parameters according to the design of experiments for the welding of the specimens, and penetration

Order Pattern	Seq. Essay	In (A)	%EN (%)	P(mm)
12	#1	-30	50	0,000
15	#2	-70	40	0,292
6	#3	-50	30	0,436
8	#4	-50	50	0,000
23	#5	-30	40	0,000
5	#6	-50	20	1,027
1	#7	-70	20	0,681
3	#8	-70	40	0,250
21	#9	-30	20	0,791
18	#10	-50	30	0,325
20	#11	-50	50	0,171
13	#12	-70	20	0,925
22	#13	-30	30	0,459
7	#14	-50	40	0,266
4	#15	-70	50	0,472
11	#16	-30	40	0,000
9	#17	-30	20	0,671
16	#18	-70	50	0,278
2	#19	-70	30	1,080
17	#20	-50	20	0,899
14	#21	-70	30	0,966
10	#22	-30	30	0,571
19	#23	-50	40	0,000
24	#24	-30	50	0,000

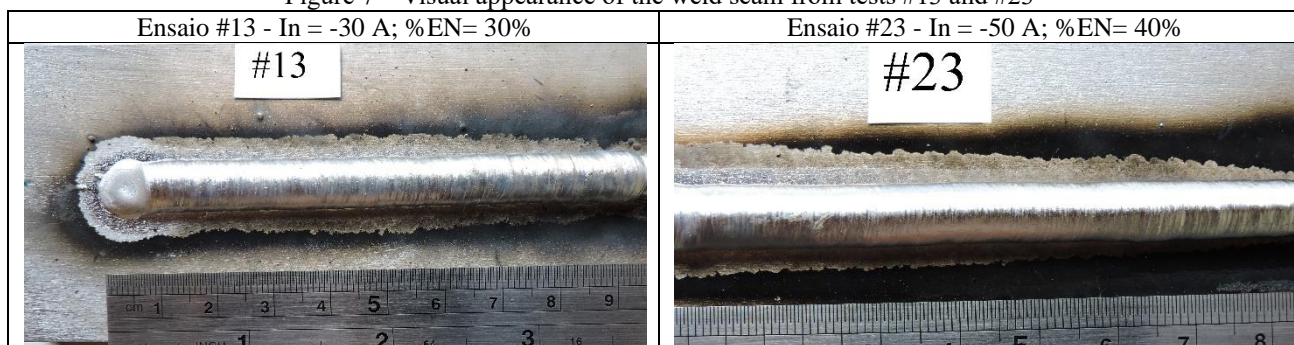
Source: Author (2024).

Figure 6 – Weld seams generated with treatments, assays #3, #4 and #19



Source: Author (2024).

Figure 7 – Visual appearance of the weld seam from tests #13 and #23



Source: Author (2024).

In order to evaluate more consistently the effects (linear and quadratic) of the main factors employed and the interactions of two factors on the observed response, analysis of variance was submitted.

Using *Minitab*®'s software, the data in Table 5 were processed for the analysis of which parameter and/or interaction has an effect on penetration (P). For this analysis, a 95% confidence interval was used, i.e., for alpha (α) values lower than 5%, it was assumed that the control variable in question is significant in the response. It is noteworthy that the lower the *p-value value*, the greater the influence of the parameter on the analyzed response.

The following sections will introduce the ANOVA Table, the Pareto chart, graphs of the main parameters and interaction, which will show the influences of the main parameters and their combinations on the response, and which of them are significant.

WELD BEAD PENETRATION

Table 6 shows the Analysis of Variance (ANOVA) for weld seam penetration. The p-value can be used to determine the significance of major factors or interactions on penetration. This value is an indicator that quantifies the significance of the response. The term "p-value" is known for its probability of significance, if it presents values lower than 0.05 (5%), the null hypothesis (factor is significant) can be rejected with 95% confidence. By means of ANOVA, it was determined that the main parameters In and %EN have a strong significant effect on penetration for a significance level α

= 0.05 (p-value < 0.05). Also, the interaction (In*%EN) has a significant effect on penetration for a significance level $\alpha = 0.05$.

Table 6: Analysis of Variance for Penetration versus In (A) and %EN (%)

Source	GDL	SQ	SQM	F-value	p-value	Contribution
Model	11	2,9579	0,26890	24,12	0,000	95,67% (R2)
In (A)	2	0,4052	0,20259	18,17	0,000	13,11%
%EN (%)	3	2,2142	0,73807	66,20	0,000	71,62%
In (A)*%EN (%)	6	0,3385	0,05641	5,06	0,008	10,95%
Error	12	0,1338	0,01115			4,33%
Total	23	3,0917				100,00%

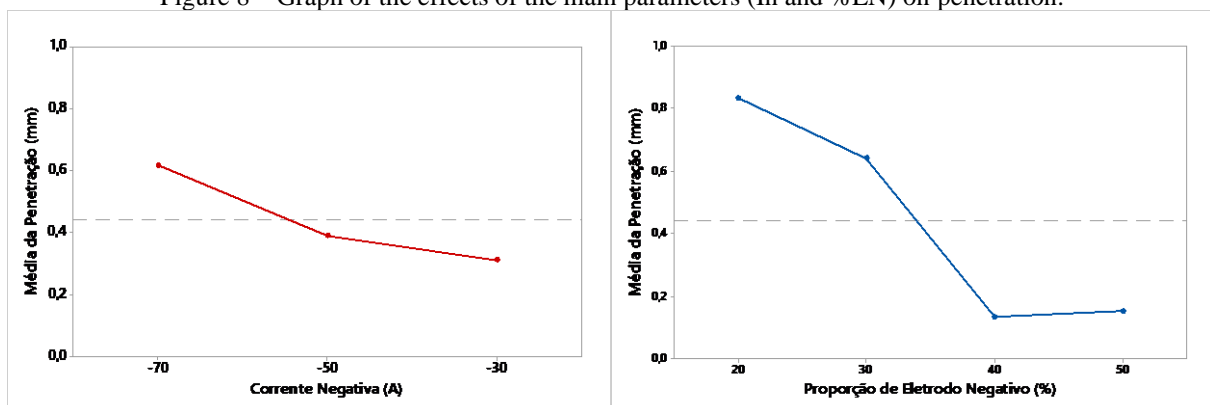
Note: GDL: Degrees of Freedom; SQ: Sum of Squares; MQ: Mean of Squares
Source: Author (2024).

Figure 8 shows the effects of the main parameters In and %EN, and it is observed that the penetration suffers a small decrease when the negative current (In) reduces in modulus from -70 to -30 A, which is in agreement with what was found by (BAUMGAERTNER, 2017). The contribution of negative current variation in penetration is 13.1%.

Increasing the ratio of negative electrode (%EN) reduces penetration as its value increases, see Figure 8. For %EN = 20%, the penetration (P) has an approximate value of 0.83 mm, when this value increases to 30%, the mean P decreases to a value of approximately 0.64 mm, increasing %EN to 40% at P = 0.13 mm and from %EN = 40% to %EN = 50% P = 0.15 mm. Results are similar to those found by (KIM ET AL., 2002; KIM ET AL., 2007; VILARINHO ET AL., 2009). The contribution of the variation in the proportion of the negative electrode to the penetration is 71.6%.

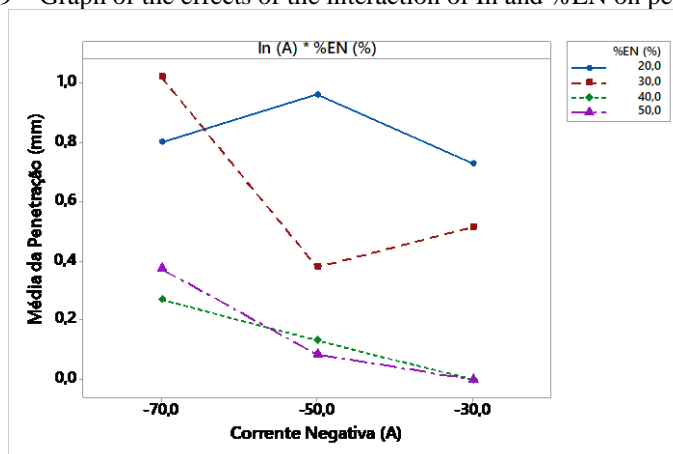
Table 6 of the ANOVA and Figure 9 show that the In*%EN interaction is significant, and the contribution to penetration is 11%.

Figure 8 – Graph of the effects of the main parameters (In and %EN) on penetration.



Source: Author (2024).

Figure 9 – Graph of the effects of the interaction of In and %EN on penetration.



Source: Author (2024).

MULTIPLE COMPARISON OF MEANS - TUKEY TEST

When conducting an analysis of variance (ANOVA) for the fixed-effects model, the null hypothesis is rejected, because there are differences between the treatment means. Sometimes, in this situation, additional comparisons and analyses between treatment mean groups can be helpful, to determine which treatment averages differ by testing for differences between all treatment mean pairs.

The Tukey test can be applied to test for any and all differences between two treatment means, the method is specifically designed for matched comparisons between all means in a population, and applies when the "p-value" for ANOVA treatments is significant.

Tukey's test will be applied to the data of the average penetration ($P - \text{mm}$) of the weld bead. Note that in this experiment, the interaction is significant. When the interaction is statistically significant, comparisons between the means of a parameter (e.g., **In**) can be confounded by the **In*%EN** interaction. One approach to this situation is to fix the %EN factor at a specific level and apply Tukey's test to the means of the In parameter at that level. It is desired to evaluate the negative current (In), for this purpose, the interest is to detect differences between the means of its three levels. Since the interaction is significant, the comparison takes place at only one %EN level, e.g. level 2 (%EN = 30%). It is necessary to estimate the variance of the error and the best estimate is to use the *MQE* of the penetration ANOVA table for the In and %EN factors, using the assumption that the variance of the experimental error is the same in all treatment combinations.

NEGATIVE CURRENT RATING AND CONSTANT %EN

Keeping constant %EN = 30%, for each negative current level (-70 A, -50 A, -30 A), the mean penetration data is calculated from the penetration data, respectively, 1.023 mm, 0.381 mm and 0.515 mm, see Table 7.

The mean of the squares of the error term (MQE) = 0.01115 can be obtained from the ANOVA, see Table 6, the degrees of freedom for the error term is $f = 12$ and the number of treatment for the negative current is $a = 3$, the number of repetitions is $n = 2$, the significance level is $\alpha = 0.05$. The value of $t_{0,05} = 3.77$ can be obtained. Substituting the values in Eq. (5) $q_{\alpha}(a, f)q_{0,05}(3,12)T_{0,05}$ can be calculated.

$$T_{0,05} = q_{\alpha}(a, f) \sqrt{\frac{MQE}{n}} = 3,77 \sqrt{\frac{0,01115}{2}} = 0,281491 \quad (6)$$

Thus, any pairs of treatment means that differ in absolute value by more than would imply that the corresponding pair of population means is significantly different. $T_{0,05} = 0,281491$

Table 7: Mean Penetration Values (mm) of the Experiment Design

In (A)	%EN (%)			
	20	30	40	50
-70	0,803	1,023	0,271	0,375
-50	0,963	0,381	0,133	0,086
-30	0,731	0,515	0,000	0,000

Comparisons of penetration averages for In: -70 A, -50 A and -30 A, keeping constant %EN = 30%.

	Average 1	Average 2	Module	T-value0.05	Decision
In -70 A vs In -50 A =	1,023	- 0,381	= 0.643	> 0,281491	Dif. Signif.
In -70 A vs In -30 A =	1,023	- 0,515	= 0.508	> 0,281491	Dif. Signif.
In -50 A vs In -30 A =	0,381	- 0,515	= 0.135	< 0,281491	There is no Diff. Signif.

The analysis indicates that at level 2 of the proportion of negative electrode (%EN = 30%), in Figure 10 it can be observed that the average penetration of the weld bead is the same when applied to the negative current, In = - 50 A and In = - 30 A and that the average penetration for the negative current In = - 70 A is significantly higher when applied to In = - 50 A and In = - 30 A. the difference in mean penetration between the negative current of -70 A and -50 A is statistically significant, as is the difference in penetration between -70 A and -30 A. However, the difference in penetration between -50 A and -30 A is not statistically significant.

By keeping the proportion of negative electrodes constant, and varying only the negative current, in the three levels evaluated, the difference should not be significant in the comparison of the means, so that the mean penetration is not affected by the In value. Thus, it is demonstrated that it is necessary to consider the value of the negative current and the proportion of the negative electrode to obtain the desired condition of penetration of the weld bead. The authors (KIM ET AL., 2002; KIM

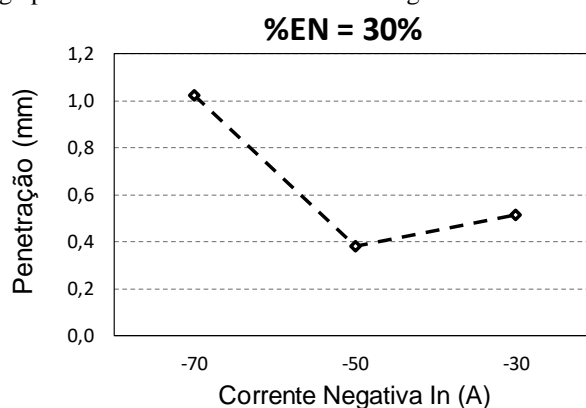
AT EL., 2007; VILARINHO AND NASCIMENTO, 2009) in their studies of the proportion of negative electrode (%EN) on the geometry of the weld bead, did not report whether or not the negative current varied.

In this study, the effect of %EN' was not evaluated, which considers the composition of time and the intensity of the negative current in relation to the total current wave in the period. %EN' compares the area of the current curve as a function of the time ($I \times T$) of the current in the negative part with respect to the total area of a pulse cycle.

Table 6 of the ANOVA shows that the interaction is significant, so it is necessary to compare all the means of *the ab* = 12 cells to determine which ones differ significantly. In this analysis, the differences between the cell averages include the interaction effects as well as the two main effects.

To perform the penetration mean comparisons, the result would be 30 comparisons between all possible pairs of the twelve (12) cell averages.

Figure 10: Average penetration for %EN = 30% and negative current: -70 A, -50 A and -30 A



Source: Author (2024).

EVALUATION OF THE RATIO OF NEGATIVE POLARITY AND CONSTANT IN

It is intended to evaluate whether the proportion of negative electrode (%NE), for this purpose, the interest is to detect differences between the means of the four levels of %NE. Since the interaction is significant, the comparison takes place at only one negative current level, e.g. level 1 ($I_n = -70$ A). It is necessary to estimate the variance of the error and the best estimate is to use the MQE in Table 6 of the penetration ANOVA for the I_n and %EN factors, using the assumption that the variance of the experimental error is constant in all treatment combinations.

Keeping constant $I_n = -70$ A, for each level of negative electrode proportion (20%, 30%, 40%, 50%), the mean penetration is calculated from the penetration data, respectively, 0.803 mm, 1.023 mm, 0.271 mm and 0.375, see Table 7 and Figure 11.

The data are as follows: $QE = 0.01115$; number of treatments, $a = 4$; degrees of freedom, $f = 12$; number of repetitions, $n = 2$. The value of $t = 4.2$ can be obtained. Substituting the values in Eq. (5) $q_{\alpha}(a, f)q_{0,05}(4,12)T_{0.05}$ can be calculated.

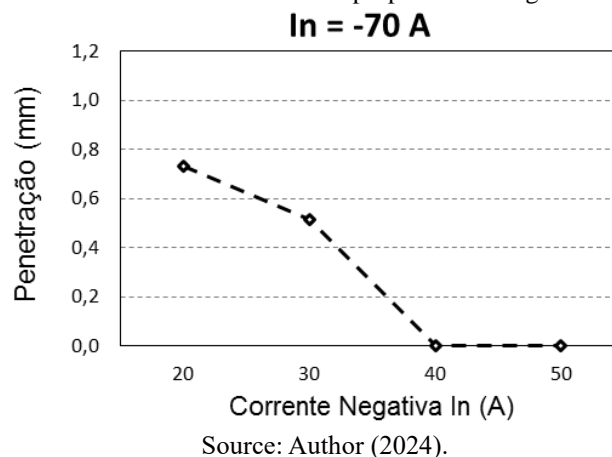
$$T_{0,05} = q_{\alpha}(a, f) \sqrt{\frac{MQE}{n}} = 4,2 \sqrt{\frac{0,01115}{2}} = 0,31359687 \quad (7)$$

Comparisons of the means of the ratio of negative electrode to %NE: 20%; 30%; 40% and 50%, keeping constant $I_n = -70$ A.

	Average 1	Average 2	Module	T-value0.05	Decision
%EN 20% vs %EN 30%	= 0.803	- 1,023	= 0.220	< 0,3136	There is no Diff. Signif.
%EN 20% vs %EN 40%	= 0.803	- 0,271	= 0.532	> 0.3136	Dif. Signif.
%EN 20% vs %EN 50%	= 0.803	- 0,375	= 0.428	> 0.3136	Dif. Signif.
%EN 30% vs %EN 40%	= 1.023	- 0,271	= 0.752	> 0,3136	Dif. Signif.
%EN 30% vs %EN 50%	= 1.023	- 0,375	= 0.648	> 0,3136	Dif. Signif.
%EN 40% vs %EN 50%	= 0.271	- 0,375	= 0.104	< 0,3136	There is no Diff. Signif

From the comparison of the penetration means for %EN 20% vs %EN 30% and %EN 40% vs %EN 50% it was determined that there is no significant difference. However, the penetration averages for %EN 20% vs %EN 40%, %EN 20% vs %EN 50%, %EN 30% vs %EN 40% and %EN 30% vs %EN 50% are statistically significant.

Figure 11: Mean penetration for $I_n = -70$ The constant and the proportion of negative electrode (%EN): 20%; 30%; 40%



CONCLUSIONS

Based on the evaluation of the penetration of the weld seams with variation of the negative current and negative electrode ratio parameters, it can be concluded that:



- There is a reduction in penetration with an increase in %EN due to the reduction in thermal contribution, which allows the welding of thin sheets and the application of coatings.
- From the statistical evaluation it was determined that the effect of EN on penetration is 13.1%, however the effect of %EN is 71.6%, also the interaction is statistically significant contributing with 11.0%.
- It is possible to select the combination of negative current and negative electrode ratio appropriately to achieve the desired penetration depending on the application (coating, root pass, additive manufacturing).


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Analysis of dilution response surfaces and bead morphology in MIG-welding process

 <https://doi.org/10.56238/sevned2024.010-051>

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ABSTRACT

The complexity of the current welding processes, as well as their sensitivity and precision, make it necessary to use statistical methods and optimization, accompanied by the search for experimental error and the adjustment of the model obtained, aiming at reducing time and cost. Although there are numerous treatments that have emerged over time, the Response Surface Methodology (MSR) has become one of the most appropriate ways to manage research related to this scope, by combining design and analysis of experiments, modeling and optimization. In addition, the search for processes that adjust to the needs imposed in the current scenario for coating, leads to the research of new welding processes, which combine low dilution, with maximized reinforcement width and height values, with only one layer. This difficulty causes welding processes to be conducted in conjunction with these tools, making the process more efficient. In this sense, with the objective of joining the two fronts exposed, the present work, through the use of Box-Behnken (BBD), sought to analyze the MSR of the dilution, width and height of reinforcement, with the use of MIG-PV welding, with filler metal AWS A5.9 ER385 (analogous to AISI 904L) in position (1G) on free surface (bead-on-plate) on ASTM A36 carbon steel substrate, with a thickness of 6.35 mm, in addition to optimizing the process via desirability with reinforcement height. The result showed that the input values were adjusted, considering the R² values of 88%, as well as the morphology of the surfaces. In addition, it showed maximum desirability in optimization, with an experimental error of 8.8%, with average height values of 5.2 mm, having great application in the current industry, with only one layer.

Keywords: Welding, Cladding, BBD, MSR, Dilution, Optimization.

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INTRODUCTION

The Response Surface Methodology (MSR) encompasses a structure, tool or technique, of great application and potential for modeling and optimization of industrial processes. This is proven by the large number of studies in various areas of knowledge, such as engineering (GHAEDI et al., 2015), health (Augustin et al., 2012), and manufacturing (ROSHAN ET AL., 2013). Analyzing specific welding applications, the topic becomes a range of possibilities, since it is possible to find numerous welding processes that are analyzed through MSR (AHMADNIA ET AL., 2016; HASAN ET AL., 2017; JAHANZAIB ET AL, 2017; LOTFI AND NOUROUZI, 2014; MOSTAAN ET AL., 2016; MOSTAFAPOUR ET AL., 2017; KORRA ET AL., 2015; RAMACHANDRAN ET AL., 2016; SAFEEN ET AL., 2016; SHI ET AL., 2014; WINICZENKO, 2016).

However, as the analyzed terms can carry a certain complexity, it is necessary to correctly design the proposed experiment, since the application makes the initially analyzed region delimited (MYERS and MONTGOMERY, 2009), and the input variables end up controlling the output variables (MONTGOMERY, 2017). Evidently, the relationship of these variables within the experimental arrangement is dictated by statistical concepts derived from mathematics (LEITHOLD, 1994). However, depending on the variables involved and their quantities in practical cases of everyday life, even with this numerical support, the functions of interest may still be unknown (BOX, 1954; STEWART, 2012).

The knowledge of the set of variables that govern the experiment ends up implying the search for oriented procedures to be able to evaluate the effect of this variation on the output variables of the proposed study (MONTGOMERY, 2017). Therefore, and in response to this need, numerous techniques have been developed to circumvent this problem, which end up forming the study of Experiment Planning and Analysis (DoE), and which stands out the Central Compound (CCD), Box-Behnken (BBD), Taguchi. The choice of these arrangements is decided depending on the need for application, and can be evaluated on several fronts, and be used individually (EKICI AND MOTORCU, 2014; TEIMOURI ET AL., 2017), in combination (PATEL ET AL., 2016) or even comparatively (SIVARAOS ET AL., 2014), sometimes seeking a better refinement of the process.

The use of this tool is not separate from its correct interpretation. In addition to due space constraints, either by the initial arrangement or by a reallocation of points with the aim of achieving the expected response, the determination of the choice of input variables becomes important, and presents two methods practiced: the first, more traditional, is employed a fractional arrangement with few runs (BOX AND HUNTER, 1961), and in the other, there is a readjustment of values similar to those of the literature, together with a baggage of practical experience of the person responsible (GOOS AND JONES, 2011), and there may also be an initial exploratory project.

However, the analysis and understanding of the convexity of the response surface, the curvature and the relationship of the direction of optimization are fundamental (HOERL, 1985) since a concave surface has a minimum point, and a convex maximum point. However, some response morphologies may have a saddle-shaped geometry, which sometimes makes it difficult to obtain maximum points, if not minimum points, and are commonly seen in manufacturing processes (SENTHILKUMAR AND KANNAN, 2015; VERMA ET AL., 2017).

Optimization turns out to be a variant of the MSR itself, being a component of the methodology. It can be understood as a necessary attribute to be objectified according to the nature of the problem (RAO, 2009; ZAVADSKAS AND TURSKIS, 2010). Depending on the morphology of the response, a rational direction can be assigned, looking for minimum, maximum or even target values, to then characterize the new input variables (DEB ET AL., 2017; ŠAPARAUSKAS ET AL., 2011), thus finding the equation of response and experimental error (BRIGHTMAN, 1978).

In the manufacturing area, it is easy to find work that maximizes results, especially in welded alloys, for example, increasing tensile strength (KUMAR ET AL., 2017; SUDHAGAR ET AL., 2017). On the other hand, studies on machined parts aimed at reducing the roughness of the parts, seeking, of course, minimum response values (KANT AND SANGWAN, 2014; ÖKTEM ET AL., 2005). The subject does not cease, since numerous studies can be analyzed with the objective of seeking the optimization of maximum and minimum values (ABUHABAYA ET AL., 2013; SONG ET AL., 2014).

A method of optimization of the response surface is the *desirability*, or desirability, initially proposed by (DERRINGER AND SUICH, 1980), which, through the simple and compound desirability values, returns the values sought as minimum, maximum or target, always observing the morphology of the response, the interaction of the optimization and its desirability values. Welding works apply the method (AHMADNIA ET AL., 2016, PIMENTEL, 2023; PIMENTEL ET AL., 2023) as well as being applied in other processes (HOSSEINZADEH AND MOUZIRAJI, 2016), showing its importance.

In welding processes, there is often a need to use the tool, due to the difficulties of the parameters involved. In the study, the application of the analysis of the response surface of the input variables and the relationship with the output variables is proposed. Graphs of dilution responses, an important variable in the welding process, especially in cladding applications, were plotted (GOMES, 2010; PIMENTEL, 2023; PIMENTEL ET AL., 2023). In addition, the morphology of the bead was analyzed, such as its width (L) and reinforcement height (H), which are important parameters for welding application (PIMENTEL ET AL., 2023).

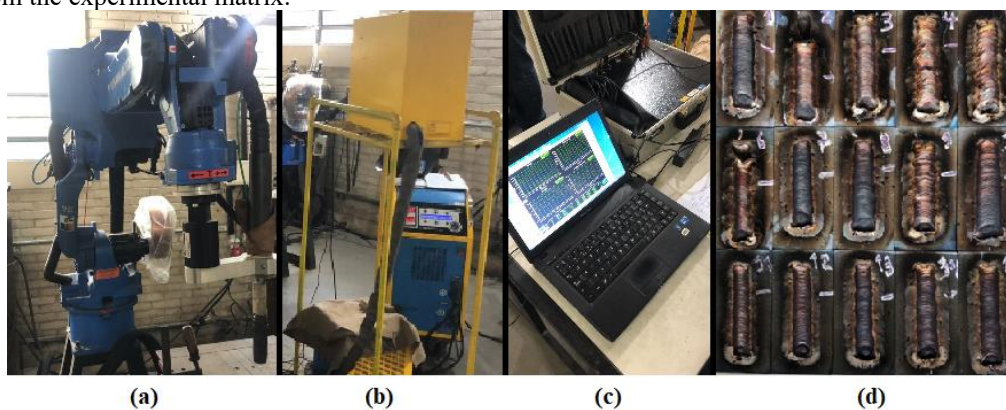
In addition, it was proposed the optimization of the experimental arrangement via the desirability method with maximum reinforcement height value, since they impact on the morphology

of the coating. To this end, the MIG/MAG-PV process was used, which, due to its reverse polarity, can achieve the necessary application for coating, since it reduces the temperature and better controls the process (FARIAS ET AL., 2005; PUHL, 2011). The process was deposited as a coating with the addition of AWS A5.9 ER385 wire (analogous to AISI 904L) on ASTM A36 carbon steel plates.

MATERIALS AND METHODS

The MIG-PV welding procedure and analysis were carried out at the Laboratory of Welding & Related Techniques (LS&TC) of the Federal University of Rio Grande do Sul. The equipment used for welding and data collection and the experimental matrix are shown in Figure 1. To drive the torch the Yaskawa robotic arm (a), an IMC DIGIPlus A7 450 welding source and wire feeding device (b), an IMC SAP V4.01 portable data acquisition and process control system (c), and the fifteen deposited strands of the experimental matrix (d).

Figure 1:(a) Robotic arm; (b) welding source and wire feeding system; (c) data acquisition system; (d) fifteen strands deposited from the experimental matrix.



The MIG/MAG – PV process was used with filler metal AWS A5.9 ER385 (analogous to AISI 904L) in position (1G) on a *bead-on-plate* on ASTM A36 carbon steel substrate, with dimensions 150 x 50 x 6.35 mm. In addition, the process was carried out with weaving, where studies have shown good results (FRATARI ET AL., 2010; MIRANDA ET AL., 2015). The levels of the input factors can be seen in Table 1, and were used in the Box-Behnken (BBD) design of experiments, for three factors it requires only 12 executions and three more replicates at the central point, totaling 15 executions (BOX AND BEHNKEN, 1960). In addition to the application of BBD, the response surface method was employed, which, analogous to the graphical representation of a cube for the BBD, results in the graphical representation of the surface of the result that can be optimized (BOX AND DRAPER, 1987).

Table 1: Input parameters and levels of the applied experiment design.

Factors	Levels		
	Minimum value (-1)	Center Point (0)	Maximum value (+1)
Amplitude (mm): At	6,0	7,0	8,0
Weaving Frequency (Hz): Ft	0,6	0,9	1,2
Welding speed (mm/s): Vs	1,5	2,0	2,5

The parameters of the variable polarity current curve were obtained through previous tests, but also by analyzing and changing the parameters of past studies, since good initial results were not obtained (KANNAN AND YOGANANDH, 2010; MURUGAN AND PARMAR, 1994; NASCIMENTO ET AL., 2009). The values can be seen in Table 2, as well as other values kept constant throughout the welding process, in addition to the filler metal diameter of 1.2 mm, can be observed: torch travel angle (neutral) = 0 °, part-contact nozzle distance (DBCP) = 18 mm, shielding gas flow rate (argon) = 18 l/min.

Table 2: Parameters Held Constant of the Variable Polarity Current Curve.

Current Curve Parameters	Constant values
Ip - Positive Peak Running	350 A
Tp – Positive Peak Time	3.0 ms
Ib - Base Running	40 A
Tb - Base time	5.0 ms
In - Negative pico current	-70 A
Tn – Negative Peak Time	5.0 ms

The welding procedure consisted of the deposition of a bead on each plate, totaling 15 experiments plus two plates for reinforcement height validation by the optimization method. For the experimental error, the simple average of two cords was performed. The cross-sections, after being cut with a standard (*cut-off*) machine, available in the laboratory, were embedded, sanded and polished. Afterwards, the attack with the chemical reagent Nital 2% was used to develop the macrographs.

In addition, the images were obtained using the Leica EZ4 HD magnifying glass and the measurements were taken using the free *software* ImageJ, with a simple average of three checks. The *software* used for the analysis of the experiment and plotting the graphs was Minitab® and Statistica®,

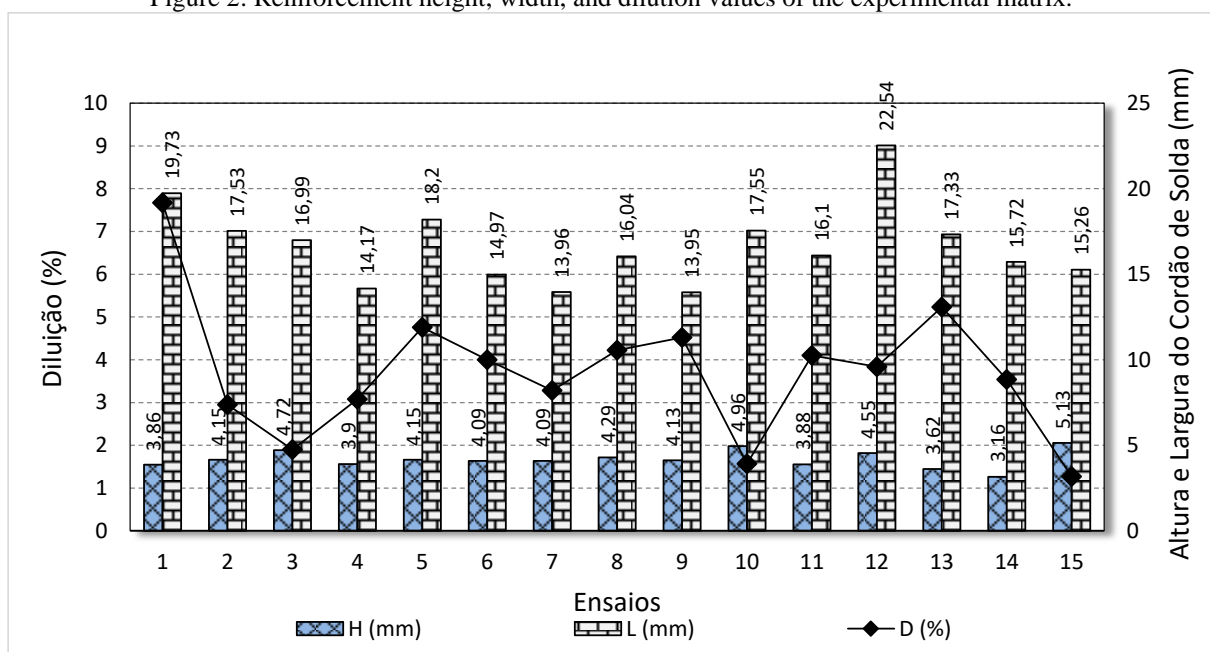
made available by the university. Surface graphs of dilution response, as well as reinforcement height and width were generated.

Analysis of variance (ANOVA) was used to evaluate the main effects (linear and quadratic) and interactions of the factors on the observed responses. For this analysis, a confidence level (α) of 0.05 was used, and for alpha values (α) lower than 5%, it was assumed that the control variable in question is significant in the response. The term p-value is known for the probability of significance, if it presents values higher than 0.05 (5%), the null hypothesis (factor is not significant) can be rejected with 95% confidence. However, the lower the p-value value, the greater the influence of the parameter on the analyzed response.

RESULTS AND DISCUSSIONS

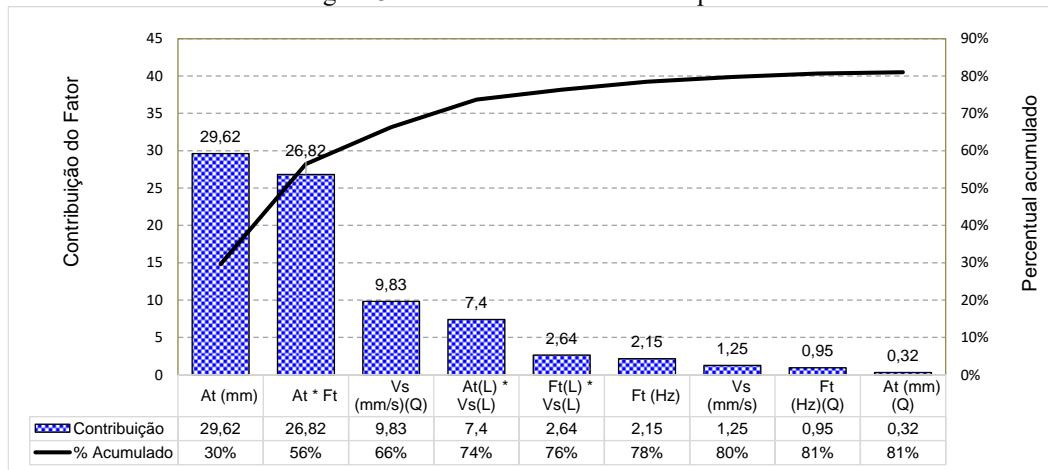
The data collected from the height and width of the weld bead, the dilution values for each treatment of the matrix of BBD experiments can be observed in Figure 2. It is possible to notice low dilution and width values that exceed 22 mm, as well as minimum reinforcement heights of 3.62 mm. The highest dilution value presented did not exceed 8%. The coefficient of determination (R^2) of each and every model must be estimated in order to know the experimental and statistical fit of the model obtained. The R^2 values of the responses analyzed were: 81% (dilution), 83% (reinforcement height) and the highest of all observed, 88% for width. These values are considered satisfactory in the analysis of the mathematical/statistical model, since the minimum value is 70% (MONTGOMERY, 2007). This shows that the dilution control, even if considered adjusted, had the lowest adjustment in relation to the bead morphology, and is also the only variable that involves metallurgical issues.

Figure 2: Reinforcement height, width, and dilution values of the experimental matrix.



By means of ANOVA, it was possible to determine that the main parameters At and Ft have a strong significant effect on dilution to a significance level $\alpha = 0.05$ (p-value < 0.05). Figure 3 shows that the weaving amplitude has a contribution of 29.62%, while its linear interaction with the weaving frequency has a contribution of 26.82%, showing that together they correspond to more than 50% of weight. The statistical error was 7.39%, the highest among the response variables analyzed.

Figure 3: Pareto chart for dilution response.



As the contribution of weaving amplitude and frequency are relevant, Figure 4 shows the behavior of this interaction in relation to the dilution studied. The behavior of frequency and amplitude at the maximum values showed an unfavorable result for dilution, since it presented high values, above 7%. The weaving amplitude values at the low value, at 6 mm, showed excellent dilution values, regardless of the weaving frequency used.

In addition, the optimal combination for minimum dilution values in the analyzed crop points to minimum values of At and maximum Ft, even though this relationship is not directly tested in the experimental matrix by the inherent characteristic of BBD. The weaving amplitude being the most influential input variable goes according to the dilution response, since At increases, increases the width and also the dilution value (PIMENTEL, 2023).

Figure 4: F_t versus A_t interaction for dilution.

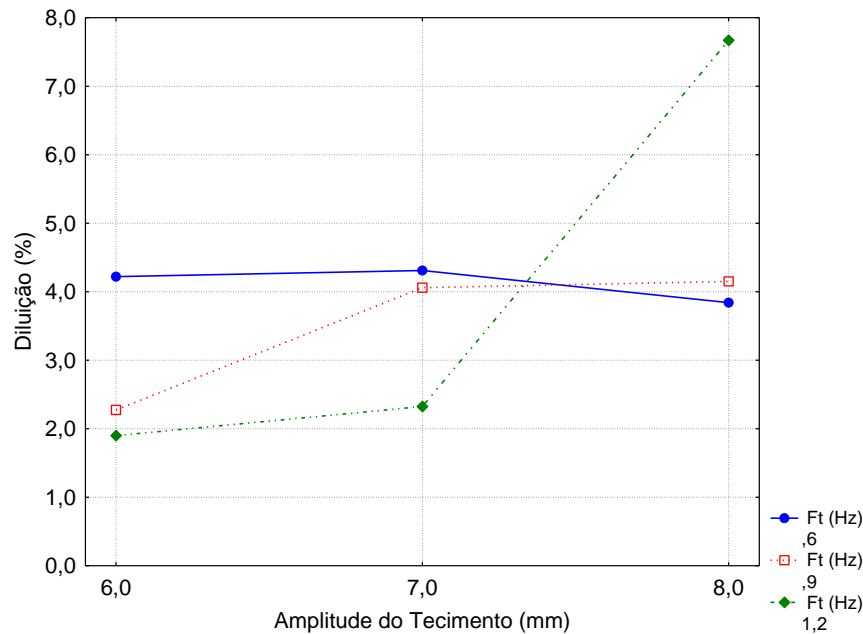
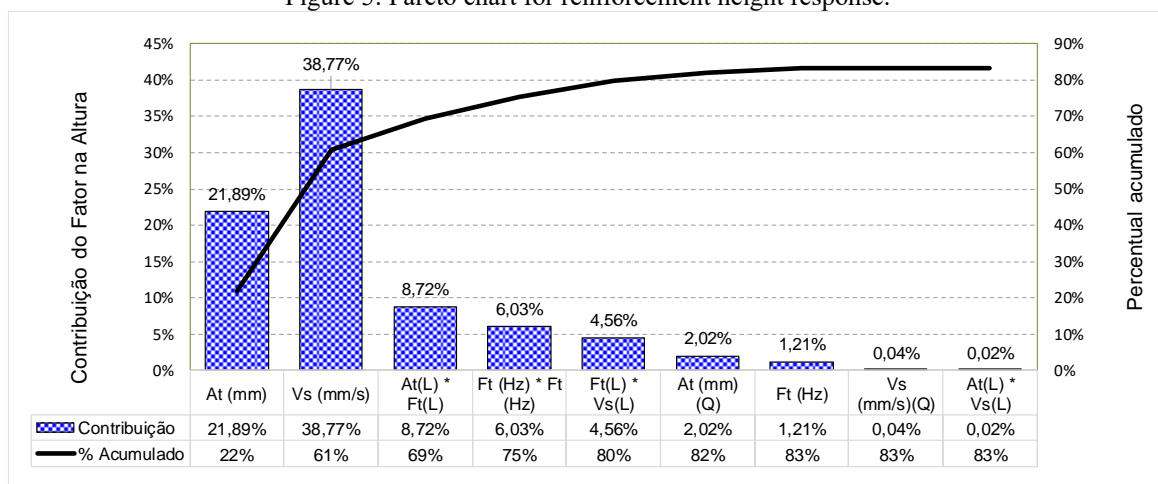


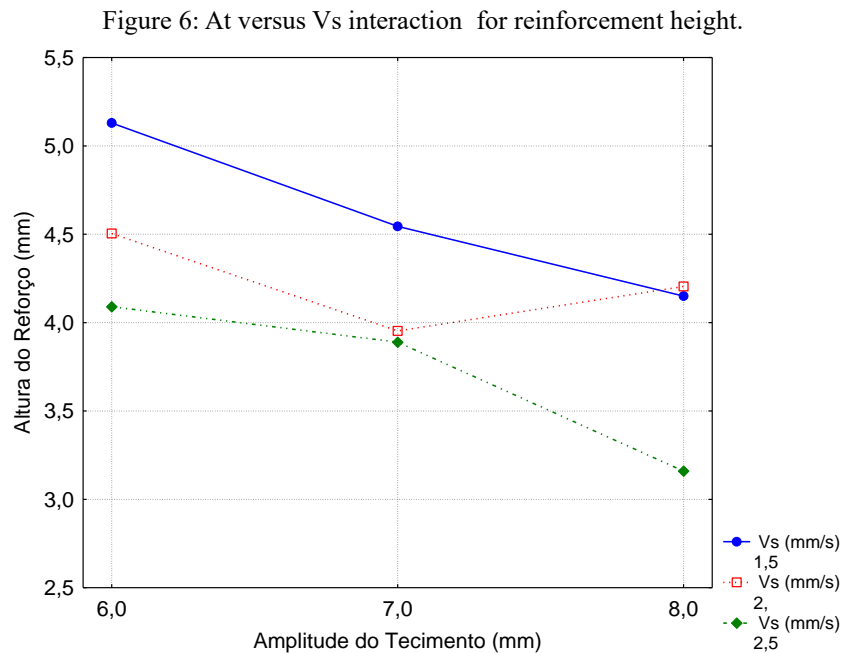
Figure 5 shows the Pareto chart for reinforcement height response. Through an analysis based on ANOVA, it is possible to observe the main contribution parameters, in which they showed a contribution of 38.77% for V_s and 21.89% for TA, both adding up to 61%. The error for the reinforcement height response was 4.68%. It can be noted that unlike dilution, the linear of significant contribution is seen in two input parameters, including a high contribution of welding speed being more prominent.

Figure 5: Pareto chart for reinforcement height response.

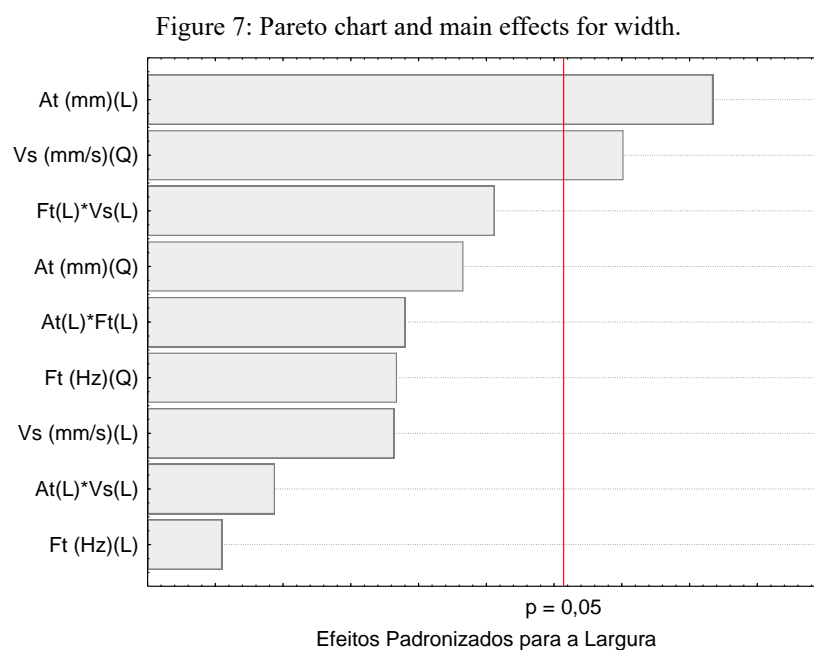


With the significant parameters seen in ANOVA, with Figure 6 it is possible to understand the behavior of the variables with the greatest contribution. It is possible to notice that as the weaving amplitude increases, the reinforcement height decreases, for all levels of V_s . The welding speed

values at the low level show higher values of reinforcement height, with a response greater than 5 mm of reinforcement height for low levels of A_t and V_s .



By means of ANOVA, the main parameters were determined, significant for a significance level $\alpha = 0.05$ (p -value < 0.05). By means of the Pareto chart, in Figure 7, it is possible to observe that A_t (L) and V_s (Q) are significant, with a contribution of 32.08 % for the first and 21.58 % for the second. In addition to presenting an error of 5.36% for width, both factors contribute more than 50%, showing the impact of the parameters.



It is possible to notice the behavior of the significant variables in Figure 8, where no curve intersects, showing an increasing behavior for all V_s , as the value of A_t goes from the low to the high level. It is possible to achieve values greater than 20 mm in width with the combination of $A_t (+1)$ and $V_s (0)$. When searching for minimum width values, values of $A_t (-1)$ and $V_s (+1)$ should be entered, reaching a value of 14 mm.

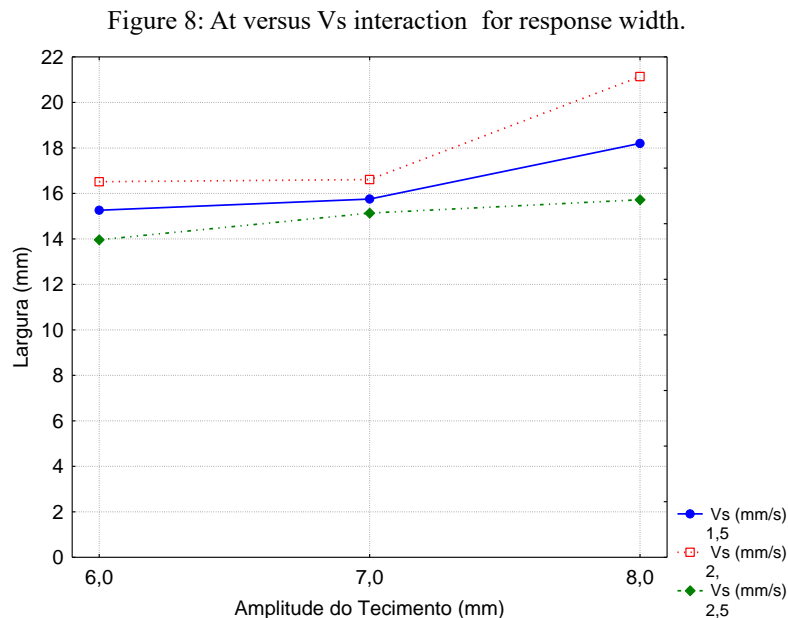
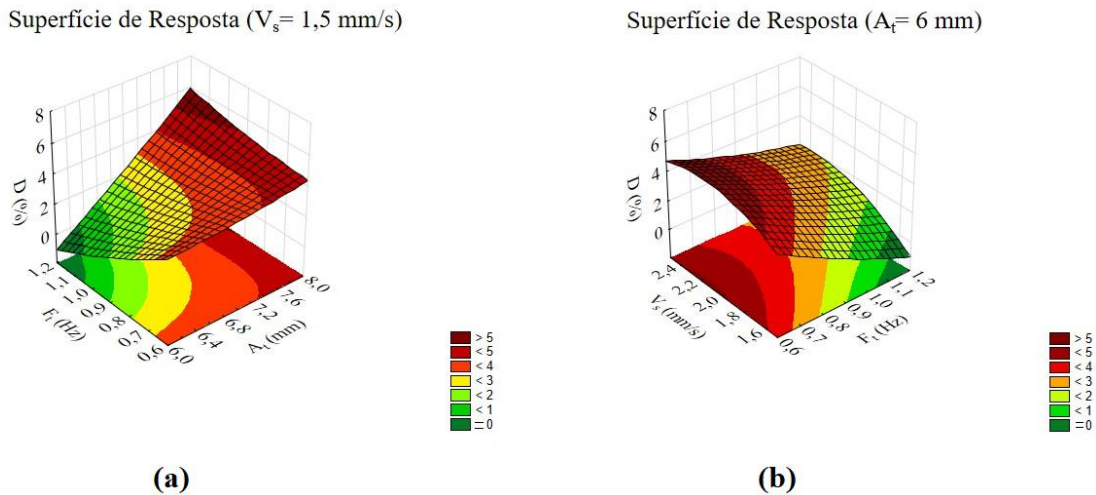


Figure 9 (a) shows the response with a value of $V_s (-1)$, as it presented the lowest dilution response, being beneficial for coating (GOMES, 2010; PIMENTEL, 2023), as well as the $A_t * F_t$ ratio proved to be influential, as seen in the Pareto chart in Figure 3. It can be seen that, even if the response values do not present a concave, convex or saddle morphology (BEZERRA ET AL., 2008; BOX AND DRAPER, 2007; EDWARDS, 2007; OLIVEIRA, 2018), a morphology similar to convex can be observed, with the minimum point being eligible.

The morphology shows that the proposed experimental arrangement presented the possibility of obtaining minimum values, even though it was not a well-characterized surface with a convex shape. With $A_t (-1)$ and $F_t (+1)$ values, it is possible to obtain minimum dilution values, much lower than those referenced (MURUGAN AND PARMAR, 1997). Even if the values fluctuate in any axis, the dilution still presents low values, applicable to coating.

Figure 9 (b) shows the response surface of $F_t * V_s$, which is significant as Figure 3 shows an $A_t (-1)$ value, since its individual response has a lower dilution value. It can be noted that the minimum dilution value is obtained with $F_t (+1)$ and $V_s (-1)$ values, in a format conducive to presenting a minimum point, within a well-established arrangement without stratopulation, but different from a convex point. In addition, in both graphs in Figure 9, it is possible to notice targets of achievable values with zero dilution, both in (a) and (b).

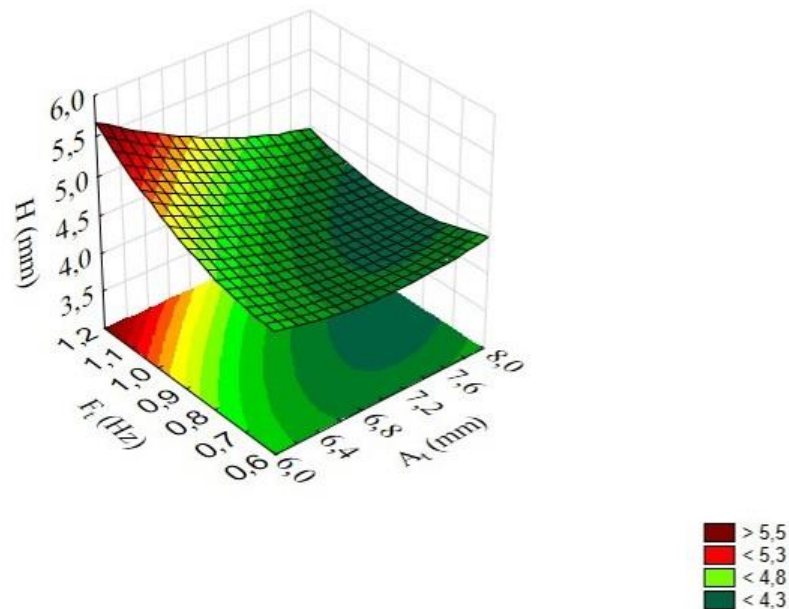
Figure 9: (a) MSR F_t versus A_t with $V_s=1.5$ mm/s, for dilution; (b) MSR V_s versus F_t with $A_t=6$ mm, for dilution.



Considering the influential values in the Pareto chart in Figure 5, Figure 10 shows the ratio of $A_t * F_t$ with V_s (-1), as it presents the highest reinforcement height response, which is beneficial for coating (PIMENTEL, 2023). With it, it can be seen that with the shape of the MSR a well-defined maximum point is now achieved, even if it is not a convex surface, reaching values greater than 5.5 mm of reinforcement height with A_t (-1) and F_t (+1). Even at the lower values of reinforcement height, it presented a satisfactory value, meeting coating projects (MOTA ET AL., 2016).

Figure 10: MSR F_t versus A_t with $V_s=1.5$ mm/s, for reinforcement height.

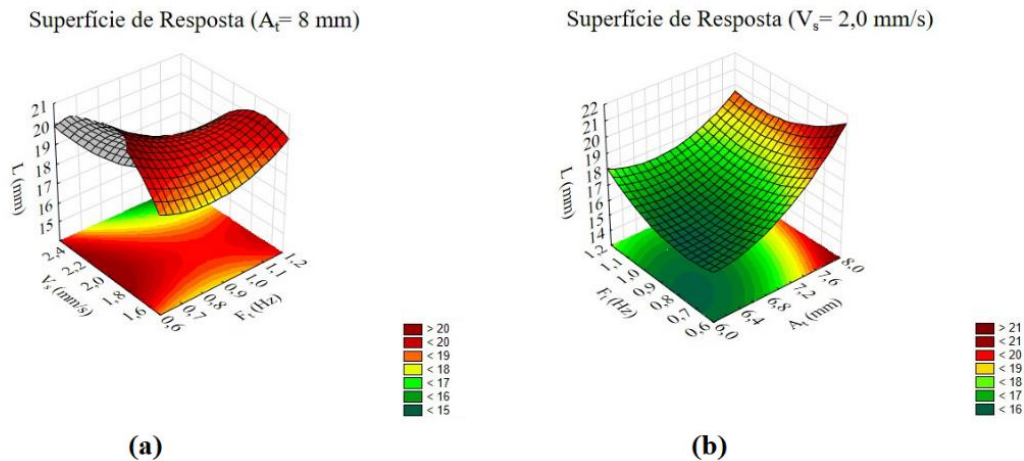
Superfície de Resposta ($V_s = 1,5$ mm/s)



By means of the influential values in the Pareto plot in Figure 7, Figure 11 (a) presents A_t (+1), as it returns the largest width value, having a saddle surface as a response, which usually for maximum point optimization presents multiple results, as most studies (OLIVEIRA, 2018). However,

the minimum point values are practically unfeasible, given their morphology. Even so, the width values present a large coverage region with values greater than 20 mm, especially in the central part of the response.

Figure 11: (a) MSR V_s versus F_t with $A_t = 8$ mm, for bead width; (b) MSR F_t versus A_t with $V_s = 2.0$ mm/s, for bead width.



However, in Figure 11 (b), with V_s (0), it presents the greatest width, as seen in Figure 7. Even though it does not have a concave surface, it is possible to observe a region of maximum point, with values of A_t (+1) and F_t (-1), reaching values greater than 21 mm, higher than coating with other welding processes that used weaving (PIMENTEL, 2023). Even with the minimum response values, in the green region, high width values are still possible, largely due to the use of weaving.

As optimization depends on multi-response, i.e., the input variables must be resized, still within the experimental arrangement, since the returned values found meet the project. Thus, the use of optimization is common to achieve a specific objective, or a series of them (PAIVA ET AL., 2007). Figure 12 (b) shows the optimization with the method proposed by (DERRINGER AND SUICH, 1980), where it presented both simple and compound desirability maximums, showing a probable range.

Also in Figure 12 (b) it is possible to notice that the values of the optimized multi-response, where they present a response of: weaving amplitude 6.0 mm, weaving frequency 1.20 Hz and welding speed 1.50 mm/s. This demonstrates that the optimization values are at the minimum extremes of the experimental arrangement for A_t and V_s , and maximum for F_t . The maximum reinforcement height value was 5.67 mm, which demonstrates a bead eligible for coating application, without the use of vertical overlap (SILVA ET AL., 2014).

Figure 12: (a) optimized cords; (b) optimization via desirability method.

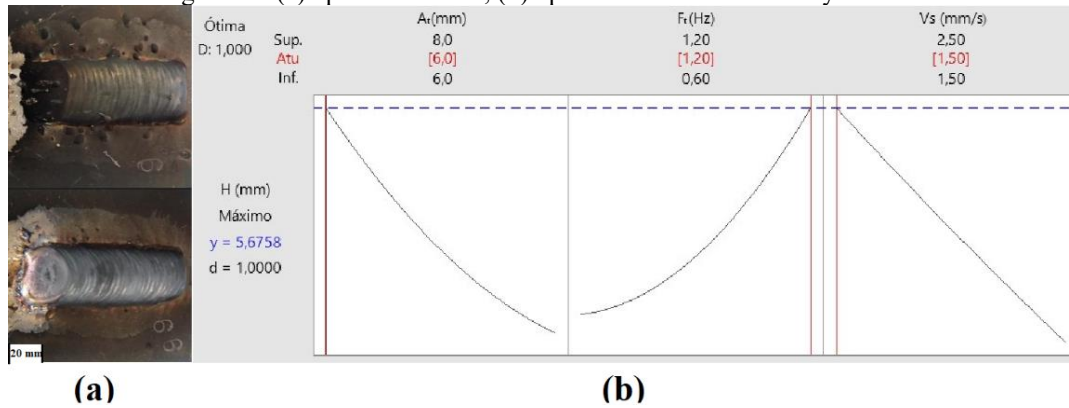


Figure 12 (a) shows the morphology of the two strands optimized to obtain the experimental error, using the reinforcement height value. In addition to presenting a good continuity, without the presence of pores, it is possible to see a good repetitiveness. The optimization error showed a value of 8.8%, even lower than in coating, with another process, but with the same pair of materials, with the use of BBD and optimization via desirability (PIMENTEL, 2023; PIMENTEL ET AL., 2023).

CONCLUSIONS

With the present work, it was possible to conclude:

- The MIG-PV process showed good geometric continuity, adequate bead morphology, as well as low dilutions that credit it to the application in coating.
- The R2 values showed an excellent fit, with a lower value of 81% for dilution and a maximum of 88% for width.
- Via ANOVA for dilution, A_t was more significant with a value of 29.62% and an error of 7.39% for the response.
- Via ANOVA for reinforcement height, V_s was more significant with a value of 38.77% and an error of 4.68% for the response.
- Via ANOVA for width, A_t was more significant with a value of 32.08% and an error of 5.36% for the response.
- The optimization via the proposed desirability method with a maximum value had a return (y) of 5.67 mm. The system fed back the input aiming at optimization with values A_t (-1) and V_s (-1) and F_t (+1).
- The proposed experimental error via desirability showed a mean value of 8.8%.

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The teaching of mathematics in EJA: The limits and challenges in pedagogical practice

 <https://doi.org/10.56238/sevned2024.010-052>

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ABSTRACT

This study addresses Adult and Youth Education (AYE) as a form of education aimed at social inclusion and the comprehensive development of individuals who did not complete their basic education at the appropriate age. AYE faces challenges such as school dropout rates and lack of resources, necessitating the strengthening of educational policies in this area. The aim of this study is to analyze the challenges and opportunities of AYE in the development of literacy, with a focus on mathematics education, through a literature review. The methodology involved a comprehensive literature review, seeking theoretical and conceptual insights. The role of the teacher in AYE is emphasized, with a focus on the importance of the affective aspect in learning. The paper also discusses literacy and numeracy, highlighting their relationship and relevance in education. Mathematical literacy is introduced as fundamental for understanding everyday situations.

Keywords: Adult and Youth Education (AYE), Mathematical Literacy and Numeracy, Social inclusion.

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INTRODUCTION

Youth and Adult Education (EJA) is a teaching modality aimed at people who have not had the opportunity to complete their basic education at the appropriate age. It aims to provide social inclusion and comprehensive education for young people and adults, allowing them to develop their cognitive, social and cultural skills.

EJA covers different age groups and student profiles, including those who interrupted their studies for various reasons, such as work, motherhood or lack of access to education in their childhood. The EJA audience is made up of people with diverse life experiences, which makes this teaching modality challenging and enriching at the same time (GOMES, 2016).

The role of the teacher in EJA is of fundamental importance, as he acts as a mediator of knowledge, stimulating the active participation of students and creating an environment of acceptance and mutual respect. In addition, the teacher in EJA must be prepared to deal with the specificities of this public, understanding their needs and offering pedagogical strategies appropriate to each context (QUINQUIOLO, 2017).

However, EJA also faces challenges, such as school dropout and the lack of adequate resources to meet the specific demands of this audience. Therefore, it is essential that public policies and investments are directed to strengthen and expand the provision of quality education for young people and adults (GOMES, 2016).

In this context, this work is justified by the need to understand and address the challenges faced by EJA, in order to contribute to the improvement of educational policies and practices in this area. EJA plays a vital role in educational and social inclusion, but it faces issues such as school dropout and the demand for pedagogical strategies for a diverse audience.

The objective of this study is to analyze and present the challenges and opportunities of Youth and Adult Education in the development of literacy and literacy, focusing on the teaching of mathematics, through a literature review.

DEVELOPMENT

METHODOLOGY

This topic presents the methodology used to carry out the bibliographic survey on EJA. The bibliographic survey consists of a research carried out through the search and analysis of works, articles, documents and other relevant bibliographic sources on the topic in question.

To carry out the bibliographic survey, several resources were used, such as:

1. Databases: Academic databases, such as Google Scholar, Scopus and the Brazilian Digital Library of Theses and Dissertations (BDTD), were accessed to search for scientific articles, theses and dissertations related to the subject.

2. Library Catalogues: The catalogues of the libraries of the University and other educational institutions, as well as digital libraries, were consulted in search of books, monographs and bibliographic materials relevant to the research.
3. Scientific Journals: Scientific journals specialized in Education, Pedagogy and related areas were examined, in order to find articles related to the theme of EJA.
4. Books and Specialized Publications: Books and publications specialized in EJA were selected, by renowned authors and references in the area.
5. Legislation and Official Documents: Official documents, such as laws, resolutions and guidelines related to EJA, issued by the Federal Government and competent educational agencies, were consulted.
6. Theses and Dissertations: Theses and dissertations that address specific aspects of EJA were analyzed, seeking to obtain detailed and updated information on the subject.

The selection of bibliographic sources was carried out with criteria of relevance and timeliness, aiming to obtain reliable and grounded information about EJA. The selected works were analyzed in search of information that supports the discussions presented in this work.

Through this methodology, it was possible to carry out a comprehensive bibliographic survey, presenting a broad view of the educational modality, its characteristics, challenges, social importance and the fundamental role of the teacher in this context. The information obtained through this research contributed to the development of this work, offering theoretical and conceptual subsidies that enrich the discussion about EJA.

YOUTH AND ADULT EDUCATION

Definition

EJA, popularly known as supplementary education, is an education program created by the Federal Government, aimed at young people, adults and the elderly who, for whatever reasons, could not have access to education at the appropriate age. Such a program allows full or partial literacy of people in a shorter time than conventional literacy, providing better conditions to remain in the labor market.

This educational modality values the students' prior knowledge, recognizing the cultural and social baggage that each one brings with them. Thus, the learning process in EJA is based on the exchange of knowledge, dialogue and the collective construction of knowledge.

Youth and Adult Education plays a significant role in promoting citizenship and social transformation. By enabling young people and adults to resume their studies, this educational modality contributes to the formation of critical individuals, aware of their rights and duties as citizens.



History in Brazil

EJA is a challenging teaching modality, since it encompasses individuals who already have a social background and bring with them a variety of experiences lived in society. Therefore, it is crucial to seek educational approaches that are different from those used for children and adolescents. It is necessary to recognize that these students have specific needs and characteristics, such as different levels of knowledge and skills acquired throughout life. Additionally, it is important to consider your personal, professional, and family responsibilities, as well as your individual motivations and interests. Adapting teaching methods to meet these particularities is essential to promote effective and meaningful learning in EJA.

In the Brazilian historical context, EJA has played a fundamental role in promoting educational and social inclusion. Over the years, Brazil has sought to expand access to education for people who, for various reasons, did not have the opportunity to complete their studies at the appropriate age. EJA emerged as a response to this demand, offering a chance for learning and personal development for young people and adults who wish to obtain their educational training. Since its implementation, EJA has evolved in terms of public policies and pedagogical practices, with the aim of meeting the needs of students and promoting quality education, aiming to overcome educational inequalities in the country. This historical path highlights the importance of EJA as an inclusive educational strategy, capable of providing lifelong learning opportunities, valuing diversity and strengthening the citizen participation of the subjects involved.

From the enactment of Law No. 9,394 on December 20, 1996, known as the Law of Guidelines and Bases of National Education (LDB), the rights related to Youth and Adult Education (EJA) in Brazil were established. Title III of the LDB, entitled "On the Right to Education and the Duty to Educate", guaranteed the right to the provision of regular school education for young people and adults, adapted to their needs and availability. This law ensured access to and permanence in school for workers (BRASIL, 1996).

According to the LDB (BRASIL, 1996), Youth and Adult Education is intended for those who did not have access to or continuity of studies in primary and secondary education at the appropriate age, and serves as an instrument for education and lifelong learning.

Subsequently, Article 37 of Law No. 9,394 was replaced by Law No. 13,632 on March 6, 2018. This new legislation addresses the importance of "education and lifelong learning" (BRASIL, 2018). It is worth mentioning that EJA is not only a means of complying with the law, but also a way of integrating the individual into society in a cultural and formal way, guaranteeing him the right to an adequate education, which provides qualification for a dignified job.

According to Article 205 of the Federal Constitution of 1988, education is a right of all and a duty of the State and of the family, and should be 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.

In addition, Resolution No. 3, of June 15, 2010, established the Operational Guidelines for Youth and Adult Education, covering aspects such as the duration of the courses, minimum age for admission and certification in the EJA exams, as well as the possibility of developing Youth and Adult Education through Distance Education (BRASIL, 2010). Over the years, EJA has undergone several transformations, as mentioned earlier. It is evident, therefore, that the trajectory of this form of education has made significant advances, although there is still much progress to be made. Youth and Adult Education in Brazil goes beyond a matter of work and dignity, it is also a search for educational progress.

An important achievement for Youth and Adult Education was its inclusion in the Fund for the Maintenance and Development of Basic Education (FUNDEB) from 2007 to 2020. FUNDEB is the main source of funding for basic education in the country and encompasses all modalities and stages of regular education, including EJA (DIEESE, 2020, p. 3). Although the contribution to EJA is lower compared to other modalities, this funding helps to maintain the education networks in state and municipal schools, where the education of these individuals takes place.

Despite the progress mentioned, the EJA still needs a project totally focused on it, without the interference of political intentions of the elites. An educational reform is needed that benefits this form of education equally in relation to other modalities.

Youth and Adult Education and the role of the teacher

EJA is an important teaching modality that seeks to promote educational and social inclusion by providing learning opportunities for those who did not complete their studies at the appropriate age. However, to ensure quality education in this modality, it is essential to understand the fundamental role that the teacher plays. The teacher at EJA faces unique challenges as they deal with adult students who have diverse life experiences and specific educational needs.

In the context of EJA, it is essential to consider that the affective aspect plays a crucial role, acting as a driving force to overcome the difficulties faced, such as work, cultural, social and age diversity, access to information and the development of critical thinking to intervene and transform society. It is essential that EJA students feel included, capable and able to learn, in order to reduce the school dropout rate.

Considering that the trajectory of youth and adult education is marked by traits of socioeconomic and cultural exclusion, many EJA students experience problems of prejudice, exclusion, shame, racial discrimination, criticism and other situations that can be experienced both in the family and in the community (LEAL, 2017). The search for a job also becomes challenging for



these students, even if they have the capacity to perform it, because in contemporary society there is a scarcity of space and time, leaving only jobs that require more physical strength than reasoning. As Soares (2002, p. 32) states, "The education of young people and adults represents an unrepaired social debt to those who did not have access to and mastery of writing and reading as social goods, whether in school or outside of it, and who have been the labor force, employed in the construction of wealth and in the execution of public works. To be deprived of this access is, in fact, the loss of an essential instrument for a meaningful presence in contemporary social coexistence."

In this context, the role of the teacher becomes of fundamental importance in the process of the student's reintegration into the school environment and in his/her permanence in school. When the student is away from the classroom for some time, it is natural that feelings of insecurity, anxiety or even distrust regarding their potential may arise. It is up to the teacher to identify the student's emotional state, providing a welcoming and safe environment, creating conditions conducive to the teaching and learning process. The teacher must act with understanding and attention, encouraging the student to keep going, despite the difficulties that may arise along the way.

Affectivity plays a crucial role in human development and, consequently, in facilitating the learning process. As noted by Mahoney (2003), emotions exert an influence on all individuals and shape their reactions and behaviors. In this context, it is essential that students feel welcomed and integrated into the educational environment, as this sense of belonging and acceptance is a motivating factor for them to continue on their training journey. It is important to emphasize that the educator, instead of assuming a central role and monopolizing the activities, should adopt pedagogical approaches that encourage the student to express his ideas and reflect on them.

In this way, the teacher becomes a facilitator of the teaching and learning process, creating a space conducive to dialogue and the exchange of knowledge. In this sense, Maturana (2004) emphasizes the relevance of the affective relationship established by the teacher as an adjunct element in the educational process. Through affectionate communication, the teacher has the opportunity to assess the student's prior knowledge on a given subject, identifying gaps and specific needs that must be filled. Thus, the construction of a positive affective relationship between teacher and student is an essential component to promote a meaningful and effective education, which values the integral development of the student.

Paulo Freire (1921-1997), one of the most renowned educators nationally and internationally recognized, played a key role in EJA, especially in the literacy of those who had not previously had opportunities to study. More than just reading and writing skills, Freire's pedagogy was focused on "reading the world", aiming to transform it and emancipate the individual as a citizen. In his works, Freire emphasized the importance of affective aspects in teaching practice as a triggering factor for



learning, emphasizing that educational practice encompasses affectivity, joy and technical mastery at the service of change (FREIRE, 1996, p. 161).

For Freire (1996), it is essential to value the subject as an integral and important part of society, capable of promoting changes in favor of the common good. In addition to systematized knowledge, it is equally relevant to recognize the knowledge that students bring from their own lived experiences, since formal knowledge acquires importance when it contributes to the formation of critical citizens capable of acting in society and improving living conditions in social, economic, political and human spheres. However, the teacher will only have access to this rich knowledge related to the student's cultural, social, and political identity through their mediation, providing an affective environment that is open to dialogue.

In line with this perspective, the EJA Guideline establishes the need to value the different cultural knowledge present in Youth and Adult Education, prioritizing them in the construction of educational guidelines (BRASIL, 2006). This approach recognizes and respects the cultural and social diversity of EJA students, strengthening their identity and contributing to a more inclusive and meaningful education (LEITE, 2016).

Thus, the pedagogical approach inspired by Paulo Freire, which emphasizes the appreciation of affective aspects, dialogue and the recognition of students' previous knowledge, is supported by EJA's educational guidelines. This approach seeks to promote an education that is capable of transforming not only the individual, but also society as a whole, providing a critical and conscious formation of students, enabling them to act in their realities in an empowered and engaged way.

Literacy and Literacy

There are several conceptions about the terms Literacy and Literacy. Many people believe that literacy would be the teaching method adopted by teachers in the classroom to insert the knowledge of written language, while others see literacy as the use of speech and writing in the social environment by the individual. There are still those who understand the two terms as synonymous. Thus, at first, it is worth highlighting the meaning of the terms literacy and literacy in education, as they are not interchangeable terms, but are related to each other (BONAMINO; COSCARELLI; FRANCO, 2002; SOARES, 2011).

Soares (2004, p.14) points out that literacy and literacy "are not independent processes, but interdependent and inseparable", and adds:

Dissociating literacy and literacy is a mistake because, within the framework of the current psychological, linguistic and psycholinguistic conceptions of reading and writing, the entry of the child (and also of the illiterate adult) into the world of writing occurs simultaneously through these two processes: by the acquisition of the conventional writing system – literacy – and by the development of skills to use this system in reading and writing activities, in the social practices that involve the written language – literacy (SOARES, 2004, p.14)

- Literacy

The term literacy conquers space when education, through research and analysis, has found that the individual's knowledge about the written language, acquired at school, which allows him to read and write anything, does not guarantee his understanding. Thus, literacy is defined, according to Soares (2004), as the relationship that people have with written culture, in such a way that non-literacy would be an incorrect term, because anyone is in contact with the written culture in society, but at different levels of literacy that oscillate with the cultural reality of each one.

It is important to highlight that literacy and literacy are not synonymous, as already mentioned, but different, inseparable and simultaneous processes. Soares (2004, p.11) reports:

However, what unfortunately seems to be happening today is that the perception that is beginning to be had, that if children are being, in a certain way, literate in school, they are not being literate, seems to be leading to the solution of a return to literacy as an autonomous process, independent of literacy and prior to it. (SOARES, 2004, p.11).

- Literacy

Literacy in Brazil gained ground after the Proclamation of the Republic, in 1889, where schools were institutionalized and with the purpose of allowing the new generations to adapt to the new political and social order. Thus, schooling, especially literacy, was an instrument for the acquisition of knowledge, progress and modernization of the country (MORTATTI, 2006).

With the passage of time and all the evolution in the field of education, the importance of the institutionalization of schools, the importance of literacy accompanied by literacy for the complete formation of the student has been reached. Therefore, the term literacy means to lead the student to the knowledge of the alphabet, teaching him to learn to read and write, that is, to acquire the alphabetic and orthographic code, through the development of reading and writing skills (SOARES, 2007).

The Perspective of Literacy and Mathematical Literacy

Literacy and literacy are not only characterized by the knowledge of letters of the alphabet, as well as the reading and interpretation of texts. When referring to the knowledge and reading of numbers and mathematical codes, it refers to literacy and mathematical literacy, which has been in force since the dawn of civilization and accompanies the individual from the beginning of life.

The learning of mathematics inserts the knowledge of numbers, signs of operations and how to do them, sentences, graphs and their properties, being characterized by mathematical literacy. The ability and techniques of interpreting literacy knowledge is called mathematical literacy.

In line with the Programme for International Student Assessment Matrix (PISA, 2012, p. 1), "Mathematical literacy is the individual ability to formulate, employ and interpret mathematics in a



variety of contexts." In this way, the student would be able to use mathematical concepts and procedures that would help him understand everyday facts and situations through mathematical reasoning.

In view of the above, the importance of mathematics in the daily life of citizens is notorious, since its use is present in simple situations such as going to the supermarket and adding up the price of the products you intend to buy to prevent the total amount from exceeding the money available to pay the bill. Still, check if the change delivered to the cashier was correct or not. Thus, literacy and mathematical literacy should direct the student to the needs of everyday life, contextualizing the problems presented so that the use of basic operations such as dividing, multiplying and adding can arouse their interest and enjoyment.

When analyzing literacy and mathematical literacy within the scope of EJA, it is necessary to consider the reality in which the student is inserted and their difficulties. Seeking literacy is essential, but not sufficient. In this teaching modality, literacy is extremely relevant to arouse the student's interest, since by contextualizing mathematical situations, elements of literacy can be applied and provide a critical and reflective look.

In this context, mathematical literacy should seek to include the student in the social environment, in view of the development of the skills of reasoning, representing, communicating and arguing safely in everyday situations. It is also worth noting that mathematics contributes to the development of the citizen, since it covers all the major areas of knowledge divided by the BNCC: languages, natural sciences, human sciences and religious education.

CONCLUSION

Youth and Adult Education plays a crucial role in educational and social inclusion, enabling citizens who have had their trajectories interrupted to resume their studies and achieve the necessary training for a full and participatory life in society.

The literacy and mathematical literacy of young people and adults ends up becoming a greater challenge, since the teacher must awaken the interest in mathematics in the student, so that everyday situations can be brought into class for reflection and critical thinking about the use of mathematics.

Despite the fact that, throughout history, legislation has sought to act to guarantee the right of inclusion of young people and adults through EJA, it is still necessary that there are projects totally directed to it, seeking to act in an educational reform to make it equal in relation to the others.




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A study on the benefits of outsourcing in the production process of the mechanical industry

 <https://doi.org/10.56238/sevened2024.010-053>

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ABSTRACT

The practice of outsourcing dates back to the Industrial Revolution, gaining prominence in the 20th century due to organizations' relentless pursuit of efficiency and cost reduction. In Brazil, this trend became prominent in the last decades, especially from the 1990s onwards, driven by changes in labor laws. There has been a noticeable increase in outsourcing various activities, from administrative services to strategic functions. This phenomenon is complex, generating debates about its social and economic impacts. However, the crucial importance of effective management of contracts and relationships with suppliers to ensure strategic alignment and quality of the final product stands out. Nevertheless, this work proposes the respective problematization with the question: What are some of the possible benefits of outsourcing in the production process of the mechanical industry? To achieve answers to this problem, we outline as a general objective to demonstrate some of the possible benefits of outsourcing in the production process of the mechanical industry. Regarding the methodological procedure, we undertake a brief literature review, with developments in qualitative classification information, thus constituting some theoretical contexts that contributed to achieving the established objective. The results indicate that when well-managed, outsourcing can generate efficiency and competitiveness. However, it is emphasized the importance of a balance between the interests of companies and the protection of labor rights. It is concluded that outsourcing, when carried out with caution and responsibility, can be an effective strategy to reduce operations, but the safeguarding of workers' rights should be prioritized.

Keywords: Strategy, Operations Management, Industry, Outsourcing.

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INTRODUCTION

With the globalization of the 21st century, new means of production have emerged and changed the way of working and the strategic productive link in the company, constituting outsourcing, in which the organization hires another company to perform specific and specialized services within its production process, consequently the contracted company performs the services as its own organization technical autonomy, with the purpose of the contract, portrays (Indústria, 2020).

According to Lima (2010p. 120):

[...] These transformations will characterize the reconfiguration of capital-labor relations within a context, known as flexible accumulation, post-Fordism or neo-Fordism, marking a new stage in the development of the productive forces in capitalism: new technologies, new ways of organizing production and managing the workforce.

Outsourcing is understood as an administrative strategy that facilitates the creation of a managed process to assign to third parties the activities considered to be supporting or ancillary to the service designated as the main activity. This allows these companies to focus their efforts on the core of their operations. It is noteworthy that outsourcing should be seen as a process integrated into a company's strategic planning, conceived in light of the reality of the environment and culture of each organization (Mamede Resede, 2021).

The main purpose of this paper is to examine the advantages and disadvantages of outsourcing in the market context. To achieve this general objective, specific objectives will be defined that consist of evaluating the feasibility of outsourcing in organizations and conducting a comparative analysis based on literature of the advantages and disadvantages associated with this process (Cavalcante, 2017).

Given the global history of the application of outsourcing, the subject has become highly controversial and discussed nowadays, since it always generates divergent opinions depending on the perspective of those involved, the work is justified through outsourcing has the purpose of emphasizing strategic aspects, enabling the delegation of tasks that do not involve "confidential information" to third parties, it is an instrument to improve operations in the production sectors, resulting in greater competitiveness and profitability of the company (Torres, 2019).

However, this work proposes as a problematization the respective question: What are some of the possible benefits of outsourcing in the production process of the mechanical industry?

In order to provide answers to this problem, we outlined the general objective of demonstrating some of the possible benefits of outsourcing in the production process of the mechanical industry. In addition, below we unfold some theoretical principles and methodological procedure on the respective theme, in order to start a brief discussion about this study.

METHODOLOGY

For this study, we used the thought of Fonseca (2002), about the methodological approach in the descriptive qualitative perspective, with research based on bibliographic reviews of books and online sources, as an attempt to understand and evaluate the intrinsic characteristics of outsourcing.

The outsourcing method, according to Melo (2011), originated in the United States before World War II and was consolidated as a business management technique from the 1950s onwards, driven by the rapid development of industries.

At first, informative materials previously available in previous research were used, as well as organizational documents, specialized journals and other pertinent sources of information, the analysis of these materials will serve as a basis for the next steps to be taken.

As stated by CEL (2008), the practice of outsourcing was gradually applied due to the arrival of the first multinational companies, especially those in the automotive sector, in the early 1980s.

As a research technique, the case study Menezes & Pinto (2016) was adopted, entitled "Outsourcing in the automotive hub of the metropolitan agglomeration of Curitiba" presenting that the phenomenon of outsourcing as complex, such as the strategy of *Just in time* (downsizing) reducing costs within the company, however, the competitiveness of outsourced companies tends to depend less on knowledge and technology, focusing more on the precariousness of the workforce. Although the reduction of labor costs is present in all spheres and activities, from operational to managerial.

Another contribution to the study is the research of Alves et. al. (2022), named "Advantages and disadvantages of outsourcing in large-scale renovations – case study", the study was developed in outsourced companies in João Pessoa – PB with contractors for renovation of a large wholesaler, from various areas of activity among them: painting, electrical and locksmith provided services.

In the study used as the basis of this qualitative research, entitled "Outsourcing: advantages and disadvantages for organizations" by Gimenez et. al. (2020), it is concluded that, after analyzing the advantages and disadvantages of outsourcing, along with the evaluation of its positive and negative points, the feasibility of this practice within organizations was verified. The application of outsourcing in institutions is considered valid and viable, resulting in agility and greater profitability for companies.

In addition, the present study used as a methodological procedure a brief review of the literature, with developments in qualitative classification information, thus constituting some theoretical contexts that collaborated to achieve the established objective. Thus, in addition to the theoretical interweaving already discussed previously here, the following are some results according to the finding of information and data collection.

UNDERSTANDING OUTSOURCING

One of the viable interpretations of outsourcing highlights the separation between the legal and economic dimensions of the employment relationship. In this scenario, the worker performs his or her tasks for a company designated as the "contractor", but all rights linked to his or her work are linked to another entity – an intermediary company identified as the "contractor" (Campos, 2015, p.80).

THE OUTSOURCING PROCESS IN BRAZIL

In 1974, Law 6.019, which instituted temporary work, represented the pioneering legal instrument in Brazil to allow outsourcing, however, only in two circumstances: extraordinary increase in labor demand or replacement of a regular and permanent employee, confirming the first attempt at outsourcing in Brazil manifested itself through legislation, currently no longer in force. which allowed banks to contract the security service exclusively through a surveillance company. (JUSBASIL, 2013).

Industry (2020) points out, in order to act as an outsourcer, it is necessary that companies are duly formalized, having a National Registry of Legal Entities (CNPJ) and registration with the Board of Trade, occurs through a contract established between the company that hires the services and the outsourced company.

The Outsourcing Law (Law No. 12,439/2017) also stipulates that the capital stock of the outsourced company must be compatible with the number of employees, in order to reinforce the security of the contracting company.

In the labor field, all companies involved in an outsourcing contract, whether the contractor or the service providers, must meet the requirements of labor laws, such as: registration in the labor card, compliance with the legal working hours, granting vacations, payment of the 13th salary, observance of social security protections and FGTS, adherence to occupational health and safety standards, compliance with what is established in the collective agreements and conventions of the respective professional category.

Torres (2019) highlights both the advantages and disadvantages of outsourcing, providing a balanced view of the various aspects associated with this practice that need to be considered and carefully analyzed, as shown in Table 1.

Table 1: Advantages and disadvantages

Aspect	Advantage	Disadvantage
Operational efficiency	Increased operational efficiency, allowing greater focus on core activities.	Difficulty in direct control of outsourced operations, affecting the quality of service.
Cost reduction	Cost savings, as the company can eliminate personnel and infrastructure expenses.	Reliance on third parties can result in increased overhead costs and a lack of financial flexibility.
Access to expertise	Access to experts and specific knowledge, raising quality.	Risk of over-reliance on external expertise, with possible loss of internal knowledge.
Flexibility	Flexibility in labor management, facilitating adjustments according to market demand.	Lack of control over outsourced employees can lead to problems aligning with organizational culture.
Focus on the core business	The company concentrates its efforts on its core business, improving competitiveness.	Possibility of loss of control over critical aspects of production or outsourced service.
Shared Risks	It shares risks with the service provider, decreasing the company's total liability.	Risk of damaging the company's reputation if the service provider does not meet the expected standards.

Source: Adapted by Torres (2019).

FORMS OF OUTSOURCING

Historically, outsourcing has been used predominantly in the core activity, rather than in the core activities. The core activity refers to the core function of the organization that adds value directly to the product, and can, as a result, increase the company's profitability. In contrast, the middle activity is located in an intermediate way in the production process, not influencing the quality of the product, but may have effects on operating costs (Carlos, 2015).

Table 2: Types of outsourcing by operational activity.

I)	Traditional	Transfer of services to third parties, where price plays a decisive role in the completion of business.
II)	Risk Outsourcing	Transfer of labor obligations, masking the employment relationship through hiring intermediated by third parties.
III)	Outsourcing with Partnership	Transfer of the execution of ancillary activities to specialized partner companies, aiming at greater competitiveness in the main activity.

Source: Adapted by Carlos (2015).

Outsourcing has the possibility of involving the procurement of the raw material, the stages of production, or even the sale of the finished product. In addition, this practice can be carried out both on the premises and outside the contracting company. Menezes & Pinto (2020), in turn, classifies by: form and object.

Table 3: Types of Outsourcing

Outsourcing Classification	Description
As for the Form	
i.External	Service providers located outside and far from the perimeter of the contracting company.
ii.Internal	Service provider located at the borrower's premises, working in the same environment and sharing responsibilities. It is the most widely practiced modality today.
iii.Cooperatives	An action that emerged in Brazil in the 90s, focused only on the relationship between the entity and the cooperative member.
As to the Object	
i.Services	Liability of the provider restricted to the execution of the contracted activities, pure provision of services.
ii.Services & Materials	It includes the supply of inputs, also making it responsible for the management of activities, with greater demand for quality.
iii.Services and Equipments	The subcontractor provides all the machinery and equipment necessary for the efficient execution of the contract.
iv.Full	Characterized by the total transfer of activities, technology and integral management of the contracted activity.

Source: Adapted by Menezes and Pinto (2021).

BENEFITS OF OUTSOURCING IN THE PRODUCTION PROCESS OF THE MECHANICAL INDUSTRY

Through the analysis of the research Alves et. AL (2022), we observe the feasibility of outsourcing this segment with full enjoyment of the benefits of this mechanism in the management of civil works, reducing time, managing labor according to the schedule, because the contractor is a specialist in this area, saving its employees, financial and logistics resources. Among the advantages, we highlight the execution of services by a specialized company, avoiding waste, reducing time and increasing productivity.

Outsourcing fulfilled its goal of agility and resource savings. Where numerous advantages were observed, such as the enhancement of the contractor's image, time optimization, increased productivity, adjunct planning of the outsourced company with the implementation of technical managers to perform the service, among others (Alves et. al. 2022).

The study also presents principles on when an outsourced company is hired and fulfills the schedule in 70% of the main scope, not planning financial and material resources, wasting some items that would be reused, resulting in the need to purchase new materials, exceeding the expected expense. Highlighting the importance of a more rigorous and comprehensive analysis of the physical structure and processes that the contracted company has, thoroughly exploring all aspects of the organization.

According to Gimenez (2020), the outsourced service stands out as opportunities for qualification, qualification and training of personnel due to the educational experience associated with the skills of the outsourcer; the opportunity to concentrate more efforts on the production process; the improvement and modernization of the decision-making process in relation to new material acquisitions; the sharing of technologies and experiences; the speed and flexibility in the

cycle of hiring and dismissal of personnel in the outsourced area, under the responsibility of the contractor; long-term cost savings; the establishment of formal partnerships with the business community, considering the lack of local knowledge on the part of the contracting company.

However, the author also shows that there is limited ability to manage human resources on the part of the outsourcer, more effective adaptation of the outsourced to the organizational culture and objectives of the contracting company, as well as the absence of adequate definition and criteria to evaluate the services at the national and/or international level, aiming at a more effective control of the services provided.

Menezes and Pinto (2021) outsourcing in the mechanical industry offers benefits such as focusing on core competencies, reducing costs, access to specialization, and advanced technology, resulting in more efficient and better quality production. It can lead to superior end products and increased customer satisfaction, operational flexibility and improved efficiency and quality, rapid adaptation to changes in demand or market conditions, and evaluation of benefits before outsourcing parts of the production process.

According to Torres, (2019) cost reduction, by transferring tasks to external companies, eliminates the need to hire additional staff or invest in internal equipment. This frees up resources and time, allowing the company to focus its efforts on other areas while work continues to get done, by avoiding the costs associated with hiring staff and setting up infrastructure, the company can direct its resources towards increasing its profitability rather than spending them on operational expenses.

Businesses can also experience a significant increase in productivity. This is because non-essential tasks are delegated to third parties, allowing the internal team to focus on the more strategic activities of the business. As a result, companies have more time and resources available to dedicate to their core business, without worrying about outsourced responsibilities (Alves et. al. 2022).

According to Fonseca (2002), it offers access to specialized services performed by qualified professionals. This specialized expertise results in a better quality service and more effective results. By hiring third-party companies, organizations can rely on the knowledge and experience of experts in various industries, which allows them to perform tasks that may not have been possible in-house, allows companies to benefit from specialized knowledge, adding value to their operations.

CONCLUSION

As previously discussed throughout this study, outsourcing has become essential for all organizations due to the increase in demands and the urgency to carry out processes in reduced timeframes, boosting competitiveness in all industrial sectors.



However, it is imperative to progress to a second stage of maturation in the partnership, focusing on developing technical competence when evaluating the process, especially in the careful selection of outsourced companies to avoid risks of inadequate service execution. In addition, contracts must be precise and specific to protect both parties, and it is crucial that the third party's reputation is complete, as it is directly associated with the contractor's work environment.

The feasibility and execution of this practice are valid and feasible within the institutions, providing agility and greater profitability to companies, in addition to introducing various experiences, inputs and qualified labor.

From this perspective, we articulate in this study some responses to the established theme and unfolding to meet the objective, using theoretical principles to demonstrate some of the possible benefits of outsourcing in the production process of the mechanical industry.

In the final analysis, it is understood that the discussion on this theme should be expanded, understanding and establishing that the purpose of this study does not consider the exhaustion of the theme, but rather in the provision of a brief discussion through which new lines and strands can be available on this subject.


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Reflections on criminal policy and deliberative democracy in habermas

 <https://doi.org/10.56238/sevned2024.010-054>

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ABSTRACT

This article sought to conceptualize the Criminal Policy and its elaboration based on the thought of classic authors in the criminal area. The objective was to reflect on changes in the way of thinking and applying the Brazilian criminal legislation, that is, if the changes defended at the time were considered, if there was participation of civil society and jurists to change the way of punishing that is effective in relation to the poor, blacks and young people from the periphery, Habermas' thought was also considered in relation to the democratic perspective.

Keywords: Criminal policy, Criminal law, Democracy.

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INTRODUCTION

In 2004, in the article "Criminal Policy: The Two Faces of Justice", the concepts of Criminal Policy were the target of the analysis in which it was sought to justify the influence of the logic of neoliberalism in the enactment of laws such as the "Heinous Crimes" and the one that regulated the Special Criminal Courts.

Despite the creation of these laws, aimed at solving serious social problems, such as crime, the mere increase in punishment in the criminal sphere did not show any change in relation to crime rates, and not even the system ceased to be selective, sheltering, since then, in its majority, poor, black, young and vulnerable.

Evidently, the expansion of technology, the need for environmental protection, and new forms of crime have led to the need to insert new appropriate typical figures into legislation.

In the present work, it was intended to conceptualize criminal policy, but also to go further, to go through the need for the production of new criminal policies, which consider in their synthesis, the social instruments and mechanisms of democracy, as described by Habermas, in his theory of deliberative democracy.

In its synthesis, criminal policy should thus consider social, economic and cultural information, provide the participation of social sectors, specialists, with sincerity, to allow dialogue between agents of importance to the development of criminal policies. Otherwise, the penal system will continue to be a sector of misery management.

THE CONCEPT OF CRIMINAL POLICY

To deal with criminal policy, one must bear in mind the way in which certain crimes are punished and the benefits that are attributed in the application and execution of sentences, considering who benefits from them.

When dealing with the concept of criminal policy, Zipf⁴ refers to the question of the punishment of an offence, and to express the practical meaning of the concept, he concludes after several considerations: "Criminal policy can be defined as the achievement and implementation of directive criteria and in the context of criminal justice⁵".

Zipf⁶ also cites several concepts of renowned scholars of criminal law as being the "legislative wisdom of the state". For Feuerbach, it would be the "systematic set of principles founded on the scientific investigation of the causes of crime".

⁴ ZIPF.

⁵ Author's translation.

⁶ Op. cit. 1979, p. 14.

From the point of view of Mireille Delmas Marty⁷, "it is the set of procedures through which the social body organizes the criminal phenomenon."

When dealing with criminal policy, Nilo Batista⁸, in two different works (1998, 1996), refers us to concepts that, in addition to being perfect, are complementary.

If, on the one hand, it relates to social changes, new or old proposals of criminal law, the verification of the performance of institutions from which principles and recommendations for changing the body and criminal legislation derive, considering them (principles and recommendations) as criminal policy, on the other hand, it observes that the arbitrary exercise of the power of the agencies that are part of the penal system cannot continue to be discarded. as if it simply didn't exist.

The way of acting through various conducts that are as repeated as they are routine, such as the maintenance of illegal arrests, forced confessions due to violence, ignorance of fundamental and human rights, among others, should be considered as part of criminal policy and not as practices already integrated into the daily fight against crime.

Approximately two decades later, the main cause of the explosion of the prison population, made up mostly of poor, young people and people of African descent, can be identified as the use of criminal policies that aim to solve the complex social problem called criminality, with the application of increasingly severe penalties.⁹

However, it seems to us that only by questioning the way criminal policy is elaborated and thought will it be possible to move from a fanciful context to reality. For Marty¹⁰, "criminal policy is related to social policy, that is, its development, and conforms to the historical moment (socio/cultural/economic) in which we live."

THE INTERNATIONAL CONSENSUS ON THE NOTION OF CRIMINAL POLICY IN THE UNITED NATIONS - UN

It was decided by the Fourth UN Congress in 1970 that criminal policy should be integrated into national development plans and be seen as an instrument of change.

As conclusions of the Fifth UN Congress on the subject, the following measures were established: (a) Social justice is the best means of combating crime; (b) Penal policy should be coordinated in its multiple aspects and integrated into the country's social policy.

⁷ MARTY, Mireille Delmas. *Modelos e movimentos de Política Criminal*, Rio de Janeiro, Revan, 1992

⁸ Batista, Nilo.

⁹ Regarding the data on persons deprived of liberty, we have that: The total number of persons deprived of liberty grew 8.15% from 2020 to 2021: from 758.8 thousand to 820.7 thousand. The number of vacancies in the prison system rose approximately 24%, with 123,000 new vacancies. Thus, the deficit of vacancies decreased by about 24.9%. The data were presented in the 2022 edition of the Brazilian Public Security Yearbook, published by the Brazilian Public Security Forum (FBSP). Available in Conjur.com.br – on 02/27/2023 and published on 07/10/2022 – Prison population increases again [...]

¹⁰ Op. Cit. 1992, p.

Living in a democratic state based on the rule of law, at first sight, may indicate the impression that criminal policy in its broadest content is the best for society and the proposals for legislation to exacerbate penalties end up being seen as a way to contain crime and, allied to this, it seems to be an interest in diverting society's attention from other problems that affect and influence crime. such as unemployment, interest rates, inflation, poverty, corruption, among others.

Criminal policy should be guided by certain lines of argument, as Heinz Zipf (1989) thinks, and these should start from the perspective of what is understood as a person, whose definitions do not always consider it to be part of a certain cultural and social structure that must respect others and have guaranteed the right to life and bodily integrity. cruel, humiliating treatment or inhuman punishment is not tolerated.

Penal intervention is an observance of human dignity and is currently being advocated for more benign means of punishment, although its scope is very slow.

It should not be forgotten that Criminal Law is subsidiary and fragmentary, and, therefore, should only intervene in issues in society as the *ultima ratio*, which means that only the offense whose legal good requires the protection of criminal law can be deserving of punishment, excluding other protective means.

Finally, there must be rationality, practicability and effectiveness in criminal prosecution, which means requirements of ethical compliance and feasibility, and the establishment of measures that are difficult to implement is innocuous.

THE ELABORATION OF CRIMINAL POLICY: FROM A DEMOCRATIC PERSPECTIVE

Criminal policy should, first of all, be part of an action plan that is outlined *pari passu* by the plural mobilization of representatives of various social segments, control agencies, as well as jurists, sociologists and researchers on the subject.

One could start from the elaboration of a diagnosis to contemplate the study of crime in certain places and the needs that influence this result, not to confront crime itself, but to effective prevention, which can probably occur to a greater extent through interdisciplinary involvement, such as biopsychosocial disciplines, in addition to legal reasoning.

Criminal policy, unlike other policies, has neither presented nor supported a democratic discussion. Civil society, when discussing an issue related to crime, does not perceive the impact caused by the sensationalist media dissemination that prevents an impartial trial and opinions free from manipulation by interests that are not clearly shown.

It is urgent to establish changes in conduct, in order to spread the discussion on criminal policy, such as: a) putting the discussion in the voice of those who know the subject, that is, jurists,

criminalists, legal operators, researchers, and, b) broadening the discussion to remove the exclusively elite forum and include the participation of society in general.

Habermas argues that deliberative democracy should be sought, in which democratic legitimacy in decision-making derives from broad public discussion, through language and communication, with the defense that there is no democracy without dialogue.

For Habermas, the deliberative character of democracy lies in the collective process of pondering and analysis permeated by the discourse that precedes the decision. In Brazil, these elements are also present in the performance of the high courts, through public hearings and the figure of the *amicus curiae*.

FINAL CONSIDERATIONS

When reflecting on the Criminal Policy, its implementation and effectiveness, it was observed that practically nothing has changed significantly, but as a change in punitive practices that can bring benefit to the convicts, we can cite the law of alternative measures to imprisonment - Law No. 9,714/98, the permission to use electronic anklets - Law No. 12,558/10 and the custody hearing - Law No. 13,964/19, and, nothing more.

It is noticeable that incarceration in Brazil continues to increase, prisoners continue to face risks of death, serious illnesses and belong mostly to the same profile as in the past: poor, young, without formal education, drug smugglers, that is, the dehumanization of prison continues, without any democratic participation in the resolution of a social problem, that is, the problem of crime.


Thus, it is concluded that as long as the elaboration of criminal policy in our country does not go through the democratic sieves and allows the effective participation of society and interlocutors from various sectors, the idea of philosophical justice that justifies the institution of the penal system to reduce it to the instance of mere management of misery and nothing more than that remains has failed.



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Social and cultural relations in the inclusion of indigenous students in non-specific schools: Denominations and difficulties

 <https://doi.org/10.56238/sevened2024.010-055>

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ABSTRACT

The text on social and cultural relations in the inclusion of indigenous students in non-specific schools: denominations and difficulties is also the result of a master's dissertation in education that deals with the difficulties of non-indigenous schools to contemplate cultures in their specificities. Problem question: How are diversity and specific indigenous education addressed and developed in a non-specific school of indigenous culture? With the objectives of analyzing, in scientific productions and documents, the offer and development of intercultural education; Identify academic and bibliographic productions that deal with intercultural, specific, differentiated, bilingual and community indigenous school education; To interpose the Curricular Proposal of the state of Santa Catarina and the National Curriculum Reference for Indigenous Education; Mapping, starting from the origin of the indigenous students, culture, identity and choice for the school outside the Village; Identify the initiatives and possibilities that the school offers to indigenous students; To analyze the perceptions of indigenous students in relation to educational processes, the study was carried out and characterized as a qualitative research, supported by related bibliographic references, semi-structured interviews with teachers, public school directors and Kaingang students from the Xapecó Indigenous Land, located in the municipalities of Ipuacu and Entre Rios SC. As a result, we identified failures and absence of pedagogical procedures that comply with the specific Brazilian legislation for the service of students from different cultures and the lack of specific training for teachers and school management, as well as the understanding of the processes of inclusion and citizenship formation for all people, without exception.

Keywords: School education, Specificity, Indigenous, Intercultural.

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INTRODUCTION

Brazilian education has different specificities and a rich diversity. In this sense, knowing indigenous education, its advances, gains and cultural contributions leads us to think about the need for an education with a specific, differentiated, bilingual, intercultural and community curriculum. This text brings reflections thought during the course carried out in a master's research in Education, applied in a municipal public school located in the surroundings of the Xapecó Land in the municipality of Ipuacu/SC, which serves Kaingang indigenous students, being, by their own choice or that of their families, no longer enroll in specific schools in the interior of the village.

INDIGENOUS SCHOOL EDUCATION

Indigenous school education is a modality of basic education that differs by highlighting peculiarities such as customs, beliefs, knowledge and participation of the community, spoken language, among other specific aspects that are taken into account. This type of education is mainly characterized by the numerous challenges faced, among which is that of offering a quality education that truly meets the needs of the indigenous community.

The challenge of indigenous school education is to propose a quality and differentiated education system, in the sense of meeting the specificities of a people different from the national society, considering that their horizons for the future are not the same as ours, and not to reduce the issue to meeting through programs of social inclusion of individual desires, even if legitimate, of some of the indigenous students (Ladeira, 2004, p. 143).

It must be understood that, due to the methods used by European peoples to catechize indigenous peoples, such as forced bilingualism, education not specific to their customs, for a long time focused only on preparing them for work, nullifying their beliefs and culture. However, in recent years, the struggle for the quality of indigenous education has consecrated some victories, such as the specificity added to the National Curriculum Reference (RCNEI). It is a document that objectively emphasizes school education in relation to indigenous schools, which must be oriented in the respective territories, taking into account their cultural, geographical, social, linguistic peculiarities, among others.

The National Curriculum Reference for Indigenous Schools, of the Ministry of Education, prepared in 1998, with the participation of indigenous teachers and leaders from all over Brazil, emphasizes that indigenous peoples have, throughout their history, created complex systems of thought and their own ways of producing, storing, expressing, transmitting, evaluating and re-elaborating their knowledge and conceptions about the world. Man and the supernatural. Also noteworthy is the presence of their own values, conceptions and philosophical knowledge, elaborated in unique conditions and formulated based on original reflections (Piovezana, 2010, p. 132).



In addition, it brings issues of respect for diversity, the appreciation of the cultures of indigenous peoples, and establishes an education that is pertinent and meaningful for indigenous communities, based on the languages, values, and practices of their societies.

It is important, however, to make it clear that, as a reference for a country with such diverse indigenous societies, and having as its foundation and goal respect for plurality and diversity, the RCNEI/Indigenous is not a curricular document ready to be used, mechanically, in any context, nor does it intend to be giving class recipes: this Reference proposes, only, to subsidize and support teachers in the task of continuous invention and reinvention of their school practices (Brasil, 1998, p. 14).

The document recommends that indigenous communities be actively prominent in the educational process, thus allowing effective control over the curricula and methodologies employed, which will ensure education according to the needs and desires of the communities. "The National Curriculum Reference for Indigenous Schools (1998) points out issues common to all teachers and schools, clarifying and encouraging the plurality and diversity of the multiple curricular programs of specific historical and ethnic projects" (Brasil, 2014, p. 73-74).

This document seeks to ensure that Indigenous teachers are empowered to maintain an effective and caring education that maintains and incorporates Indigenous principles in educational institutions. It requires cooperation between different parties, such as local and federal governments, communities, teachers, and schools, in addition to believing that the curriculum must be malleable, adapting to each situation or requirements of the community in which they are inserted.

Among the rights to be guaranteed and ensured at school is the right to build a differentiated and specific curriculum. This theme can be an instrument to experience a school that is appropriate to the interests of the community, helping to form a renewed practice, distancing itself from previous models of integration and homogenization (Brasil, 1998, p. 99-100).

One of the greatest difficulties in applying the RCNEI is to make sure that the funding, i.e., the necessary resources, is available, as well as overcoming the political and bureaucratic obstacles that may prevent the applicability of the guidelines. However, it remains a fundamental instrument to promote education that governs and celebrates Brazil's cultural and linguistic diversity. It enables indigenous peoples to strengthen their cultural identities and engage critically in society. We should be aware that the RCNEI represents an expressive milestone in education in Brazil, as well as a fundamental step towards improving equality and inclusion in Brazilian society, since it is the one that mentions that the ideal teacher to teach classes in an indigenous community is the indigenous person himself.

Community: Because it is conducted by the indigenous community, according to its projects, its conceptions and its principles. This refers both to the curriculum and to the ways in which it is administered. It includes freedom of decision regarding the school calendar, pedagogy, objectives, contents, spaces and moments used for school education. *Intercultural:* Because it must recognize and maintain cultural and linguistic diversity; promote a situation of



communication between different sociocultural, linguistic and historical experiences, not considering one culture superior to the other; stimulate understanding and respect between human beings of different ethnic identities, while recognizing that such relations have historically occurred in contexts of social and political inequality. *Bilingual/multilingual*: Because cultural traditions, accumulated knowledge, education of the younger generations, religious beliefs, thought and practice, symbolic representations, political organization, projects for the future, in short, the socio-cultural reproduction of indigenous societies are, in most cases, manifested through the use of more than one language. Even indigenous peoples who are now monolingual in Portuguese continue to use the language of their ancestors as a powerful symbol to which many of their identifying traits converge, thus constituting an important symbolic bilingualism. *Specific and differentiated*: Because it is conceived and planned as a reflection of the particular aspirations of indigenous people and with autonomy in relation to certain aspects that govern the functioning and orientation of the non-indigenous school (Brasil, 1998, p. 24-25).

In recent years, there has been a marked change in school curricula, which has focused on contemplating all the cultures that encompass the school environment. In this sense, "[...] the different reforms in the area of education incorporate the intercultural perspective, either as one of the articulating axes of school curricula, or by introducing issues related to cultural differences as cross-cutting themes [...]" (Candau; Russo, 2010, p. 163).

With regard to the construction of a timeline of educational processes, it is notorious that the curriculum has taken different directions, starting from the education that was presented after the discovery of Brazil, in the year 1500, to the present day.

The establishment of the first schools in indigenous communities in Brazil is contemporaneous with the consolidation of the colonial enterprise Portuguese. This is not to say that indigenous peoples did not have their own education processes before the arrival of the Portuguese (Luciano, 2007, p. 3).

As previously mentioned, the indigenous school curriculum brings with it specificities that are not found in a non-indigenous curriculum, and, in order to understand such differences, it is urgent to suspend our conceptions and everything that, until then, we have understood as an educational model.

The school model brought and implemented by the Portuguese (with a teacher, classroom, books, desks, subjects, curriculums, principal, etc.) is totally foreign to traditional indigenous cultures, but little by little it has become necessary and important for post-contact life (Luciano, 2007, p. 3).

Figure 01 - Painting First Mass in Brazil, 1860, by Victor Meirelles



Source: Itaú Cultural Encyclopedia (2001-2024) Accessed on: May 18. 2024.

In the figure above, it is possible to observe that, with the arrival of the first educators/catechists in Brazil around the year 1500, formal education began to be constituted in a predatory and imposed way, where the indigenous people were treated as soulless beings, devoid of feelings or any social skills.

This education had a very clear mission to civilize, Christianize and patriotize the Indians. In other words, to make the Indians cease to be Indians (stop speaking their own languages, abandon their cultures, their customs, their lands) to become obedient and submissive Christians and patriots to facilitate the possession of their lands and the wealth existing therein by the colonizers (Luciano, 2007, p. 3).

The significant cultural genocide that indigenous peoples have suffered since the arrival of Europeans is irreversible. In this context, any legislation that will be implemented will only mitigate, in part, the profound damage that these peoples face in various aspects.

So much so that the first objective of education is to make us aware of the reality of our fellow human beings. That is to say: we have to learn to read their minds, which is not simply equivalent to the strategic dexterity of preventing their reactions and anticipating them in order to condition them to our benefit, but implies first of all attributing to them mental states like ours and on which the very quality of ours depends. This implies considering them as subjects and not mere objects; protagonists of their lives and not mere empty cronies of ours (Savater, 1998, p. 43).

Savater (1998) reflects on a current theme that relates education to the arrival of the Jesuits in Brazil: by treating indigenous peoples as beings devoid of souls, they imposed a type of education that disregarded their language, customs and beliefs. Such behavior still persists in many schools, where interculturality in the classroom is not recognized.

With the 1988 Constitution, Indians in Brazil were guaranteed the right to remain Indians, that is, to remain with their own languages, cultures and traditions. By recognizing that indigenous people could use their mother tongues and their learning processes in school



education, the possibility was established for indigenous schools to contribute to the process of ethnic and cultural affirmation of these peoples and to be one of the main vehicles of assimilation and integration (Grupioni, 2021, p. 130).

Specific and differentiated indigenous school education as a right of indigenous peoples is the duty of the State.

The Kaingang people distinguish indigenous education from school education: indigenous education is focused on knowledge about oneself, about nature, about the other and is responsible for the acquisition of the specific customs and knowledge inherent to each community to which the individual belongs. School education is conceived in the sense of complementarity between indigenous and non-indigenous knowledge; School education has also been an element that enables the Kaingang to affirm individual and collective cultural identity, construct subjectivity and otherness. It is designed in such a way as to guarantee access to non-indigenous school codes; In addition, for the formation of citizenship awareness, the ability to reformulate strategies of resistance, guarantee of their rights, the promotion of their cultures, the knowledge of the structures of non-indigenous society, and the acquisition of new knowledge useful for the improvement of the living conditions of the Kaingang. Kaingang education is structured in its own ways of teaching and learning, which involve knowledge and customs characteristic of each village. This knowledge is taught/learned orally in daily life, in rituals, myths and in the different forms of organization of each community. The Kaingang people think of school education as a way to reduce inequality, to establish rights and achievements, in addition to promoting intercultural dialogue between different social agents (Santa Catarina, 2019, p. 91-92).

With the rights formally guaranteed in the Federal Constitution of 1988 and infra-constitutionally, countless efforts are made to ensure a differentiated indigenous education, which includes the language, customs, knowledge and knowledge of these peoples, as well as teacher training within these communities.

Article 210 of the Constitution guarantees educational assistance to indigenous peoples at all stages of basic education, and Article 231 recognizes indigenous peoples' original right to the lands they traditionally occupy, as well as the guarantee of preservation of their ways of life and social organization, customs, languages, beliefs, and traditions.

In addition, the Law of Guidelines and Bases of National Education (LDB) (Law No. 9,394 of 1996) provides for the provision of bilingual and intercultural school education for indigenous peoples, in addition to the appreciation of their languages and cultures. Another relevant legislation is the National Policy on Indigenous School Education, instituted by Presidential Decree No. 6,861 of 2009, which establishes principles, guidelines and strategies for the provision of indigenous school education throughout the country.

Among the objectives and goals set forth in the National Education Plan is the universalization of the provision of educational programs to indigenous peoples for all grades of elementary school, ensuring autonomy for indigenous schools, both with regard to the pedagogical project and the use of financial resources, and ensuring the participation of indigenous communities in decisions related to the operation of these schools. For this to happen, the Plan establishes the need to create the indigenous school category to ensure the specificity of the intercultural and bilingual education model and its regularization with the education systems (Grupioni, 2001, p. 27).



The conception of indigenous education considers cultural peculiarities, based on nature and empirical knowledge allied to scientific knowledge. With its own curriculum, it addresses the specific characteristics of indigenous peoples, values cultural diversity, and is extremely relevant and necessary, especially for the rescue and preservation of culture. On the other hand, despite the advances, there are still many barriers that prevent the training of indigenous people in higher education, such as the lack of inclusion policies and the lack of adequate structure in universities. As such, the higher education of indigenous people becomes even more important, as it is a fundamental step towards the construction of a more egalitarian and democratic society.

By investing in their training, we will be strengthening cultural diversity and, for this reason, it is essential that measures are created that enable the access and permanence of indigenous people in universities, ensuring the training of trained professionals committed to valuing and defending the culture and rights of indigenous peoples.

Since 1970, indigenous school education in Brazil has made significant progress with regard to the legislation that regulates it and the rights to a specific, differentiated and bilingual school, also with regard to the training of indigenous professionals to work in their communities of origin, at different levels of education (RCNEI/indigenous, 1998). Specific educational policies are created for Indigenous School Education and various higher education courses, such as PROLIND – Indigenous Degree Program, created by the federal government in 2007/08, and funds are made available for the education systems of the state public networks to develop courses at the basic and higher education level (Piovezana, 2010, p. 141).

Still, in addition to what the author cites in relation to higher education, there is the constitutional specificity in the education of children and young people, "§ 3 Regular elementary education will be taught in Portuguese, ensuring that indigenous communities use their mother tongues and their own learning processes" (Brasil, 1996, Art. 32). According to Piovezana (2010, p. 140),

Currently, differentiated, bilingual and intercultural education is a demand of the country's indigenous leaders. The Indigenous School aims to achieve the socio/economic/cultural autonomy of each people, contextualized in the recovery of their historical memory, in the study and appreciation of their own language and science, systematized in their ethnoknowledge, and in the access to scientific information of the majority society.

According to the author, education becomes a point of discussion, being part of the indigenous movement, demonstrating this culture's interest in relating the school as a transforming agent of the subjects' autonomy.

Knowing that education is not only done in the classroom, indigenous community education brings parallels with the community in general, understanding that the school is not isolated.

Thus, community education takes place through workshops and other non-school education actions, working on content of national society such as teaching/learning the Portuguese



language and mathematics, to the extent that they can be tools for the type of relationship that these peoples wish to develop with national society (Brasil, 2020, n.p.).

The development of the indigenous school curriculum brings community life as one of its bases and, by contradicting the classical model of the curriculum, demonstrates that the struggle for rights to contemplate culture is not in vain, and that the contemplation of empirical knowledge as a relevant guarantee is indispensable.

In Indigenous School Education, it is understood that it is not satisfactory to think of indigenous schooling only as a simple transposition of a Western school model to an indigenous community, but one must take into account what the community's life project is, what and how the school can contribute to this project, what they think about the school and what they expect from it (Ciaramello, 2014, p. 48).

As of 2019, with the implementation of the Santa Catarina Curriculum Proposal, indigenous peoples ensured the implementation of a new model of education, even though it was already considered a right under the Federal Constitution.

With regard to Indigenous School Education, with the Federal Constitution of 1988, Indigenous Peoples conquered the right to a specific, differentiated, intercultural, bilingual/multilingual and community school education. Article 210 (Brasil, 1988) ensures that indigenous people use their mother tongues and their own learning processes, and it is up to the State to protect the manifestations of indigenous cultures (Santa Catarina, 2019, p. 91).

According to the National Curriculum Reference for Indigenous Schools (Brasil, 1998, p. 22),

Because it is conducted by the indigenous community, according to its projects, its conceptions and its principles. This refers both to the curriculum and to the ways in which it is administered. It includes freedom of decision regarding the school calendar, pedagogy, objectives, contents, spaces and moments used for school education.

It must be reiterated that, over time, indigenous education has gained space and notoriety and the laws have become more contemplative and specific, ensuring that the first inhabitants of Brazil known as *Indigenous Peoples* achieve the continuation of customs and beliefs, however, there is still much to do and many rights to guarantee so that the laws are really put into practice. In this sense, the indigenist struggle for an education that contemplates their culture must take place day after day, since these people suffer constant threats, whether educational, cultural or territorial.

CURRICULUM PROPOSAL AND THE NATIONAL CURRICULUM FRAMEWORK FOR INDIGENOUS EDUCATION

The Curricular Proposal of Santa Catarina, which is the guiding document of basic education, which carries in its essence helping the teacher to ensure the quality of public education, guiding pedagogical practices. Its first publication took place in 1991 and its last update dates back to 2014,



with additions of texts prepared by thematic groups, having as a guiding principle the expansion of the reflection of six essential themes and public policies for education in Santa Catarina. Diversity as a formative principle is one of its fundamental elements.

Diversity is understood as a characteristic of the human species: human beings are diverse in their historical and cultural life experiences, they are unique in their personalities, and they are also diverse in their ways of perceiving the world. This notion refers us to the idea of differences in the constitutive identities of human beings, their social organizations, ethnicities, nationalities, genders, sexual orientation, religiosities. In short, diversities of social groups, of identities of the social being in its singularity that are constituted in spaces, environments, in historical times with diverse characteristics (Santa Catarina, 2014, p. 54).

This principle guides public education teachers to plan actions that contemplate diversity. In addition, the context of diversity in the Curricular Proposal of Santa Catarina deals with different teaching modalities, bringing Indigenous School Education as one of them, evidencing its particularities and importance.

From this, the teacher has the opportunity to adapt his planning by putting himself in the place of the other. "Therefore, valuing ethnic and cultural differences, for example, does not mean adhering to the values of the other, but respecting them as an expression of the diversity of every human being, without any discrimination" (Santa Catarina, 2014, p. 54).

Over the last few decades, we have seen in social movements a great advance in guaranteeing individuality, that is, guaranteeing the right to difference. When studying the Curricular Proposal of Santa Catarina, it is necessary to reflect on diversity, on how we all have different histories and experiences. It is also necessary to value the political and historical awareness of diversity, as well as its recognition and appreciation. In this sense, it is not only a matter of tolerance for the other, but of the right of everyone to have their identity preserved.

Therefore, why is it necessary to discuss some groups and explain the processes of prejudice, discrimination and exclusion that have been experienced as a result of a curriculum that does not take into account the differences in school? How has diversity been thought of, recognized and embraced in schools? Why are some groups considered as "the" different ones? Why do these groups create their own movements and demand a reorganization of the curriculum? What is the relationship between diversity, inclusive education and comprehensive education? Why is the issue of diversity central to this curricular proposal? How can diversity be considered as a formative principle? (Santa Catarina, 2014, p. 55-56).

Certain social groups continue to demand government actions that ensure, within the curriculum, the representation of plural identities, based on the four pillars of education: learning to know, learning to do, learning to live together and learning to be. According to LDB 9394/96,

Article 26-A. In public and private elementary and secondary schools, the study of Afro-Brazilian and indigenous history and culture is mandatory. § 1 The syllabus referred to in this article will include various aspects of history and culture that characterize the formation of the Brazilian population, based on these two ethnic groups, such as the study of the history of Africa and Africans, the struggle of blacks and indigenous peoples in Brazil, black and

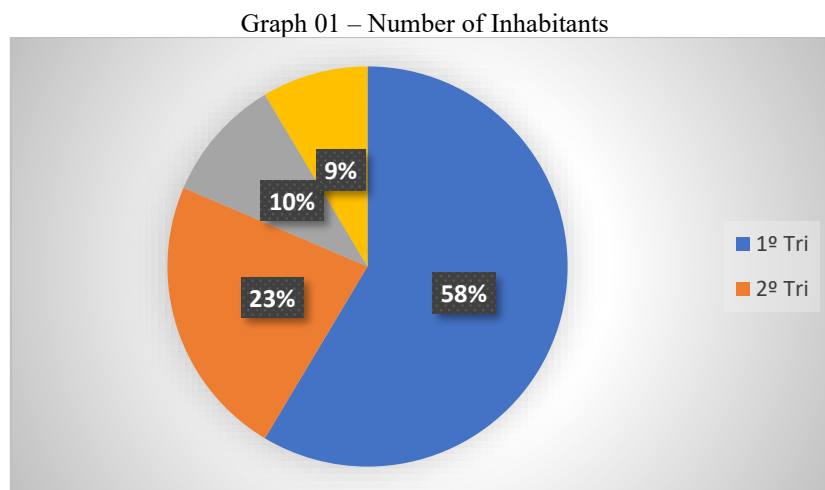
indigenous Brazilian culture, and blacks and Indians in the formation of national society. rescuing his contributions in the social, economic and political areas, pertinent to the history of Brazil. § 2 The contents related to the history and culture of Afro-Brazilians and the Brazilian indigenous peoples will be taught within the scope of the entire school curriculum, especially in the areas of artistic education and Brazilian literature and history (Brasil, 1996).

From then on, the study of Afro-Brazilian and indigenous cultures became part of school curricula. However, this inclusion may not have been sufficient to ensure the effective practice of teaching these cultures in all their specificities. This is evidenced by the stereotyped activities often carried out by schools, which are often restricted to the contents of books and the internet. It is necessary that the curriculum is effectively implemented, guaranteeing the right to explore and study cultural diversities.

It is significant to reflect on how important it is to articulate the school's knowledge with the knowledge brought by the school's subjects. It is ethical for the school to ensure that this mixture produces other knowledge, other rationalities, other interactivities and postures in the context of ethnic-racial relations (Brasil, 2014, p. 67).

PUBLIC SCHOOLS VERSUS INTERCULTURAL EDUCATION

When observing the specificities of the non-specific schools that serve indigenous students in the municipality of Ipuacu/SC, the cultural diversity is evident in its tangle of customs and beliefs, being the municipality formed by descendants of Germans, Italians, caboclos and mostly indigenous (Graph 01), it is up to the schools to ensure that such cultures are included within their planning. Thus, recognizing the importance of cultural diversity in the classroom.



Source: IBGE. <<https://g1.globo.com/sc/santa-catarina/noticia/2023/08/07/censo-do-ibge-populacao-indigena-de-sc-cresce-182percent-e-chega-a-21541.ghtml>>. Accessed: 29. Mai. 2024.

Brazil is recognized as a peculiar country with a very rich culture, it is necessary that we recognize the different cultures that form it and become aware to rethink our beliefs, to become enlightened and open to understanding interculturality, seeking ways to see the world: such a change



within the school environment needs to start with the school curriculum, where, in theory, it would form a solid basis for respecting different cultures. Thus, knowing and understanding education over time and its distinctions with regard to indigenous culture and its contributions to education is essential.

Despite the different studies on interculturality, little is said about the difficulties faced by indigenous people when leaving their culture and living with another, there is a significant gap in studies and research that specifically address the difficulties and contributions of these students in the classroom (from non-specific schools), we consider that the lack of knowledge and the precariousness of information, may lead to unsatisfactory practices in their inclusion.

In non-specific schools that serve students of different ethnicities such as indigenous, it is necessary to seek strategies through formal teaching and curriculum that guarantee the relationship with cultural diversity, for this the teacher needs to recognize that the classroom is made up of different cultures, because in this way he guarantees students to express themselves and bring their customs and cultural peculiarities in proposed activities.

No one escapes education. At home, on the street, at church or at school, in one way or many, we all involve bits and pieces of life with it: to learn, to teach, to learn-and-teach. To know, to do, to be or to live together, every day we mix life with education (Brandão, 1995, p. 7).

The scientific education learned within schools and the culture that encompasses beliefs and customs that the student brings with him, are intrinsically interconnected, so that we cannot conceive education without bringing the experiences and experiences of the students, one of the ways to transform this perspective is through the school curriculum, where the teacher establishes a connection between daily life and formal education. The teacher, as a mediator, needs to master references that allow him to conduct an autonomous and reflective thinking, with work proposals that will be really effective in the teaching and learning process in the classroom, bringing the local culture linked to teaching (Santos; Silva, 2016, p. 14-15).

Figure 02- Municipalities of Ipuauçu and Entre Rios, SC



Source: NSC Total – The Kaingang and the female prominence in the struggle for land. Accessed on 10. Mai. 2024

According to Figure 02, we perceive the extension of the Xapecó Indigenous Land and thus we understand the importance that the indigenous people have for the municipality, however, we need to understand the choice for non-specific public schools, making the influence of families on the decisions of many of the indigenous students notorious, as mentioned by one of the interviewees, a 9th grade student, *"Not really! That's not my choice, it's my parents who decide."* As for the reason why the family members choose the school outside the Xapecó Indigenous Land, she reinforces that *"They think it's better here, and I accept it"*.

The lack of belonging is noticeable in the students, since they treat their own culture as "other". When a 9th grade student was asked about the difficulties in talking about the Kaingang culture within the school, he replied *"No, we can talk openly. But I have nothing against them, because whenever I go there, I do things with them, because there are parades, so I go there to do things with them."* The student refers to his own people as "them," as if he did not belong to such a culture. At another moment, this same student reinforces, in relation to the specific school, *"One thing is that the teachers didn't pay much attention to us, we mostly stayed "barde" there. The teachers just talked, took us outside to play and didn't pass almost anything."* Such a statement may be an indication of the reasons why families choose to enroll their children in non-specific schools, but it is not possible to say that this actually happens, because it is an isolated answer, which cannot serve as a parameter for reaching conclusions.

FINAL THOUGHTS

With regard to the Curricular Proposal and the National Curriculum Reference for Indigenous Education, it is notorious the need for the existence and reaffirmation of such documents to ensure a



quality indigenous education that reinforces the cultural particularities within the school environment, so that, even if it is not a specific school, students have the right to a specific and differentiated education. because quality basic education is for everyone and it is the duty of the State to guarantee this policy to students.

Indigenous education has given visibility to an ethnic group that has been historically massacred, translating the essential needs for the preservation of their culture. Although the indigenous educational model has been transformed over the years, the struggle to ensure its effective implementation continues. Interculturality in education is inseparable from the knowledge, customs, and beliefs that must be addressed, integrating issues of ethnicity, generation, nation, and people. It is observed that indigenous education should ensure the participation of students' experiences, combining them with knowledge. It is crucial to intensify efforts to promote otherness and respect for differences, with evaluations and reception that fully integrate school and social life, without ignoring the specific culture of each ethnic group and individual and community aspirations.

As a result, failures and absence of pedagogical and curricular procedures that comply with the specific Brazilian legislation for the service to students from different cultures were identified. Another factor that should be taken into account is the training for teachers who serve students in diversity and their cultural specificities, also extended to school managers. School pedagogical political projects need complementary studies that meet the proposals of inclusion and understanding for citizenship education when attending to diversity as a formative principle and those of inclusion and citizenship training processes for all people, without exception.




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Thecla Schiphorst: Development of wearable technology as a tool for expressive interaction

 <https://doi.org/10.56238/sevened2024.010-056>

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ABSTRACT

Thecla Schiphorst builds her work by establishing links between art, body and technology. Through her consecutive interactive installations *whisper: wearable body architecture* (2001-2003) and *exhale: (breath between bodies)* (2003-2005) she uses wearable technology as an interface between the self and the inner self; between the self and the other; between the self and the environment. In this terrains of human/computer interaction with somatic and performative methodologies.

Keywords: Thecla Schiphorst, Whisper, Exhale, Wearable, Interface, Interaction, Performance.

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INTRODUCTION

The Canadian artist Thecla Schiphorst (1955) develops in a common space originated from the art/technology alliance. Her artistic and research work is mainly based on studying new forms of body communication employing, on the one hand, new technologies and, on the other hand, somatic and *performance* practices to open a path towards self-knowledge and human relationships. This marked interdisciplinary nature of her work is forged in her background in contemporary dance and programming, highlighting her work with Merce Cunningham in the development of the LifeForms program with the SFU team and her work as a teacher and researcher member of the School of Interactive Art at Simon Fraser University in Vancouver, Canada.

We approach the interdisciplinary universe of the artist by analysing two of her interactive installations *wearable* developed consecutively between 2001 and 2005, leading the *whisper[s]* research group. *Whisper* is an acronym for "wearable / handheld / intimate / sensory / personal / expectant / response / system" (SCHIPHORST, 2005, p.167). In both correlated projects, *whisper: wearable body architecture* and *exhale: breath between bodies*, Shiphorst enters the then sterile field of wearable technology to investigate ways to delve deeper into the interior of our body and establish connection with ourselves through the use of body technological interfaces, with the aim of promoting body/mind self-regulation and the transmission of our inner self to others.

CONTEXT: LOOKING INSIDE

Covering a study related to the design of digitally interconnected interfaces for wearable technology from Schiphorst's perspective, involves contextualizing the experimental process in the principles of somatic theory that gives meaning to artistic experience. The *wearable* garments used in both interactive art installations are the product of a research work based on the development of different practices with a group of participants, with the aim of developing models of experience and methods of union from "corporeality" to human/computer interaction.

The main objective pursued during the research process, and in the experience of the interactive *wearable* installation itself, is based on the exploration of the internal sensory world, defended in the somatic discipline, as a means of understanding our corporeal-mental states. Somatic practice invites us to listen and feel our inner self to establish an intra/extracorporeal link and develop attention to our internal organic patterns, so that we can become more aware of our body state. Thomas Hanna, one of those responsible for the dissemination of the discipline, refers to somatic awareness as an attitude of listening to oneself, of internal attention, which develops as the individual actively participates in the continuous interaction between the organic processes of the body, the environment and intentions, constituting an essential component of the formation of a cohesive sense of self (CASTRO and URIBE, 2010, p.33).

The garments worn in both installations measure participants' internal body data, such as heartbeat or breathing, and then transform that digital data into responses by actuating actuators according to the patterns collected. In this way, an expressive visual (projections, LEDs), tactile (vibrators, fans) and sound (speakers) response is produced. Thus, from the somatic perspective, the participant of the installation enters into his or her own bodily state. Shiphorst (2006, p.178) based on the reflections of the neurologist Antonio Damasio on bodily states suggests that:

these 'feeling' body-states are an interconnected set of feeling, thought, emotion and physiological functioning: each of these being present and affecting the other. He asserts that the induction of a body-state can be brought about through attention to any one of the interconnected patterns: so that attention to physiological patterning (for example breath) can induce a body state, or conversely, attention to other associated patterns, such as the occurrence of certain thought patterns can also induce the body state.

Shiphorst focuses on internal organic patterns (breathing, heartbeat) as a primordial phenomenon for technological interaction. Those patterns captured by sensors and converted into data can also be shared among participants in the interactive installations. Starting from the idea of interconnection defended by Damascus, the potential of the act of paying attention to internal patterns is highlighted, arguing that such patterns can be understood as part of an interconnected universe of feelings, thought and emotion, which together constitute a bodily state and that, therefore, one's own consciousness directed towards, for example, the rhythm of breathing, has the power to self-induce or self-regulate mental/bodily systems.

METHODOLOGY: DESIGN OF EXPERIENCES

The *interactive wearable installations* *whisper* and *exhale* are the result of a succession of explorative procedures used to guide the different design phases that converge in interdisciplinary creation. It is designed for the user based on the analysis of practices in the first person through a set of guided experiences. These *workshops* or preliminary projects, outline the different paths to follow to finalize the production of the interactive experience of wearable technology, they are the prelude to the design of the garments, to the technology involved in the processes of interaction/expression and to the experiential journey itself given in both facilities.

The premise that moves both projects is the awareness of our internal states, the attention to our organic rhythms that can be attended, and that are intended to be heard, observed and shared through technological tools. Therefore, the previous exercise is based on somatic-based research by applying internal listening practices as well as activities derived from dance, theatre and performance methodologies such as non-verbal interaction or body improvisation. Physical objects, modified garments and first prototypes of wearable technology are also used in these workshops to facilitate the final sketching work and the design of interaction experiences.

<*between bodies*> is the name of the five practices that precede the interactive public installation *Whisper: Wearable Body Architecture*. Throughout the development of the workshops, methods are used that derive from the notion of "deep listening" that Pauline Oliveros and Augusto Boal use as exercises in their process of creating performance practices; such as the emphasis of some senses over others using blindfolds and earplugs in the participants, that must pass in silence through space. Practices derived from Butoh dance methodologies are also used, such as making movements as slowly as possible, while silently trying to transmit a mental image, exploring the development of non-verbal interactions. As Shiphorst puts it, "this technique is utilized to enable the body to shift its attention to an immersive state in relation to its environment" (Schiphorst, 2009:150). In reference to the use of somatic practices in the course of the workshops, the artist states that "it includes practices such as Laban Effort-Shape Analysis, Feldenkrais and Alexander technique. From the Somatics perspective, knowledge is constructed through the experience of the body" (SHIPHORST, 2004, p.3)

In order to promote internal data exchanges in an analogue way and to investigate the body gesture in relation to the object, during the development of the workshops, stethoscopes are provided to users so that, in pairs, they can experiment on listening to their body and that of their companion through the object. It is an interaction game that allows predicting responses and stimuli of the participants.

In the last phases of <*between bodies*> garments specifically designed to work on interaction and body extension are used, such as oversized shirts sewn in different areas between the participants (Figure 1), shirts with long sleeves joined in a group network and a first *wearable* prototype where one of the participants has a pair of sensors incorporated and his partner a red LED that reacts to the stimuli captured. The objective is to analyze the way in which the participants develop using clothing as an object of interaction.

Heart[h] is a set of three *workshops* that precede *Exhale: (Breath Between Bodies)*, which brings together the practice and experience developed in <*Between Bodies*> and *Whisper*, and adds an interest in incorporating new methods of expression. Focused on breathing in *heart[h]*, the methodology applied in previous workshops is repeated, incorporating digital breathing bands connected to sound software in users , working in greater depth from the wearable technological interaction resulting from the experience in previous practices.

All these previous practices were documented through recordings, interviews and forms with the participants, serving as fundamental preliminary research work for the creation of the final wearable prototypes and the experience design itself that culminate in the facilities.

Figure 1: . <between bodies>



Source: Thecla Schiphorst website
Available in: <https://whisper.iat.sfu.ca/process.html>

DRESSING YOURSELF

Thecla Schiphorst calls the wearable technology creations used *whisper* and *exhale a-wearables*, incorporating the "a" at the beginning of the word in reference to the "attention" one takes of oneself when wearing one of these garments. *A-wearables* function as an interface for interaction between the participant's external and internal worlds. Metaphorically, the technology used activates a biofeedback loop working synchronously with internal physiological processes. The sensors incorporated in the garments record the organic data, which is interpreted and transformed into digital data on the wearable plates, which in turn send this data to different actuators generating sound, visual and tactile responses. This expressive interaction that occurs between the self and the inner self is also shared with the other, generating a network of body communication. By bringing technology closer to our body, by dressing our data, we become observers and directors of our physical patterns, but it also gives us the possibility of communicating and feeling the intimate spaces of others.

WHISPER: WEARABLE BODY ARCHITECTURE

The interactive public installation *whisper: wearable body architecture* was made between 2001 and 2003, a period of time that spans from the procedural phase of five workshops <between bodies> together with *V2_lab* and in collaboration with Susan Kozel, to the premiere of the

installation at DEAF03 (Dutch Electronic Atrs Festival) in Rotterdam in February 2003. The purpose of the installation is to generate a network of intra and extracorporeal interaction through wearable technology.

Based on premises that emerge from somatic practice, Schiphorst uses physiological patterns, namely heart rate and breath flow, as a representation of the body system. This physiological data is collected and translated into digital data to be replicated and "materialized" in sound and images. Schiphorst focuses his research on the knowledge of our inner being, creating the necessary technology for the user participating in the installation to discover visual and sound compositions generated by his own organism, his own self.

The interface that connects the breathing data to the visual and audible actuators is a garment whose pattern is reminiscent of a kimono (Figure 2). Each *a-wearable* has a series of sensors that monitor the breathing data and heartbeat of each participant, as well as several microcontroller boards that map and translate the data sent via a Bluetooth wireless network to the actuators. Through a programming system, the digital data sent can be translated into expressive responses with patterns generated from the physiological data of the participants.

The visuals offered in response to the physiological data obtained from the participants are projected on the floor of the installation space (Figure 3). These projections draw a unique composition that is created and fluctuates based on the data received, providing the possibility of altering those visual patterns according to one's own body state or, using that external source of information as a means of controlling or monitoring oneself.

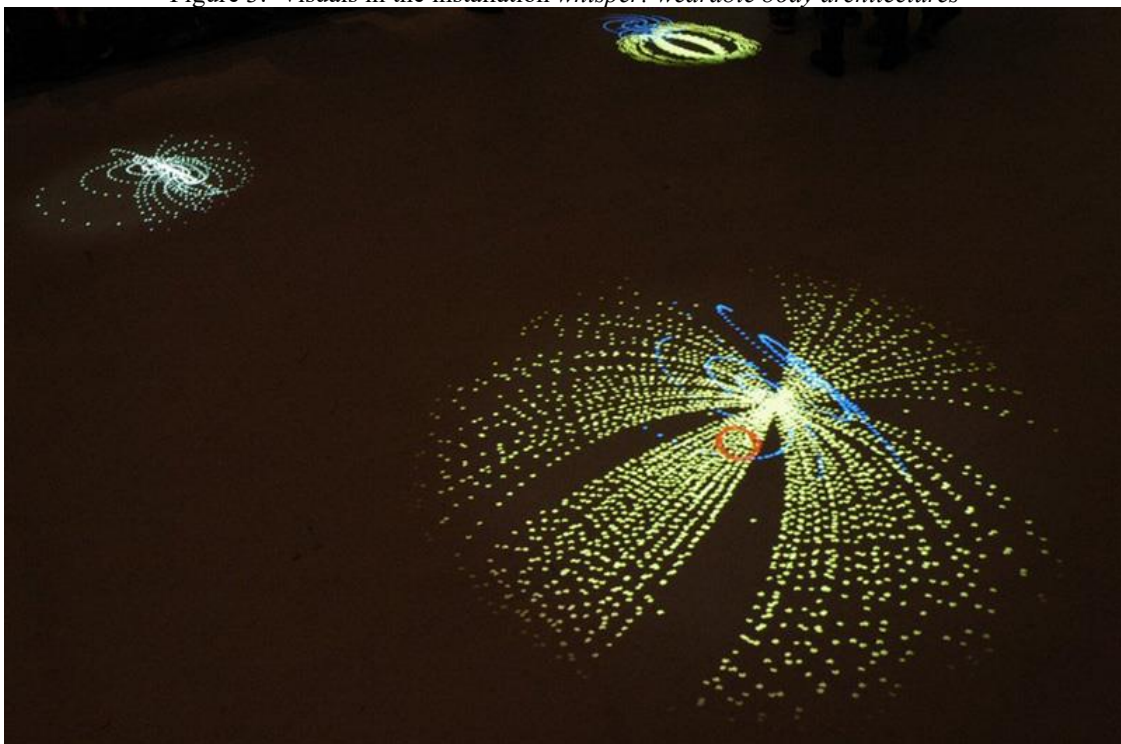
In *whisper: wearable body architecture*, the user has the possibility of sharing and exchanging their data through the use of their *a-wearable*, so that they become an observer of their body system and *a voyeur* of that of others. Each garment has a series of interconnection points so that each user can connect to another participant's *a-wearable*. By performing this gestural interaction, the digital responses merge, generating hybrid visual and sound models (Figure 4).

Figure 2: Detail of one of the wearables used in the whisper installation : wearable body architectures



Source: Thecla Schiphorst website
Available in: <https://whisper.iat.sfu.ca/process.html>

Figure 3: Visuals in the installation *whisper: wearable body architectures*



Source: V2_Lab website
Available in: <https://v2.nl/events/whisper>

Figure 4: Whisper installation : *wearable body architectures*



Source: V2_Lab website
 Available in: <https://v2.nl/archive/works/whisper>

EXHALE: (BREATH BETWEEN BODIES)

The interactive public installation *exhale: (breath between bodies)* culminates the research processes given in *whisper: wearable body architectures* and in the previous experimentation workshops *heart[h]*. In *exhale*, the invisible is started towards the invisible, a cycle is undertaken from the user's breathing rhythm until its translation into the activation of different devices in contact with the participants. The *a-wearables* created for *exhale* focus on the flow of the breath as a mode

of expression and interaction, each participant can send their internal data to the other users but, unlike the previous installation, this data is not manifested externally but the response effect is produced through the sense of touch.

The system of interaction between the self and the inner self, the self and the other, the self and the group is produced on *the exhale* through skirts in whose linings there is a network of devices that form a communication mechanism formed by sensors, microcontroller boards and small actuators that react from the users' breathing data (Figure 5). This data can be exchanged and, secretly, each user can feel the internal body system of their partner. The breathing rhythm of the users of the facility is recorded by bands with sensors that wrap around the rib cage of the participants. Inside the skirt linings, response generating devices are integrated, these are small fans and vibrators that are activated forming patterns from the rhythm of breathing. People who wear these *a-wearables* will receive through touch the translation of their respiratory flow or that of other participants. The flow of air driven by the fans and the vibration produced inside the skirts works as an expressive medium of the body system, allowing the consciousness of the organism to be activated, to feel it and to exchange it.

Users of the installation can choose, select and change the mode of interaction through touch by activating small fabric panels sewn on the sides of the skirts. These panels have motion-sensitive tactile recognition sensors, so the interaction of the self with the other occurs when a participant is willing to share their data with another person by activating the motion sensors through gestural interaction with their *a-wearable* (Figure 6).

Group interaction in *exhale* occurs when the rhythm of breathing coincides between several users of the facility. Each skirt has a built-in external LED circuit that varies its intensity depending on the group's breathing rhythm, so in this case the synchronized breathing patterns would work as a *dimmer* that regulates the intensity of the light in a collective interaction network.

Figure 5: , Detail of one of the wearable skirts used in the installation exhale: (breath between bodies)



Source: ACMSIGGRAPH website

Available in: <https://digitalartarchive.siggraph.org/artwork/thecla-schiphorst-exhale-breath-between-bodies/>

Figura 6: : (breath between bodies)



Source: ACMSIGGRAPH website

Available in: <https://digitalartarchive.siggraph.org/artwork/thecla-schiphorst-exhale-breath-between-bodies/>


CONCLUSION

Thecla Schiphorst's work since its inception has been nourished by the union of several disciplines as disparate as programming, somatic practice, body expression, new technologies or fashion design. Through the two case studies previously analyzed, we observe the artist's interest in exploring the hidden of the human being using new technologies as a tool. Almost two decades after the development of these wearable interactive installations, currently most artistic projects derive from interdisciplinary/multidisciplinary collaborations whose development revolves around collaborations with the field of science/technology. We could consider Thecla Schiphorst a benchmark not only in the field of development of projects that combine art and science, but also in its attraction towards the development of corporeal interfaces focusing on the interior of the human being and its interaction with the environment. Shiphorst intervenes in these two facilities in the production of wearable prototypes exploring inside our bodies, opening a path to continue researching and evolving as technology allows, currently dealing with the development of wearable prototypes that not only interact with us, but are integrated into our being.

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Extortion in Mexico

 <https://doi.org/10.56238/sevened2024.010-057>

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ABSTRACT

Extortion has become normalized, to such a degree that it is already part of Mexican culture. In Mexico there is an extorted society.

When the extortionist obtains a benefit, money, property, or services by coercing or threatening through physical violence, property destruction, or personal injury, extortion becomes theft.

Extortion has become an easy and quick source of financing for organized crime structures, governments and political organizations, including political parties, since it is highly profitable and generates fewer material, economic and human losses.

"The intuition that only organized crime extorts through violence, kidnapping or threats is false, it also does so through the collection of fees and dues. And it is not only organized crime, but the government itself and its institutions, as well as private companies that are also part of this harmful practice. It all begins, however, in the individual sphere where extortion has become common in everyday life. Accepting illegitimate payment for parking in a public space or being subjected to having your car scratched? Paying for garbage to be collected or putting up with it being left and accumulating on the street? Pay an official to do the procedure quickly or wait weeks or even months? To pay weekly or monthly dues to criminal groups or to be a victim of violent threats? Offering a juicy tip as a mechanism to gain access to a privilege to which one is not entitled?" (De la Calle, 2020)

In general, there are two types of extortion, telephone extortion, which is one of the most common crimes and the one that most worries the public security authorities in Mexico, many of them are committed from inside prisons, and face-to-face extortion, which is when the extortionist appears directly at the workplace identifying himself as a member of a criminal organization to charge for the security service or only so as not to do harm, so he threatens to deprive a family member or the victim himself of his life or damage the establishment. This type of extortion is the least investigated because it requires a person to report this crime. The crime of extortion has a 97.4% black figure, that is, it is not reported to the state prosecutors' offices or prosecutors' offices for fear of reprisals from criminals dedicated to extortion or if the authority is involved. Most people, not having enough resources to file a complaint against the crime of extortion, prefer to make a payment, a gift or a moche to a corrupt official or a criminal, since the cost can be much higher than that implied by the initial threat: lawyers, paperwork, etc. risks and wasted time.

Keywords: Extortion, Telephone extortion, Face-to-face extortion, Threat, Right of floor, Organized crime, Government, Black figure.

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INTRODUCTION

There are two general types of extortion: Direct or face-to-face and indirect.

Direct: in this type of extortion, the offender is physically present at the home, school, work or any establishment where the victim is, to demand money or to do, stop doing or tolerate something to obtain a benefit, causing someone property damage.

"Through the use of physical or moral violence, intimidation and threats through shooting, sending boxes with animal heads, floral or fruit arrangements with an envelope, photographs of relatives or "courtesy" visits to offer protection or request the collection of "rent or floor rights", criminals try at all costs to extort money from their victims." (Lee, 2024)

This type of extortion is the most worrying because of the participation of organized crime, since it is not only committed against companies and citizens, but also against the authorities themselves, especially at the municipal level.

The indirect is mainly carried out through telephone calls, text messages, email or any other means through threats, psychological violence, or the use of information related to the victims. Its purpose is to obtain a profit. Within this type there are several modalities:

"Virtual kidnapping of a family member: This type of call is the most common and the most aggressive, as it threatens direct violence. The criminal indicates that he has kidnapped a family member or close person and threatens to kill or harm him. In some cases, the voice of the alleged abductee can even be imitated through a recording, which is usually the voice of a child or woman. Large amounts of money are asked for and a payment period is imposed in a short time.

Extortion of liberty: The phone call focuses on "informing" about the detention of a family member for any reason and requesting a certain amount of money to release him.

Cybernetics: This type of extortion is carried out through the Internet or any means of communication, such as mobile phones or tablets, and refers to requesting confidential data or accessing the victims' computer systems and demanding money in exchange for regaining control of the information. It is also a form of digital violence, this modality involves forcing a person to follow the will or requests of a third party for possessing something of value such as personal information, images, audios or videos of a real or simulated sexual nature." (Kühne Peimbert, 2023)

One of the three crimes with the highest crime incidence in Mexico is extortion, after fraud and robbery.

Extortion not only threatens people's assets, but also alters emotions, causing fear, anguish and uncertainty.

"During 2021, 4.9 million extortion crimes were committed, where 90.3% of the cases were committed through a phone call and in 9% of the cases the victims delivered the money requested by



the extortionists. In addition, this is the crime that is least reported to the authorities, with a 97.4% black figure²." (INEGI, 2022)

Extortion has different faces, including those carried out by the Government when officials ask citizens to "bite" to speed up a procedure, a traffic or road police to let you park in a prohibited place and even to carry out a concession.

Virtual kidnappings are also extortion; those carried out by unions or certain groups against companies and face-to-face ones such as floor collection, as well as those that occur between employees within organizations, such as sextortion.

"The one that should be of most concern is precisely the participation of organized crime in face-to-face extortion, which is not only committed against companies and citizens, but also against the authorities themselves, especially at the municipal level." (Badillo, 2023)

There is a very serious problem on the part of the authorities, which is the concealment of information, where the figures are not so high, in addition to the fact that the information they make public is not disaggregated, which makes it impossible to know how many of the crimes are telephone, cyber or face-to-face extortion or the other different types of modalities.

Given the growing diversity of types of extortion, the most common is that carried out by telephone, but face-to-face extortion is the one that puts people's physical integrity and lives at risk the most.

One of the most common extortion crimes in Mexico is the collection of piso, known as derecho de piso, which is an "illegal tax" that is collected by organized crime from tenants, affecting thousands of businesses and companies in the country.

The National Institute of Criminal Sciences defines extortion as a "high-impact crime that consists of a person, association or for-profit organization, which through deception, threats and/or violence, forces any other person to give, do or stop doing something in order to damage their property and emotional sphere." (INACIPE, 2020)

The crime of extortion is provided for in the 32 State Penal Codes and in the Federal Penal Code. Its description and sanction may vary depending on the state of the republic.

Article 390 of the Federal Criminal Code (2023) defines extortion considered a high-impact crime as follows:

"Anyone who without the right forces another to give, do, stop doing or tolerate something, in order to obtain a profit for himself or for another or causing someone property damage, shall be

² According to the National Institute of Statistics and Geography (INEGI, 2022), the black figure represents all "criminal acts that are not reported to the Public Prosecutor's Office or that are not the subject of a prior investigation and therefore do not appear in any statistics." With the new criminal justice system, crimes for which an investigation file has not been opened are added to the definition of a black figure.



punished with a penalty of two to eight years' imprisonment and a fine of forty to one hundred and sixty days."

It also states that the penalties will increase up to a little more if it is carried out by a criminal association, a public servant, former public servant, member or former member of a police corporation or the Armed Forces.

"In addition, the public servant or former public servant and the member or former member of a police corporation shall be dismissed from public employment, office or commission and, in the case of a member of the Armed Forces in a retired, reserve or active situation, the definitive dismissal from the institution to which he or she belongs, as well as the disqualification from holding public office or commission for one to five years." (Federal Police, 2018)

This means that forcing a person to cover a fee with threats is extortion, which is also known as floor collection.

Over the years, this type of extortion has increased considerably through which a fee is demanded from business owners of all types illegally, under threat and extortion. The modus operandi of criminal groups consists of armed men leaving a message in the businesses to establish contact with the owners and let them know the fee they will have to pay for the right of floor.

"The right of floor occurs when criminals or criminal groups show up to businesses to demand that the owners of the place pay a certain amount of money from time to time in exchange for protection both for the owner who is being extorted and for the establishment.

The collection of the floor is then an offer of protection against a threat of harm to the owner or the business. In this modality, the extorter can exercise violence if the collection fee is not paid, through homicide, kidnapping or burning of the business.

In the case of telephone extortion, it occurs only once: one person deceives or threatens another for the victim, pays an amount and the affected person receives nothing in return. Even an extortionist may have little ability to carry out a threat, but he uses the violent context to his advantage.

Meanwhile, in cases of flat collection, the victim and the perpetrator have a continuous tax relationship: the offender collects a fee every week or month and visits his "client" to collect; sometimes the rules change and the quota goes up or its periodicity is shortened, among other things." (Martínez Trujillo, 2021)

OBJECTIVES AND GOALS

The main objective of this research is to publicize how the crime of extortion has increased in Mexico, among which the face-to-face extortion of companies through the collection of floor fees stands out, what its modus operandi is and what proposals have been made in Mexico to combat it.

This work is justified because in our country it is a latent issue that deserves an exhaustive and in-depth investigation, since the consequences are very serious, especially the resurgence in violence, the increase in insecurity and the loss of confidence of investors to establish their companies that generate jobs.

MATERIALS AND METHODS

The main sources of this research are documents such as codes in force in Mexico, reports, interviews, guides, books and magazines that talk about the different modalities of extortion, national and local newspapers that on numerous occasions and very frequently present articles that denounce this type of crime, as well as official websites such as INEGI,³ ENVIPE,⁴ ANPEC,⁵ SESNSP⁶, COPARMEX,⁷ MCCI,⁸ in addition to studies that experts have carried out on the subject.

Therefore, it is considered that this work is of a documentary and descriptive nature.

RESULTS

Since there have been statistical records of the incidence of the crime of extortion in Mexico, a clear upward trend can be observed despite its annual fluctuations.

According to data from the National Institute of Statistics and Geography (INEGI), in 2021 829 thousand extortion crimes were registered in businesses, of which 44.8% correspond to the collection of the floor.

According to the Employers' Confederation of the Mexican Republic (Coparmex), five out of 10 companies experienced corruption and extortion during 2023, which represents 48%, the highest percentage in the last six years.

73% of businessmen did not report to the authorities, arguing that filing a complaint is useless and for fear of reprisals. Only 4% who did report had a process that was investigated and culminated in the corresponding sanction, that is equivalent to saying that only 4 out of every 100 extortions are reported.

There are three main reasons why companies participated in acts of corruption and extortion and that they are directly linked to public servants.

According to Mexicans Against Corruption and Impunity (MCCI) "59% of companies gave in to this practice of corruption to speed up procedures.

³ National Institute of Statistics, Geography and Informatics.

⁴ National Survey of Victimization and Perception of Public Security.

⁵ National Alliance of Small Merchants.

⁶ Executive Secretariat of the National Public Security System.

⁷ Employers' Confederation of the Mexican Republic.

⁸ Mexicans Against Corruption and Impunity

This was followed by obtaining licenses or permits where 39% opted for this decision and finally, to avoid fines, sanctions or closures, in 31% of cases.

Despite the growth in the incidence of corruption, 73% of businessmen decided not to report to the authorities. (González, 2024)

"The crime of extortion affects more and more Mexicans. In the last four years of the Administration of President Andrés Manuel López Obrador, this crime, associated with the collection of floor and payment of fees to organized crime, reached a victim rate of 7.67 per 100 thousand inhabitants nationwide.

The figure represents an increase of 50 percent, compared to the last four years of Enrique Peña's administration (2015-2018), which closed with a rate of 5.1, according to the Executive Secretariat of the National Public Security System (SESNSP).

During the last two years, 2022 and 2023, the highest peaks of extortion victims were reported, with 8.36 and 8.48, respectively." (Baranda, 2024)

Ramón Castro Castro, bishop of Cuernavaca, Morelos, revealed that the municipality of Cuautla is being subjugated by criminal gangs that charge right of floor to tortilla shops, hamburger stalls and sugarcane companies in the area.

The extortion of tortilla shops is 50,000 pesos as an entrance fee and 10,000 pesos per month and the stall that sells hamburgers is charged a floor fee.

"Extortion and drug dealing have grown rapidly in recent years, with the resurgence of violence due to disputes between groups dedicated to micro-trafficking and control of local plazas, while extortionists and kidnappers legitimize their threats through violence and murder.

The cartels no longer live from drug trafficking, but from extorting society.

The crime of floor collection and extortion ranked third in recurrence nationwide and although it is not a new crime, it has spread in at least 23 of the country's 32 states, according to the Victimization Survey (ENVIPE-2023).

A merchant or businessman can refuse to pay and run the risk of the threat becoming a reality, but in a context of high violence and uncertainty it is a scenario that few would choose.

Another alternative would be to go out of business, relocate, or become employed. This choice can be made by businesses of a certain size and line of business, especially those that are in a position to move their company from one place to another, despite the fact that this change is imposed.

Of course, the aggressor could follow his victim anywhere to carry out his threat. Although it would be very costly, in particular because it would have to exercise violence in a territory where it does not necessarily have the conditions to do so, such as support from local criminal networks or public authorities.

"Extortion is directed with total impunity; it is an illegal and immoral tax that charges for the right to work and funds the criminal gangs that plague 75 percent of the national territory." (Di Costanzo, 2024)

In most businesses, all merchandise has a price with a fee included, imposed each month by a member of the criminal group that dominates the area in exchange for protection.

"According to the Laboratory of Analysis, Trade and Business of the UNAM,⁹ the fees charged by Organized Crime to tenants, producers, farmers, and the entire chain of suppliers and marketers of products already have an important impact on inflation, we have the case of lemons or avocados in Michoacán, so the right of floor can affect inflation by up to 2 or 3 percentage points." (Di Costanzo, 2024)

"During the government of Andrés Manuel López Obrador, violence has stagnated at historically high levels and, in addition, the country has experienced a severe epidemic of face-to-face extortion or collection of the right of floor. According to official figures, which must be taken with caution, since the black figure in this crime is 98%, extortion grew 45% during the first five years of this administration. The alarming increase in extortion has gone hand in hand with a staggering territorial expansion of organized crime; an expansion that has not only had a devastating effect on a large number of local economies, but has also begun to undermine the health of Mexico's main institutional creature in the last half century: the democratic regime." (Guerrero Gutiérrez, 2024)

According to intelligence and security experts, reporting is not easy. This is partly due to the collusion of certain elements within the institutions of justice with criminal groups, as it generates fear in the victims to report the possibility of reprisals.

Reporting can be counterproductive, useless or dangerous. Rent collection is a crime that involves a long-term relationship and a complaint can cause the extortionist to increase the level of violence to impose his protection. That is, the criminal, the only real provider of protection, can retaliate against his protégé, since he dared to denounce.

At the national level, the black figure in the case of extortion is 97.4%, according to the National Survey of Victimization and Perception of Public Security (ENVIPE). (INEGI, 2023)

The black figure can be close to 99%, a microuniverse of crimes is reported in relation to what really exists. People on the one hand do not report because they know that there is no capacity for investigation and fear inhibits them from reporting; at the same time, more and more people are engaged in this because the risk is very low.

In addition, there is a 99.8% impunity rate for the crime of extortion. (Findings, 2022)

⁹ National Autonomous University of Mexico

"The states where businesses pay the highest fees are: Guerrero: 50 thousand pesos; Aguascalientes: from 1 thousand to 50 thousand pesos; Mexico City: from 300 to 25 thousand pesos; Chihuahua: from 15 to 20 thousand pesos; Jalisco from 3 thousand to 20 thousand pesos and Tabasco: from 500 to 20 thousand pesos.

For their part, the entities with the greatest impact on their sales are: Chihuahua from 70 to 80%; Guanajuato from 50 to 60%; Morelos and Chiapas 50%; Puebla and Tlaxcala from 30 to 50%; Guerrero and Mexico City: from 10 to 40%; Oaxaca: 33%; Jalisco: 25%; Tabasco and Zacatecas: 10 to 20%." (Di Costanzo, 2024)

DISCUSSION

According to Coparmex's Security Monitor, which takes into account official figures from the SESNSP, as well as the surveys they do with their survey of partner companies throughout the country, from January to April 2024, 31 victims of extortion were registered on average per day, which represents more than one extortion per hour. while in the same period a year ago it was 24 a day, that is, one per hour.

The leader of the employers' sector pointed out that the incidence of crime could be almost 10 times higher, which means the prelude to impunity.

This is equivalent to an increase of 8.3% compared to the same period in 2023. In 2023, 10,975 victims of extortion were registered, virtually identical to the all-time high of 2022 with 11,039.

With data from #DataCoparmex during 2023, 54.5% of the members were victims of some crime, which means, one in two, the main one being robbery of businesses and extortion the second most frequent, 70% was by telephone or social networks and 30% in the form of floor collection, a factor that inhibits the arrival of investments in the country.

According to Coparmex calculations, the cost of crimes for companies amounts to 120,000 million pesos.

José Medina Mora, national president of Coparmex, said: "We are interested in making this situation visible because without public security, without legal security and without infrastructure (i.e., water, energy, ports, roads, industrial parks, etc.), Mexico will lose the opportunity to attract new investments for an amount close to 35 billion dollars thanks to the phenomenon of company relocation or Nearshoring. But it must also be said: without security for citizens and without a frontal fight against extortion, there will be no effective transformation of society." (COPARMEX, 2024)

"The National Alliance of Small Merchants (ANPEC) reports that extortion by organized crime against small, medium and large businesses represents at least 20 percent of their profits since



in many cases they reach 50 thousand pesos per month and in many cases represent the disappearance or bankruptcy of the establishments." (Di Costanzo, 2024)

"Mexican criminal groups rely heavily on extortion as a source of income, targeting individuals, small, medium and large enterprises. The rate of extortion has increased substantially in some Mexican states, while in others it has decreased. Extortion can also involve private citizens, who falsely claim to belong to criminal groups in order to obtain small extortion payments. Territorial extortion, known as "cobro de piso," has become a low-cost source of income for criminal groups. The food industry has become an increasingly frequent target, leading to food crises and supply chain disruptions. Extortion remains a major problem in almost all Mexican cities, with municipalities in the states of Michoacán, Guanajuato, Zacatecas, Morelos, Nuevo Laredo, and Mexico having the highest rates." (GI-TOC, 2023)

Organized crime in Mexico has taken over brands, products and goods. This phenomenon distorts the market and generates control of territory throughout the country and corrupts state institutions through bribery and intimidation.

Organized crime is no longer only dedicated to drug trafficking, but has expanded its activities to illegal businesses, such as extortion, the collection of rent also called "criminal tax", oil theft, human trafficking, kidnapping, with which they obtain billions of dollars a year. Criminal cells also have legal businesses, although the vast majority have generally been acquired the hard way, or work with criminals in money laundering.

This would not be possible without the complicity of people from the business, financial or government sectors.

Mexican cartels foment violence throughout the country, using various firearms, including those for military use, which causes brutal confrontations with rival cartels for territorial control and with different state public security institutions.

"Weapons for organized crime arrive in Mexico mainly from the United States, since between 70% and 90% of the pistols that appeared at crime scenes in the country were manufactured in the United States. Drug cartels get guns in Texas and Arizona and smuggle them across the border." (Pacheco Ortiz, 2024)

Criminal groups go to businesses and establishments to demand, under threats, that the owners pay a certain amount of money periodically. The objective is to offer "protection" against the threat of damaging the business or the person who owns the establishment. The extortionist is presented as "the protector", while the criminal can exercise violence if the fee is not paid.

"For criminals there is no longer any activity, line of business or formal or informal business that they do not extort, in addition to also controlling entire markets in the country for products such as chicken, tortillas, eggs, construction materials and many other activities that can no longer operate



quietly and legally if they do not pay fees and taxes to criminals. And those who refuse to pay outright are murdered, see their businesses burn in flames or, the bravest, prefer to close their family businesses, companies or harvests, so as not to have to pay taxes to organized crime, in addition to those they already pay to the government." (García Soto, 2024)

CONCLUSION

"The social and economic impact of extortion is devastating, disproportionately affecting the most vulnerable sectors of society and hindering economic and social development. Therefore, a comprehensive approach to combat it is imperative in Mexico.

This must include reforms in the justice system, community prevention strategies, and greater transparency and accountability in public institutions.

Only by addressing both the causes and manifestations of this phenomenon can a sustainable and effective solution be achieved." (Cabeza de Vaca Hernández, 2024)

Although the government is making an effort to combat the crime of extortion, experts suggest implementing a comprehensive strategy that attacks the underlying causes that are causing this phenomenon, such as the lack of economic opportunities, corruption and the weakness of the rule of law in some regions of the country.

Coparmex is promoting the inclusion of the crime of extortion in article 73, section XXI of the Constitutional Reform, whose opinion was approved in the Chamber of Deputies on October 5, 2023.

The ruling seeks to toughen the penalties for those responsible for extortion and that it be typified in all the country's Penal Codes and without contemplating modalities, such as sentencing extortionists to prison of 15 to 60 years in prison.

Claudia Sheinbaum, virtual winner of the Presidency of the Republic in Mexico 2024-2030, proposes to classify extortion as a serious crime and that it be established both in the Federal Code and in the Penal Codes of each state. In addition, the conditions have to be met so that it is not the victim who denounces directly to the Prosecutor's Office, but through a third party such as the National Guard.

In addition to strengthening the development of the investigative capacities of the National Guard to know who are those who commit the crime of extortion and to be able to disintegrate criminal gangs.

As well as the creation of the "National Intelligence and Investigation System that will have a link between public security and state prosecutors' offices to address the crimes with the greatest impact." (Corona, 2024)



"The federal government has allowed the crime of extortion to grow due to the lack of a clear strategy to combat it, deficiencies in management and investigation, and lack of support for the states." (Baranda, 2024)

"The crime of extortion is incorporated both in the Federal Penal Code and in the penal codes of each state. However, this crime is largely investigated by local authorities because federal crimes are only those related to weapons for the exclusive use of the army and explosives, with theft of hydrocarbons, those that are committed against health, those that attack communication routes or are committed in federal areas.

In some states, this crime is investigated in specialized prosecutors' offices. However, any prosecutor's office can receive your complaint and the police can do it too." (Kühne Peimbert, 2023)

In order to have greater transparency regarding the security situation in the country, it is proposed to promote citizen complaints through campaigns and increase the channels for reporting and improve the accompaniment for vulnerable people, since the low percentage of complaints and the high percentage of impunity show that the justice system is not functioning properly.

"The complaint is only part of the solution if it meets two conditions. First, it has to immediately trigger an alternative offer of protection that allows the victim to dispense with the 'original' offer, the criminal one. That is, if the police have the capacity to provide protection against extortion and other threats, the complaint becomes the demand for "relief protection."

Second, the complaint has to trigger an investigation and eventually a judicial process that guarantees the reparation of the damage for the victim and the neutralization of these violent actors. According to ENVIPE (2022), considering only the cases of extortion that have an investigation folder (i.e., 2.6%), we know that in 60% of the cases nothing has happened; in 26%, the investigation is in process, 0.3% recovered their assets and only in 1% there was reparation of the damage. In short, as long as the prosecutors' offices do not assume their role, it is useless for the population to take the risk of denouncing." (Le Cour Grandmaison, 2022)

Organized crime in the Mexican economy is a challenge that requires comprehensive solutions and the collaboration of all sectors of society.

If the extortion is by telephone, the following recommendations are suggested: Identify what they are demanding; In the event that the extortion falls on a family member, try to locate them immediately to find out if they are okay. If the family member was located, it must be hanged; write down the number they are calling from, characteristics of the voice of the person who is holding the call and all the data that can be noticed, if there is noise, if the voice has a particular accent; if possible, record the call; avoid as much as possible confronting or questioning the caller so that violence does not increase in their demands; if a threatening call is received to make deposits, hang



up; immediately contact 089 to report the call that was received, no matter where in the Mexican Republic the victim is.

If the extortion is through the internet: Do not click on any link that is not recognized; copy the URL of the profile or email you are extorting; To avoid continuing to receive these emails, you can block the email address and mark the sender as spam; if you have access to backup accounts, change passwords, to prevent them from trying to access the accounts and use personal information; take screenshots or record the profile and message screen; Immediately contact 089 to report the message that was received.

If the offender goes directly to the business to request a payment in exchange for not harming the property or family, the following recommendations should be followed:

Do not immediately give in to demands and remain calm; not to express a direct refusal to the offender; ask for a deadline to get the money requested, which will allow the scenario to be analyzed and request help from the authorities of the State Prosecutor's Office, where specialist personnel will attend to the case and report any intimidation, threat and collection of economic fees.


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Traditional and cultural knowledge of peasants: Agricultural production based on empirical knowledge

 <https://doi.org/10.56238/sevned2024.010-058>

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ABSTRACT

This study investigates the traditional and cultural knowledge of peasants in agricultural production, especially empirical knowledge. It focuses on contributions to the theories of Social Movements, considering the dispute in the field of knowledge and the resistance to empirical productions in areas of Agrarian Reform settlements. The objectives include analyzing conceptions of rural education, identifying traditional peasant practices, and analyzing how the MST conceives and recreates itself based on traditional knowledge. This is a bibliographic and field research, whose theoretical framework is based on authors such as Caldart (2009; 2012), Freire (1987) and Santos (2007). The field research, carried out with the leaders of the MST and peasants from the 25 de Maio Settlement and the Dom José Gomes Settlement in the municipality of Chapecó/SC, highlighted the evolution of production techniques, combined with technology and the strengthening of cooperatives, improving living conditions in the settlements. The interviews indicated a problem of non-succession of families in the lots of settlements, leading to rural exodus and the formation of small estates. Despite this, the settlements maintain experiences of resistance and the production of healthy food, such as the small farmer's market in Abelardo Luz. In the course of the research, production experiences were observed that avoid the use of chemicals and techniques that are aggressive to the soil, showing that it is possible to have income without adhering to the conventional model of production, valuing nature as an essential part of life.

Keywords: Knowledge, MST, Traditional, Culture, Peasants.

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INTRODUCTION

This research on the traditional and cultural knowledge of peasants aims to contribute to the theories of Social Movements, considering the constant dispute in the field of knowledge and the resistance to empirical productions in the areas of Agrarian Reform settlements. In this sense, *rural education* deals with such knowledge as a starting and ending point in its teaching methodologies. Guided by the question "How do peasants conceive traditional and cultural experiences and their relations with scientific knowledge?", this study sought to identify, based on the experiences of the MST, knowledge that has been built over generations, such as how to deal with the land and live with people, respecting and preserving values, empirical and traditional knowledge.

As it is a path built throughout the elaboration of a master's dissertation in Education, the general objective of this study was unfolded in four specific objectives, namely: a) To analyze conceptions of *rural education* regarding the traditional and cultural knowledge of the MST peasants and their relations with scientific knowledge; b) To identify traditional peasant knowledge practiced by MST settled farmers and means of preservation and continuity passed down from generation to generation; c) Analyze how the MST and training processes, in the context of *rural education*, conceive and recreate themselves based on traditional knowledge and preservation of the Creole seed; and d) Relate the concepts discussed by *rural education* with the struggle of social movements.

As for the methodology, the study is characterized as a literature review, field research and intervention of the researcher, who is the son of MST settlers. The approach used was dialectical historical materialism, and the analysis tool was Bardin's (2016) content analysis methodology.

In the following text, some relevant aspects were addressed, such as the theoretical framework based on the studies of Caldart (2009; 2012), Freire (1987) and Santos (2007), and some considerations reached through field research. It should be noted that this production is part of the result of a research developed for a long time in the place where the researcher Robison Risso belongs, the MST 25 de Maio Settlement, located in the municipality of Abelardo Luz/SC.

SOCIAL MOVEMENTS FROM THE PERSPECTIVE OF BONAVENTURE'S CRITICAL THEORY

To approach Critical Theory, it is essential to start from the premise that its purpose is to explain or understand reality. Analyzing theory critically implies, primarily, describing what is in relation to what is not yet, but can become. Critical Theory reveals the essence of phenomena through the understanding of their historical development and the context in which they were constituted (Santos, 2007). Its comprehension, in this study, is fundamentally based on the studies of Boaventura de Sousa Santos (2007), whose purpose is to understand how criticism can influence the search for social emancipation, and generate the spirit of nonconformity in the face of reality,

culminating in the construction of a path for a new theory that guides towards the overcoming of exploitation and social injustice.

According to the author, one of the issues that is central to this discussion refers to the experience of the people, who sometimes have expectations that become rooted in their culture that those who are born in such a social situation die without overcoming this state (Santos, 2007). In ancient societies, experiences coincided with the expectations of the people, because those who were born poor and illiterate died in the same condition in which they were born. On the other hand, in modern society, the state we are born into can be overcome in the course of life. For Santos (2007, p. 18) "This discrepancy between experiences and expectations is fundamental to understand what we think, and how we think about social emancipation in modern society".

The contradiction between experience and expectation is evident in a society where the expectations of the population at the global level are predominantly negative. This is because the governmental structure that organizes and elaborates social policies is geared to serve the interests of big capital, to the detriment of the majority of the population, which belongs to the working class. As a result, changes reported by the media often indicate deteriorations in essential areas of life, such as health, social security, and education. Even facing a crisis marked by discrepancies between experiences and expectations, regulation and emancipation, it is indisputable that we need a more just, dignified and inclusive society for all people, without exceptions.

Thus, based on this assumption, social movements are inserted, aiming to think about mechanisms of contribution to the search for social emancipation, in view of a structural transformation in society, through access to housing, means of production and life with dignity. The problem, in practice, is that theories are usually not in line with reality, and do not actually bring contributions that help to break the paradigms that bar the revolution of the social structure.

Today we are experiencing a complicated problem, a discrepancy between theories and social practice that is harmful to theory as well as to practice. To a blind theory, social practice is invisible; for a blind practice, social theory is irrelevant (Santos, 2007, p. 20).

The author's reflection is important for social movements, which need articulation to account for the contradiction that exists between theory and practice, after all, it is essential to build a new way of producing knowledge, which generates alternatives that lead to the revolution that the movements aspire to. As a result, it is necessary to mention:

[...] The most troubling thing about today's world is that so much social experience is wasted because it takes place in remote places. Very local experiences, not very well known or legitimized by the hegemonic social sciences, are harassed by the media, and therefore have remained invisible "discredited". In my view, the first challenge is to confront this waste of social experiences that is the world (Santos, 2007, p. 24).



According to Santos (2007), indolent reason or metonymic reason contributes to the waste of social experiences by contracting, diminishing and subtracting the present. This phenomenon occurs because most people's conception of the world is fragmented, which impedes the vision of the totality of the relationships established in the various spheres of society. In this context, a contradiction arises: people expand the vision of the future as something grandiose, while at the same time contracting the perception of the present, making it impossible to fully understand it. The ideal would be the opposite movement: expanding the present and contracting the future, accumulating more experiences in the present for a better preparation for the future.

When analyzing from the point of view of the existing dichotomies, one stands out: that the only rigorous knowledge is scientific knowledge, and other knowledge has no validity or utility in applied science. Such a statement is intended to belittle popular knowledge of groups such as peasants and indigenous peoples that has been built up over centuries of experiences.

And as such, the social practices that are organized in this type of knowledge are not credible, they do not exist, they are not visible. This monoculture of rigor has been based, since European expansion, on a reality: that of Western science (Santos, 2007, p. 28).

Thus, it is essential to shed light on the class struggle, since having the peasant and his knowledge as a reference, it is necessary to infer that there are constant attacks by the capitalist system, whose purpose is to erase the importance of their experiences, forcing a dependence on multinational companies in the entire production process, as Marx already pointed out in his theory on capital. To keep the experience alive is to sustain resistance against the possible extinction of the peasantry and its traditions.

During the studies in the Technical Course in Agroecology, it is possible to understand that this monoculture is strongly present from the origin of the production process, which is the domain of the seed. From the moment the farmer loses the independence of his own seed, he becomes hostage to the entire technological package of production of the large corporations. The next step is the unfeasibility of peasant experiments, which do not apply to the genetic changes already established in the seed and which have caused a vicious cycle that will run through the entire production line, until the trade of the final product, which leaves only a small part for the producer.

Another process of monoculture that must be learned is the naturalization of differences, which ends up hiding hierarchies, which classify people according to their ethnicity, class or sexual orientation. Hierarchy is a result of this naturalization, after all, the idea that these classifications are natural is constructed, making it seem that hierarchization is a natural process.

Unlike the capital/labor relation, here hierarchy is not the cause of differences, but their consequence, because those who are inferior in these natural classifications are inferior "by nature," and therefore hierarchy is a consequence of their inferiority; in this way, differences are naturalized (Santos, 2007, p. 30).



With regard to changes in social relations in the Western tradition, globalization proves to be a powerful tool for nullifying local knowledge, valuing only those of universal interest. Such logic appears, mainly, in the big brands that locate their consumers according to the products they provide, making the global hegemonic, dominant and unique, and ignoring the local culture.

Capitalism uses this premise of globalization to impose its methods of domination of the spheres of labor and nature. In this sense, it is worth reflecting on the difference in the approach to land by peasant and indigenous peoples in relation to capitalists: while the peasant looks at the land in different cycles, that is, the land that produced well in one year must rest the next year to then return to cultivation, the large producer uses the land in a predatory way. With repetitive cycles of commodity monoculture, making frequent use of synthetic fertilizers.

For capital, what matters is productivity and not the quality of production, which makes peasant products less important. Thus, the peasant is surrounded by the invasion of capital and finds it increasingly difficult to keep his experiences of life and production active. Hoarding becomes more important than anything else, even if it impacts the environment and people's lives. "With the development of commerce and private property [...] commercial needs became a priority and production ceased to be focused on the needs of those who produced to meet commercial profit" (Tonet; Lessa, 2008, p. 97).

According to Tonet and Lessa (2008), this process of change in the commercial relationship is what led to the emergence of social classes, which culminated in the appearance of numerous social contradictions. From these transformations, divisions of labor were imposed on society, which made mercantile relations increasingly important.

With the emergence and development of capitalism, this situation became even worse. The essence of bourgeois society is the private accumulation of capital, and this is only possible if men live in a society submissive to the demands of the global process of capital accumulation. It therefore becomes the decisive reference point of all spheres of action of men. On an individual level, a successful life is the life of someone who has accumulated wealth. On the social level, men are reduced to labor power, which is nothing more than a commodity like any other (Tonet; Lessa, 2008, p. 98).

Following the notes of Tonet and Lessa (2008), when analyzing Marx's theory, we can infer that capital is the social relationship created by men and that dominates the whole society. Thus society becomes alienated from capitalism through the submission of the human being to capital. In the midst of this relationship of domination exercised over men through the exploitation of labor and maintained by the human need for survival, science presents itself as a powerful tool of the social system, especially with regard to agricultural production, where small farmers who do not have large areas for cultivation and state-of-the-art machinery suffer from unfair market competition. Keeping popular knowledge alive in this scenario is a major challenge for smallholder farmers. To try to



overcome this contradiction between science and popular knowledge, Santos (2007, p. 33) emphasizes that:

[...] the possibility that science enters not as a monoculture, but as part of a broader ecology of knowledge, in which scientific knowledge can dialogue with secular knowledge, with popular knowledge, with the knowledge of indigenous peoples, with the knowledge of marginal urban populations, with peasant knowledge.

It should be noted that scientific knowledge and popular knowledge do not cancel each other out, each has its relevance. It is undeniable, for example, that in order to make advances in relation to the study of planets with space travel, science is fundamental, but when it comes to the preservation of the biodiversity of planet Earth, popular knowledge is much more effective, after all, modern science is more focused on destroying biodiversity than understanding it in order to preserve it. In this sense, indigenous peoples are the ones who still maintain a large part of our planet's biodiversity, precisely because they understand that they are part of it and not its owners and that they depend on it to exist. Thus, it is necessary to find the middle ground, on which we depend on the two forms of knowledge, popular and scientific (Santos, 2007).

The author also proposes five ecologies to overcome the waste of experience, bringing absent experiences and making them present. We highlight the fifth ecology, which is the Ecology of Productivity.

In the domain of the fifth logic, the productivist logic, the sociology of absences consists in the recovery and valorization of alternative systems of production, popular economic organizations, workers' cooperatives, self-managed enterprises, solidarity economy, etc., which the capitalist productivist orthodoxy has concealed and discredited (Santos, 2007, p. 36).

Social movements in their most diverse forms of organization, each according to its objectives, bring the logic of breaking the orthodoxy of the capitalist system, after all, they aim at human emancipation through class struggle, whether in urban or rural areas. Specifically citing the MST, when it organizes people to occupy the land and make it productive, generating the livelihood of thousands of people, it is contributing to strengthening the sociology of absences. When Santos (2007) reflects on ecologies, he points out ways to strengthen families after the conquest of the land, after all, the challenge is enormous to build sustainable production processes that keep people in their production units. It should be noted, however, that all social movements are based on the Ecology of Productivity.

The sociology of absences seeks to make present experiences that, although available, are treated as absent, and it is essential to bring them to light. Together with the sociology of absences, the sociology of emergencies emerges, which aims to analyze the future in a concrete way, considering progress as a non-linear process. This approach seeks to conceive the new, even without



pre-defined solutions, and to build a world full of possibilities and alternatives, contrary to the single vision promoted by capitalism (Santos, 2007).

According to Santos (2007), it is necessary to approximate the objectives of the Social Movements, seeking to find points of convergence in what is common between them, that is, it is necessary to create intelligibility without destroying diversity. This process is only possible through what the author calls Translation, in order to be able to capture all the richness of each social organization, analyzing the experiences that are being wasted and that hold immeasurable riches.

Critical theory, which is the basis of this text, needs a different rationality from the one we are used to. Based on this assumption:

We need another kind of rationality, and then we start to think about a broader kind of rationality, we need to reinvent critical theory according to our needs today. One thing that is clear to us is that there is no general knowledge; nor is there general ignorance (Santos, 2007, p. 52).

There is no less relevant or more relevant knowledge, each knowledge has its importance according to the reality in which the subject is inserted and according to his historical and cultural construction and with the relationships he has established throughout his trajectory. When Santos (2007) points out that there are two types of knowledge, the knowledge of regulation and the knowledge of emancipation, he makes it clear that both have starting points and points of arrival, and that ignorance represents total chaos and knowledge is order, the way out of this state towards enlightenment. Knowledge is to put things in order, in society and in reality. Dominating knowledge within classes is dangerous for the current social system, because through it people become aware of their exploitation and thus can understand the need to organize themselves to break the chains of domination of capital (Santos, 2007).

Also according to Santos (2007), modern science developed within the knowledge of regulation, therefore, it is not favorable to emancipatory knowledge. That is why the need for emancipatory knowledge to be that of the ecology of knowledges, after all, it is not possible to meet human demands only with scientific knowledge to the detriment of popular/empirical knowledge. This ecology of knowledge aims to learn new knowledge without ignoring what has already been acquired.

Throughout my training within the pedagogy of the Movement, it becomes evident that neoliberalism promotes the radicalization of the present. According to this view, the failure to solve social problems is attributed to the incomplete development of the market. Thus, it can be inferred that economics determines the way in which the environment reflects social relations and guides which knowledge should be preserved and which should be hidden. There are experiments in peasant production without the use of chemicals that show extraordinary results, both in the quality and



quantity of what is produced. However, this form of production is not of interest to the large market, because the science that develops "pesticides", genetically modified seeds and high-tech machinery would not obtain the desired economic return.

The term "neoliberalism" is recent, dating from 1945, and is generally used to denote adherence to the liberal doctrine of the Anglo-Saxon tradition that states that the freedom of the individual within the law is the best way to achieve, through pragmatic methods, prosperity and progress. At the heart of this notion is the defense of free-market capitalism. The State should only intervene to re-establish free economic competition and individual initiative (Caldart, 2012a, p.578).

According to Caldart (2012a), capital uses neoliberal educational policies, through the private sector, to act directly in Brazilian education.

However, in spite of the fact that we find in these propositions much of the neoliberal ideology practiced by like-minded governments and corporations that act directly or indirectly in education – training skills for the market, flexibilization of state control over private education, individualization of the pedagogical act, technocratic evaluation to stimulate competition between educational institutions through rankings, rewards and punishments, elementary compensatory education (reading, counting and writing) for the so-called poor, association of educational objectives with those of governability, etc. – it is irrefutable that, even in the most orthodox neoliberal experiences, everyone claims some role for the State in education (Caldart, 2012a, p. 579).

Caldart (2012a) also points out that the MST maintains that it is not enough to guarantee access to public schools. There is an urgent need for a profound review of the ways of researching and producing knowledge. Without a radical critique of Eurocentrism and its current form – neoliberal single-mindedness – education serves as a "weapon" in favor of the dominant sectors. Knowledge is a powerful weapon, which can be used for liberation, but if it is not based on critical theory, it can be another form of alienation from the capitalist system.

According to Santos (2007), there are two aspects of knowledge, cold knowledge and hot knowledge: cold knowledge refers to the vision of obstacles, and hot knowledge is the will to overcome them. Through it, it is possible to understand the need to break colonialism, analyzing the power structures of the State that expropriates many people of their own humanity.

The possibility of giving people back their humanity begins with the concept of democracy, which occurs through the process of breaking power relations and initiating what can be called "shared authority". Social movements work with the idea of shared authority, where everyone is part of the decision-making, has the right to an opinion and thus also takes responsibility for the results.

Capitalist society sustains itself through two systems, the system of exclusion and the system of inequalities. The system of inequalities occurs through the capital/labor relationship, after all, without the exploitation of the worker's labor, there is no accumulation of capital. Karl Marx (1867) categorically theorizes this process of generating capital through what he called *surplus value*. The system of exclusion aims to keep those who are outside, on the margins of society, as invisible, not



being valued and respected as subjects of rights. The sociology of absences sheds light on these subjects who are hidden.

Santos (2007, p. 68) believes that "[...] The ecology of knowledge that I propose to you will have many possibilities to face this problem, especially to confront some disastrous and harmful traditions in the theory and critical practice of modernity." Thus, in order for all cultures and knowledge to have their spaces in each reality, it is necessary to use ecology as a tool for democratization and liberation of those who are exploited.

Several Latin American revolutionary movements, such as the government of Hugo Chávez, contradict the logic of silencing those who are marginalized and denied their humanity. The problem is that many social movements are very distant from each other, which makes them fragile and susceptible to being easily undermined by the current system (Santos, 2007). Based on this assumption, Santos (2007, p. 96) infers that "The problem with social movements is that at a certain moment they have an enormous activity, they are in the press all the time, and the next month they are no longer there, they are in reflux, people do not go to assemblies and meetings".

Based on the author's analysis, corroborating my experiences as a subject formed in the struggles of the MST, I affirm in relation to the demobilization of social movements, that this brings to light a chronic problem in countless social organizations: when there is an emergency demand, people mobilize around this objective, and from the resolution of such demand, Stagnation returns and leaders find it difficult to bring their members together. This is remarkable in the realities of agrarian reform settlements, because after the conquest of the land and the structuring of the settlements in their most diverse demands, people start to fight only for their individual demands, and no longer mobilize collectively, weakening the sense of community.

From the elements listed, it can be said that peasant social movements have a great challenge ahead, which is to find a balance between their objectives and articulation with other movements in order to strengthen the struggles for social emancipation. The experiences built over centuries by each people need to be taken into account when discussing the structure of a society based on the ecology of knowledge. The sociology of absences is also the possibility of bringing to the present the experiences that are at risk of being wasted. For neoliberalism, what does not generate economic value has no value, but for native peoples and peasants, each knowledge is important in the maintenance of traditions and in the right to humanization (Santos, 2007).

CHAMPION AGRICULTURE

The populations of the countryside, the waters and the forests (peasants, indigenous peoples, quilombolas, riverside dwellers) have been strongly present in the political scene in Brazil in recent decades, and struggle to conquer and resist in their territories. These subjects organize themselves in



movements that deconstruct/construct/reconstruct territories, which is why they are called socio-territorial movements (Fernandez, 2005).

Peasant agriculture is a way of agricultural development and life for families who, by having access to land and available natural resources, begin to produce food that guarantees their livelihood. This model differs from the capitalist mode of production, which expropriates the worker of the fruits of his labor.

Peasant production units, by having as their centrality the social reproduction of their direct workers, who are the members of the family themselves, present a different rationality from that of capitalist enterprises, which are based on wage labor to obtain profit. As peasant families reproduce their specificity in a social formation dominated by capitalism and given that the peasant economy presupposes markets, peasant production units suffer the most distinct influences on their way of doing agriculture (Caldart, 2012, p. 26).

The peasantry faces a process of ideological confrontation due to hegemonic capitalist expressions, such as subsistence agriculture and family farming. Since the colonial period, subsistence agriculture has discriminated against peasant production, considering the peasant subaltern and inferior for not meeting the demands of the large market and large-scale monoculture.

After the process of the Green Revolution, in the mid-1950s, the concept was introduced that peasants should enter into contracts with capitalist companies, coming to be called Family Farmers.

The expression family farming brings as a corollary of its conception the idea that the possibility of growth of peasant family income can only occur if there is the direct and indirect integration of family farming with capitalist companies, in particular agro-industries (Caldart, 2012, p. 29).

This process of consolidation of family farming brought with it the subordination of farmers to capitalist enterprises, making them reproducers of the dominant technological matrix of production. On the other hand, the conception of peasant agriculture incorporates the perspective of production and autonomous way of living, without denying modernity. The central focus of peasant agriculture is the production of food both for the reproduction of the family and to feed society in a broader sense.

RURAL EDUCATION

It is not possible to approach the history of *rural education* without first examining its movement and recognizing this new space for the deepening of ideas and values collectively constructed by workers, subjects of their own history, including peasants, as well as educators committed to the working class, who, until the moment they assumed historical protagonism, they were perceived through other perspectives and conceptions.



Rural education goes back to the times when the colonels had a space on their own farm for literacy and schooling of the children of the employees, at the levels that the former wanted. This time still persists in rural farms in Brazil in agro-industries and industries, with markets and internal tricks that "crest" people, forcing them to buy their products and follow their ideals.

The origin of *rural education* goes back to popular peasant movements, in which the subjects themselves begin to organize their lives based on the needs they identify. Thus, in the mid-90s, more precisely in 1997, ENERA (1st National Meeting of Agrarian Reform Educators) took place in partnership with UnB (University of Brasilia). From this date on, the practices already carried out in the peasant areas were systematized and solidified in the field of class confrontation. Rural *education*, outdated in its concept and practice, gives way to *rural education*. The emphasis on *DO in the field* refers to the subjects by which it is thought, the peasant subjects.

It is essential to explain that the concept of *rural education* has been hijacked and distorted by the Brazilian elite in such a way that agribusiness calls itself a defender of *rural education*, employers' federations and employers' unions. In view of this, it is necessary to say that as workers, we will continue to build education at the level of literacy, schooling at all levels, according to our demands, which are much greater than the utopia of the full freedom of the human being.

The history of education in the Landless Movement is a journey made with persistence and struggle. For the basic education of the settled children, parents, teachers, young people and students have fought hard. Collectively and with the conditions of each moment. The education proposed by the MST has a different organization, work and matrices, since the reality is also different. It is also urgent to think that, in fact, such an organization is getting bigger and more complex. The workers' struggle grows in necessity and strength. Therefore, the challenges also increase and become more complex. Education needs to assume the tasks that fall to it in this process of strengthening the organicity of the MST, of clarity of the pedagogical political project, as well as of the pedagogical principles.

According to Caldart (1996), pedagogical principles refer to the way of doing and thinking about education, in order to concretize one's own philosophical principles. They speak of the elements that are essential and general in our proposal of education, including especially the methodological reflection of educational processes, drawing attention to the fact that there can be differentiated practices based on the same pedagogical and philosophical principles. In other words, the pedagogical practice that takes place in a settlement school is very different from the pedagogical practice that takes place in any other school.

The word education has many meanings. For the MST, it is the process of human formation, through which people insert themselves into a given society, transforming themselves and transforming this society. That is why it is always linked to a conception of the world. For the



movement, education is never neutral: either it transforms the reality to which it is inserted or it helps by perpetuating a system that increasingly elevates the commodity and increasingly lowers the human being.

Throughout my path in education, both in the practice of rural educator and in my academic training focused on *rural education*, I acquired the awareness that the freedom of the land is not only a matter for farmers. The freedom of the land is everyone's business, because it is not enough to have schools in the countryside, it is necessary to help build schools in the countryside, with a political pedagogical project linked to the causes, challenges, dreams, history and culture of the working people of the countryside. Rural education should not be thought of as a partisan political project or a social movement, but rather as an education that is linked to the needs of all rural people, linked to their realities so that learning is not empty, meaningless for their lives.

From the studies provided by the MST's pedagogy, which is based on the reality of the student and the preservation of the cultural roots of each community, rural *education* acts in its methodologies and practices. The peasant, especially the settler, unconsciously denies his own condition as a country person, seeing himself as inferior rather than different from the urban person, thus falsifying his identity. Rural *education* works from the perspective that rural people can identify themselves as belonging to something, with all its values and particularities.

Rural education, with its differentiated pedagogy, seeks the implementation of an apprenticeship that identifies the peasant as a son of the land and that has with it a close connection of struggles, achievements, healthy life, differentiated values and love. It is believed that within this education lies the germ for the transformation of the entire society. This education questions social structures and the culture that legitimizes them, questioning society. This formation goes far beyond the school, it occurs through the entire historical process of each individual and each society through daily life and experiences, it is always linked to a certain political project and a conception of the world.

With the pedagogy of the Movement, it is believed that for the realization of *rural education*, it needs to become an educational project that is included in public policies. One of the political objectives of *rural education* is to help mobilize and organize peasants in social movements that strengthen and identify their collective presence in society and that is their main space of education for participation and for the necessary social struggles.

According to Caldart (2009), it can be said that the school desired for the countryside is the one that helps to know the reality or realities. It must start from what one thinks, lives, does and says. It needs a curriculum that meets the needs of each reality. First, you must be very clear about your goals, and from them, seek to know what must be done to achieve them. The need to produce



agroecologically is also valued through *rural education* so that the preservation of all forms of life occurs and so that the land continues to generate quality food, also in the future.

At this point, Caldart (2009) points out the importance of *rural education* being linked to the food production process, working on the school floor with the awareness and tools necessary for the mastery of the productive technique that agroecology proposes as an alternative to the agribusiness production model.

If free action is free only in so far as man transforms his world and himself, if a positive condition for freedom is the awakening of human creative possibilities, if the struggle for a free society is not free unless through it an ever greater degree of individual freedom is created, the revolutionary process must be recognized as eminently pedagogical (Freire, 1987, p. 134-135).

For the author, every time we talk about social practices, work, culture, we can also be talking about education, and it is for this reason that education cannot be conceived in a way that is disconnected from reality. School is the continuation of reality and not a place of escape from it. Reality must be the starting point and the end point of education. Common sense and daily knowledge should be the starting points that, through study, analysis and understanding, will be transformed into scientific knowledge that will return to society in the form of new practices, transforming reality.

Understanding that *rural education* is more comprehensive than simply the rural space, it involves a proposal for transformation for the whole society, because there is no human development if only one of the social sectors develops and the others remain stagnant. From my studies and experiences, I consider that *rural education* is not a ready-made proposal, it does not present finished solutions. It is under construction and must be adapted to each reality in which it is inserted. She does not ignore formal education and traditional content, as they are also part of learning, but they must adapt to the needs of each reality.

FINAL THOUGHTS

Education is not neutral: either it transforms the reality to which it is inserted or it helps by perpetuating a system that values the commodity and oppresses the subjects. Freedom of access to and use of land is not only a utopia for farmers, it is also for humanity as a whole. Thus, we understand that the land is not private, it is public and the right of all people who want to produce on it, without exception. In this sense, it is not enough to have schools in the countryside, it is necessary to build rural schools, that is, schools with a political pedagogical project linked to the causes, challenges, dreams, history and culture of the rural working people.

Rural education is a powerful tool to keep peasant experiences of production alive. The traditional knowledge developed in the classroom drives the educational processes, thus giving



meaning to the contents addressed, that is, contextualized. In summary, it can be said that the desired school for the countryside is the one that helps to know the reality or realities, starting from what is thought, lived, done and said. It needs a curriculum that meets the needs of each reality.

The need to produce agroecologically is also valued through *rural education* so that the preservation of all forms of life occurs and so that the land continues to generate quality food in the future as well. From this perspective, dealing with the contents from the concrete reality of the countryside, valuing the peasant, strengthens the cultural dimension of the peasant's resistance in his conquered land. The traditional knowledge practiced by peasants, when brought to formal education environments and approached with due importance, can become scientific and be the basis for an education thought out at a general level.

According to the results of the empirical research carried out, it was observed that from the occupations with the objective of conquering the land to the present day (2024), the people interviewed demonstrate a strong link with the cause of the social movement as a tool to fight for dignity and transform the reality in which they lived before joining the MST. It is also evident that there have been many changes in the context of technologies used in small-scale farming. At the beginning of the settlements (1986), work was predominantly manual, carried out with rustic tools such as axes, sickles, machetes and ox plows. Faced with land of inferior quality and low productivity, survival was a challenge and many families ended up abandoning their plots, migrating again to urban centers.

Over the years, the traditional production techniques brought by the peasants, combined with technology and the strengthening of cooperatives, have facilitated the evolution of the settlements and consequently improved the living conditions of the settlers. The traditional peasant knowledge is present from the preparation of the soil, the cultivation and improvement of the Creole seed, the use of medicinal plants, the planting times based on the phases of the moon, the preparation of organic fertilizers to reduce the cost of industry and the way of living in the countryside, with particularities of each community. forming a specific culture.

An issue that emerges strongly in the statements of the interviewees is the concern with the non-succession of families in the lots of settlements. The tendency for only the elderly to remain on the properties has led to difficulties in terms of labor for work, which, in turn, has contributed to the rural exodus in these regions. This reality has a direct impact on the structuring of the community, since schools face a decrease in the number of students, cooperatives suffer from a shortage of members, which makes it difficult to maintain their activities and, consequently, the process of selling lots favors the formation of small estates.

Still in the settlements, experiences of resistance and life with regard to the production of healthy food are still active. In Abelardo Luz, the Small Farmer Fair is held every Saturday, and

settled families have access to this space in the city to sell their products, thus valuing their production. During the field research, it was possible to learn about two production experiences that deviate from the patterns of capitalist agriculture, being a peasant family in the Dom José Gomes Settlement in Chapecó (SC) and one in the community of Santa Rosa III, in Abelardo Luz (SC). Both production experiments aim to avoid the use of chemicals and farming techniques that harm the soil and natural resources. These are examples that it is possible to have income without having to adhere to the conventional mode of production, treating nature as indispensable wealth for life and not as a simple commodity as the capitalist system of society treats it.

Santin (2023), brings the observation that the Landless movement has taken on a dimension that goes beyond the struggle for land, that is, it is not only by conquering a piece of land that the problem is solved, but it is also necessary to advance in the issue of the model that is used. According to the author,

With our experience we can see that with diversity productivity is much higher, maybe you can harvest a little less corn per hectare, but along with corn you can harvest other plants, other products and in addition you take care of the land. By understanding the cycles of nature, you can reap much better results, but then it refers to a series of public policies, for example agribusiness agriculture.

People are also in need of human fulfillment. Capital conveys the idea that it is necessary to have money in order to have fulfillment, but it is noticeable that this system is leading farmers into debt, causing depression from their youth in the countryside. Thus, the peasant experiences accumulated in generations of agroecology are consolidated as a confrontation with the conventional agriculture model and as a way of obtaining income for small farmers.

Santin (2023) also analyzes traditional knowledge that:

We bring traditional knowledge as a basis, that is, to produce in diversity in quality and not in quantity. Speaking from a technological and scientific perspective, the greatest university we have is Nature, and unfortunately we still need to acquire a lot of wisdom and knowledge about it. So the challenge is how the new generations can get to know more about Nature. Nature for us has a production effect as well as a therapeutic one.

From the field research, some elements were present. For the peasants, the relationship with the land, with the signs of nature and the use of medicinal plants is very present. In the words of Santin (2023):

When we are stressed with traffic with our daily lives, from work, getting home and going to the fields, putting our hands in the dirt and our feet on the ground is an excellent therapy. Knowing nature is very important, after all, for example, why is the watermelon ripe at the time when we need liquid the most or why are citrus fruits ripe in winter? These elements show that nature is giving us the signals and we need to learn to understand these signals. Why did the ancients tell children to put their feet on the ground? The earth is a unifying element, which unifies, for example: if there are two piglets of different sows in the pigsty and we throw a litter of earth in the middle, they do not fight, because the earth leaves them



with the same smell. Another traditional knowledge is about plants, for example, here we are implementing an agroforestry, where we can organize the plants according to those that need a little more shade, those that need less, as we organize in the same place several different species.

Regarding the seed, Luz (2024) analyzes it as follows:

When I was a child, I lived with my grandparents and as they already had a piece of land, they were always very capricious, they took great care of the seeds mainly, they never bought a grain of seed. When I was a child, they exchanged a lot of seeds among the neighbors, which gave a lot of variety to each type of crop. I never ate a bought corn or rice in my childhood days, we always grew our own food and harvested.


One of the foundations of agroecology is the seed. It is essential to have mastery of the seed so that there is no dependence on the technological package implemented by companies that aim to dominate the production process. Traditional knowledge has taught us to understand the signs of nature, it teaches us what we need to understand to reap good fruits. Science is important, but practice brings us immeasurable experiences.



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The fight against microbial growth "in the light" of photodynamic therapy

 <https://doi.org/10.56238/sevned2024.010-059>

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ABSTRACT

With the emergence of several strains of antibiotic-resistant bacteria, there has been a demand for new therapeutic alternatives to combat the growth of microbial pathogens. PACT (Photodynamic Antimicrobial Chemotherapy) is a therapeutic modality, inspired by the treatment of tumors, that aims to kill microorganisms by photodamage, by employing the combination of a photosensitizer and light irradiation, usually of the wavelength of visible light. Thus, PACT can be applied in different contexts, with Dentistry as one of the greatest applications, but PACT can be used in the treatment of skin infections and even disinfection of surfaces in hospital and industrial environments. This paper addresses historical and technical aspects of PACT, in terms of mechanism of action, sensitive microorganisms and future perspectives. This document is

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the result of the final work of the discipline "Special Topics in Pharmacology II", prepared by graduate students in Natural Products, Synthetics, Bioactives, Cellular and Molecular Biology.

Keywords: PACT, Photosensitizers, Light irradiation, History of Therapeutics.



INTRODUCTION

The use of light in medicine is dated to records that are more than 4,000 years old. In different parts of the world, such as Egypt, India, and Greece, the use of sunlight was already known in the treatment of numerous conditions, for example psoriasis and vitiligo (Silva *et al.*, 2018), as well as in the process of microbiological treatment of drinking water, based on religious precepts (Azevedo Netto, 1959). Since antibiotic therapy, society's quality of life and life expectancy have changed substantially, however, the use and abuse of antibiotics over the decades has allowed the emergence and dissemination of resistant pathogens that pose a great threat to health (Aslam *et al.*, 2018).

Thus, new strategies are proposed and the use of light to combat microbial growth has emerged as a potential solution to the problem. PACT, the universal acronym for *Photodynamic Antimicrobial Chemotherapy*, is a simple technique that is based on three pillars: a compound, natural or synthetic, that is sensitized by light irradiation and will form free radicals with molecular oxygen, resulting in the death of the microorganism (Derikvand *et al.*, 2020).

The technique is safe and can be applied against bacteria, fungi, viruses and parasites. In this work, advantages, applications, mechanism of action and a brief history of PACT are presented. In addition, the perspectives concerning photosensitizers are presented, as well as the types of light irradiation for each treatment.

HISTORY OF PACT

Based on the premise defined in antiquity about the use of light in medicine, some therapies evolved by associating exposure to sunlight with the consumption of plants, observing that the therapeutic effect was due to the participation of plant pigments activated by light (Silva *et al.*, 2018).

During the so-called golden age of microbiology (1860-1930) the idea of cell death stimulated by the interaction of chemicals and light was reported. Oscar Raab was the first to divulge the subject, when he occasionally discovered the lethal action of the combination of acridine red and light on protozoa that cause malaria. A lower lethality was observed on rainy days, while the opposite was seen during bright days. Their conclusion was that the dye was activated by some fluorescence product, postulating a mechanism involving the transfer of energy from light to the chemical compound, similar to what occurs in photosynthesis (Rossin *et al.*, 2020).

In the year 1900, eosin was administered parenterally in a treatment against epilepsy, and dermatitis was observed in the skin regions when exposed to the sun. This observation led to the first application in human medicine of the interaction between light and a fluorescent compound. Herman von Tappeiner and Jesionek tested the application of eosin and exposure to white light for the

treatment of skin tumors. In this study, the participation of oxygen in these photosensitization reactions was demonstrated and seven years later the phenomenon was described as "photodynamic action" (Correia *et al.*, 2021).

In the following years, much was experimented in the attempt to understand photosensitization, but it was only in the 1960s that studies deepened and PACT was consolidated as a therapy, applied in different treatments, especially local, mucosal or skin infections, as well as widely explored in Dentistry (Takasaki *et al.*, 2009). At this time, there was an understanding that the photodynamic action or effect was possible if the light irradiation presents an emission of adequate wavelength with the absorption spectrum of the photosensitizer (dye), in the presence of molecular oxygen (Simões *et al.*, 2018).

APPLICATIONS OF PHOTODYNAMIC ANTIMICROBIAL THERAPY (PACT)

PACT is a promising strategy to confront, above all, bacterial resistance to antibiotics, but the generation of reactive oxygen species brings to light different therapeutic possibilities, whose results are promising.

SKIN INFECTIONS

PACT can be used to treat acne, seborrheic dermatitis, and infected wounds. The photosensitizer is applied to the affected area, followed by exposure to light irradiation. Important results have been achieved in *in vitro* and *in vivo* assays against *Staphylococcus aureus* (Karner *et al.*, 2020). In *in vivo* models, PACT has also demonstrated an acceleration in the healing process of wounds, ulcers, and infections caused by bacteria. Additionally, the healing process was accelerated because the antimicrobial activity demonstrated by PACT also prevented the development of secondary infections (Sun *et al.*, 2020).

ORAL INFECTIONS

Dentistry is the area that benefits the most from PACT. The most commonly used photosensitizers are methylene blue and toluidine blue. Animal models have shown a reduction in the progression of periodontitis, in radiographic terms, with a reduction in bone loss, as well as in histological terms, with a decrease in the extent of the inflamed area (Kikuchi *et al.*, 2015). In addition to bacterial periodontitis, PACT can be applied in the treatment of bacterial gingivitis, as well as fungal and viral infections. In the latter, the treatment of cold sores was associated with administration with acyclovir (Gholami *et al.*, 2022).

EYE INFECTIONS

In ophthalmology, PACT can be applied to treat bacterial, fungal and viral infections, but more investigations are conducted in *Pseudomonas aeruginosa* infections. The photosensitizer used is rose bengal, whose bactericidal action is against clinical isolates of *P. aeruginosa* (Durkee *et al.*, 2020). The dye has also been used in the laser treatment of bacterial keratitis caused by *Staphylococcus aureus* because, as an advantage of the technique, there is no selectivity for the infectious agent (Paiva *et al.*, 2022).

RESPIRATORY INFECTIONS

Important results have been achieved in the therapy of sinusitis and bronchitis, as well as respiratory infections in patients with cystic fibrosis, especially caused by antibiotic-resistant bacteria. *In vitro* assays using methylene blue and toluidine blue and laser irradiation showed a significant reduction in the number of clinical isolates of *Acinetobacter baumannii* and *Pseudomonas aeruginosa*. The study and others like it suggest that PACT mediated by these photosensitizers represents a promising approach in the treatment of infections with multidrug-resistant respiratory pathogens (Kashef; Yahyaei, 2014).

CANCER TREATMENT

The photosensitizer is administered to the patient, and then the cancer-affected area is exposed to light irradiation, leading to selective destruction of the cancer cells. PACT has been employed as a primary or adjuvant treatment for some cancers, e.g., skin, lung, esophagus, and thyroid cancers (Kim *et al.*, 2018).

COVID-19

During the most critical period of the pandemic (2020-2022), PACT was also investigated as a possible form of treatment. In this case, PACT was combined with photobiomodulation (PBMT), a technique that allows the reduction of oxidative stress through the interaction of light with biological tissues. Methylene blue-mediated PACT was evaluated in oral lesions caused by SARS-Cov-2, with laser application to the injured area. This allowed relief from painful symptoms and rapid healing in patients (Pacheco *et al.*, 2022).

SURFACE DECONTAMINATION

In addition to the treatment of infections in humans and animals, PACT also has applications in the decontamination of surfaces in hospitals, laboratories and other facilities whose disinfection is crucial to prevent the spread of pathogenic microorganisms. Applied to solid surfaces, water, and air,

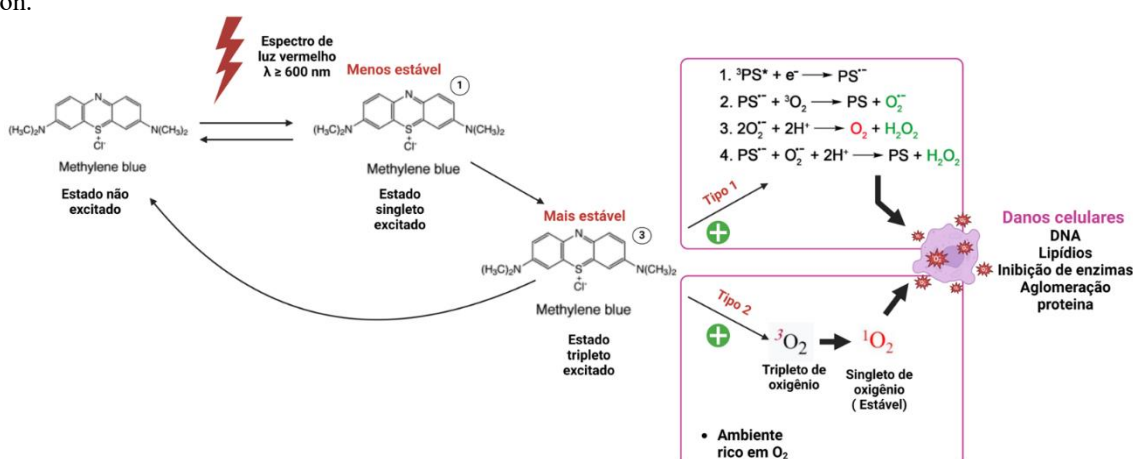
methylene blue-mediated PACT has been shown to be effective, safe, and low-cost (Almeida *et al.*, 2020).

PACT MECHANISM OF ACTION

PACT activity is based on the combination of a low toxicity photosensitizer and an appropriate wavelength of light, which in the presence of oxygen in the medium, is activated and generates reactive oxygen species. The phototoxic response produced causes damage to biomolecules and/or oxidation of cellular structures, leading to death (You; Li, 2017).

There are two types of mechanisms in PACT. In both types, the photosensitizers enter the single excited state (type I mechanism), but due to the atomic stability of the molecule, there may be conversion from the single excitation state to the triplet excitation state (type II mechanism). In the type I mechanism, hydrogen is abstracted with the production of free radicals and radical ions, which are highly reactive with molecular oxygen, generating reactive oxygen species, such as superoxide anions or hydroxyl radicals. As a result, oxidative damage is produced in the cells. In the type II mechanism, the reaction with molecular oxygen generates singlet oxygen, which, being extremely reactive, can interact with the cell and produce oxidative damage. The type II mechanism is more common, however, the type I mechanism is important under low oxygen concentrations (Carrera *et al.*, 2016). Figure 1 summarizes the process involving the two mechanisms.

Figure 1 – Mechanisms of formation of reactive oxygen species in Photodynamic Antimicrobial Chemotherapy. In the type I mechanism there is excitation formation in the single state, while in the type II mechanism there is singlet oxygen formation.

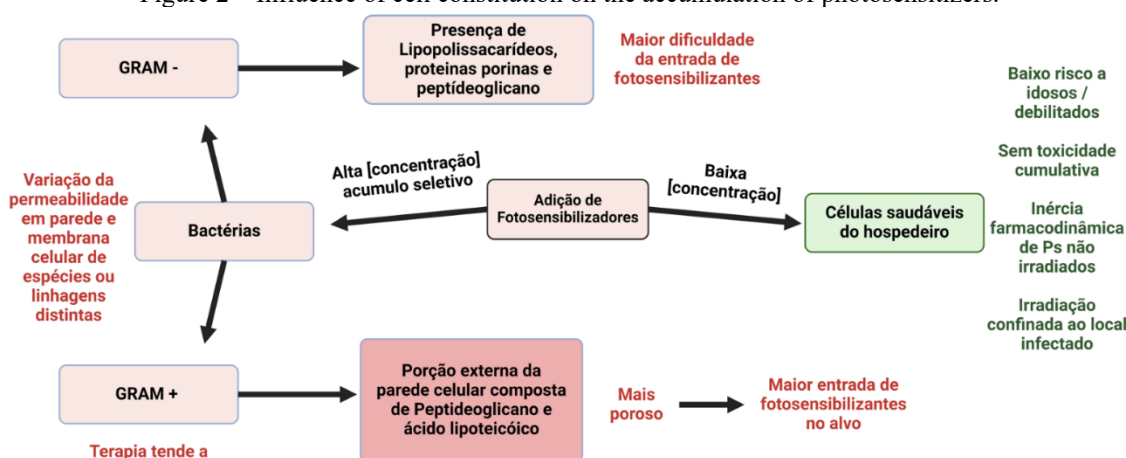


PACT is more effective at inactivating Gram-positive bacteria because the cell wall is thicker, composed of 90% peptidoglycan in addition to lipoteichoic acid. In addition, the porosity of the wall allows the passage and accumulation of the photosensitizer to the plasma membrane (Huang *et al.*, 2012). On the other hand, the morphology of Gram-negative bacteria hinders the penetration of the

photosensitizer. However, lipopolysaccharides, lipoproteins, and proteins with porin function end up being target molecules (Biyiklioglu *et al.*, 2019), as shown in Figure 2.

Different molecules present in microorganisms are targets of PACT. Reactive oxygen species can induce structural changes in nucleic acids, such as DNA-protein cross-linking and single or double-strand breaks, however, it is suggested that DNA damage may not be the main cause of cell death (Sabino *et al.* 2023).

Figure 2 – Influence of cell constitution on the accumulation of photosensitizers.



Source: authors

On the other hand, significant oxidative damage can be observed in lipids, causing lipid peroxidation and plasma membrane disruption (Hu *et al.*, 2018). This promotes increased permeability and loss of membrane integrity, resulting in death (Alves *et al.*, 2013). Proteins, on the other hand, can be oxidized, leading to the inhibition of enzyme systems, as well as agglutination of critical proteins (Oliveira Silva *et al.*, 2024). In this sense, PACT can also be effective against the formation of biofilm by the presence of polymers. However, biofilm is a more resistant structure and the different phenotypes found inside it hinder the action of reactive oxygen species (Melo *et al.*, 2013).

PHOTOSENSITIZERS

Regardless of the mechanism of action of PACT, its efficacy of PACT will depend on the interaction of the photosensitizer and the target cell. The most important factors involved in this interaction are photosensitizer concentration, as well as hydrophobicity and light absorption characteristics (Biyiklioglu *et al.*, 2019). On the other hand, of the target cell, the main factors are the morphology and cellular constituents (Figueiredo-Godoi *et al.* 2022).

New PACT models search for molecules with potential photosensitizing activity studies in the field of photodynamic therapy. In addition to the property of generating free radicals, the

photosensitizer needs to show extra activities such as antioxidant activity, recruitment of immune cells, and action in more than one apoptosis induction pathway (Polat; Kang, 2021).

NATURAL COMPOUNDS

There are two classes of photosensitizers. Natural ones have the advantage of being biodegradable and sustainable. In the search for these substances with varied bioactive profiles, there is a direction in the prospection of drugs of natural origin since they offer a safer and less toxic alternative compared to traditional synthetic photosensitizers. Chart 1 presents a selection of some photosensitizers of natural origin, highlighting their PACT applications in the fight against microorganisms. The summarized examples were chosen based on clinical studies, promoting potential entry into the future pharmaceutical market, with special attention to cancer chemotherapy.

Table 1 – Natural photosensitizers

Molecule	Fonte natural	λ_{max} nm	Activity	Reference
Curcumina	<i>C. Long</i>	405-547	<i>S. mutans</i> , <i>L. acidophilus</i> , <i>L. monocytogenes</i> , <i>Salmonella</i> sp., <i>P. gingivalis</i> , <i>A. actinomycetemcomitans</i> , <i>S. pyogenes</i> , <i>E. coli</i> , <i>Pseudomonas</i> sp., <i>A. baumannii</i> , <i>E. faecalis</i> , <i>C. albicans</i>	Silva, Vasconcelos (2021) Polat et al. (2021) Youf et al. (2021)
Ys. amniolyco	Endogenous amino acid	630	<i>B. cereus</i> (MDR), <i>E. faecalis</i> (MDR), <i>L. monocytogenes</i> , <i>S. aureus</i> (MDR e MRSA), <i>S. epidermis</i> (MDR), <i>S. faecalis</i> (MDR), <i>M. marinum</i> , <i>M. smegmatis</i> , <i>M. phlei</i> , <i>A. baumannii</i> (MDR), <i>A. hydrophilia</i> (MDR), <i>E. coli</i> (MDR), <i>H. pylori</i> , <i>P. acnes</i> , <i>P. aeruginosa</i> (MDR), <i>S. enterica</i>	Felicio et al. (2008) Harris et al. (2012) Shinoda et al. (2021) Youf et al. (2021)
Hypericin	<i>H. perforatum</i>	593	<i>S. aureus</i> , <i>E. coli</i> , <i>E. faecalis</i>	Kashef et al. (2013) Dong et al. (2020)
Ác. cynamine	<i>Cinnamomum</i> sp.	262-270	<i>E. coli</i>	Ferenc et al. (2010) Oliveira et al. (2021)
Ác. Gallic	Chestnut, plum, mango and grapes	320	<i>S. aureus</i> , <i>E. coli</i>	Dechsri et al. (2024)
Resveratrol	<i>Vitis</i> sp.	307-321	<i>S. aureus</i>	Zhang et al. (2019)
Ác. Ferulic	Rice, soybeans, apples, bananas and oranges	215-328	<i>E. coli</i>	Shirai; Automotive (2019)

Aloe-Emodin	<i>A. vera</i>	370-500	<i>A. baumannii</i> , <i>E. faecalis</i> , (MDR) <i>S. aureus</i> , <i>S. pneumoniae</i>	Wang et al. (2021) Otieno et al. (2021).
Quercetina	Onion, red wine, fruit	577	<i>E. coli</i> , <i>L. monocytogenes</i>	Lee et al. (2023)
Chrysanthemina	Rye and Peach Tree	550	<i>P. gingivalis</i>	Teerakapong et al. (2017)
Silibinina	<i>S. marianum</i>	550nm	<i>E. coli</i>	Lee; Lee (2017)
Polifenol do chá verde	<i>C. sinensis</i>	274	<i>S. aureus</i> (MDR), <i>E. coli</i> (MDR)	Hu et al. (2019)

MDR= Multi drug resistant/Multi resistant to antibiotics

Source: authors

SYNTHETIC COMPOUNDS

The synthetic compounds applied in PACT are classified as first to third generation, according to the structural modifications made to the molecule in order to optimize the properties, with a reduction in adverse effects (Kwiatkowski *et al*, 2018). First-generation photosensitizers today are more limited due to low chemical purity, poor tissue penetration, and hypersensitivity reactions (Gunaydin *et al*, 2021). In this context, second-generation patients are more selective (Zhang *et al.*, 2018) and third-generation carriers seek greater selectivity through carrier systems such as nanosystems (Mfouo-Tynga *et al*, 2021).

At PACT, in addition to natural bioactives, photosensitizers are classified into three more families, according to the origin and structure of the molecule. Thus, the molecules are classified as synthetic dyes, tetrapyrrole structures, and nanostructure systems (Ghorbani *et al*, 2018). Table 2 summarizes the main molecules.

The group of synthetic dyes is part of the class of first-generation photosensitizers studied using PACT. Because they have a cationic charge in their molecules, they exhibit a high affinity rate in the wall of Gram-negative and Gram-positive bacteria, making them still widely used (Abrahamse; Hamblin, 2016).

Table 2 – Synthetic photosensitizers

Family	classes	Activity	Reference
Tertrapirrol	Porphyryns, phthalocyanins	<i>P. acnes</i> , <i>P. gingivalis</i> , <i>Prevotella</i> sp., <i>A.</i> <i>actinomycetemcomitans</i> , <i>P. aeruginosa</i>	Chen et al. (2022) Abrahamize; Hamblin (2016)
Synthetic corantes	Phenotizines (methylene blue and derivatives, toluidine blue); Xanthenes (Rose Bengal, Fluorescein)	<i>S. aureus</i> MDR, <i>K.</i> <i>pneumoniae</i> MDR, <i>Candida</i> sp., SARS-CoV 2, <i>P. aeruginosa</i> , <i>N.</i> <i>keratitis</i>	Chakraborty et al (2024) Adre et al. (2022) Halili et al. (2016)
Third generation	Nanosystems with methylene blue, borodipyromethane nanoparticles,	<i>C. thracomatis</i> , <i>S.</i> <i>aureus</i> , <i>E. coli</i>	Qi et al. (2023) Wang et al. (2022)

MDR= Multi drug resistant/Multi resistant to antibiotics

Source: authors

Tetrapyrrole structures have the property of producing, for the most part, type II singlet oxygen, but the classes included in this group differ in relation to the region of light absorption. Phthalocyanines have an absorption band in the 670 nm region while porphyrins are active in the 400 nm up to 630 nm region (Kou *et al.*, 2017).

LIGHT SOURCES IN ANTIMICROBIAL PHOTODYNAMIC THERAPY (PACT)

The correct definition of the light source is crucial for the efficiency of the PACT as well as for the minimization of harmful effects. For this, some requirements are considered, namely: i) knowing the absorption spectrum of the chosen photosensitive molecule; ii) accurately assess the characteristics of the area to be treated; iii) establish the intensity of light necessary to activate the photosensitizer applied; iv) look for sources that emit light uniformly; and, v) consider the structural, financial and human resources issues of the place where the light source will be used. In this context, the main light sources used in PACT are LASER (*Light Amplification by Stimulated Emission of Radiation*), LED (*Light-Emitting Diode*) lamps and sunlight (Piksa *et al.*, 2023).

The LASER is the most widely used light source because it is considered more versatile, having been used since 1960. The structure of the LASER is made up of three main parts: the active medium, which can be solid, liquid or gaseous, and contains the electrons that are stimulated. The second part is the energy source, responsible for providing photons that stimulate the electrons of the active medium; and finally a pair of mirrors arranged on opposite sides, responsible for reflecting the photons released in the process, causing the system to be retrostimulated, allowing only a small percentage of the light to escape (Williams, 2008).

This results in a directed, monochromatic type of light, i.e., with a single wavelength and with high intensity, capable of exciting photosensitizers without affecting adjacent tissues or areas (Piksa *et al.*, 2023). The main types of LASERS used in PACT are argon ion, Nd:YAG (neodymium-

doped yttrium-aluminum-garnet), diode and metal vapor pumped dye lasers (Brancaleon; Moseley, 2002; Mang, 2004; Stájer *et al.*, 2020). The main disadvantage is the cost of acquisition and maintenance, followed by the small area of reach, however, it becomes advantageous in the application in Dentistry (Asnaashari; Safavi, 2013; Theodoro *et al.*, 2021; Rathod *et al.*, 2022, Wawrzyk *et al.*, 2021; Ying *et al.*, 2023).

LED lamps, on the other hand, overcome the limitations of using LASER. They were developed in 1962 and only in the 1990s did they begin to be applied in PACT (Opel *et al.*, 2015; Palucka, 2012). LED bulbs are produced with high-efficiency semiconductor materials that produce light when electricity passes through them (Jagdeo *et al.*, 2018). The centrality of an LED is the P-N junction, formed by a combination of two types of semiconductors: the P-type (positive) and the N-type (negative). The most commonly used materials are InGaN, AlGaInP, AlGaAs, and GaP; and the emission wavelength can vary from the ultraviolet to the infrared region, depending on the material (Brancaleon; Moseley, 2002; Prasad *et al.*, 2020).

In addition, LED technology is very effective, as electrical energy is transformed into light energy with low thermal energy production (Hasenleitner; Plaetzer, 2019). Because of this, LED lamps have high durability, intense brightness and, compared to other light sources, low cost (Pereira; Carvelli, 2018). In addition, LED irradiation is more appropriate for deeper lesions (Doix *et al.*, 2018).

Sunlight is most commonly used in disinfection (Amichai *et al.*, 2014). It has a wide spectral range ranging from ultraviolet to infrared, allowing the use of different photosensitizers, with ultraviolet being the one with the best results (Leanse *et al.*, 2023).tag. However, it can result in a therapy with a low degree of control, being less recommended, although it is applied for wound healing, reduction of microbial contamination, and disinfection of household items (String *et al.*, 2023).

As an alternative, systems that are less efficient than LED light sources and safer than sun exposure, other irradiation sources are proposed, such as tungsten filament, xenon arc, metal halide, sodium and fluorescent lamps. These fonts are low-cost and easy to handle compared to LASER. Another positive aspect is related to the use in large areas, without the need for coupling to fibers (Brancaleon; Moseley, 2002).

CONCLUSION

PACT presents itself as a good alternative to antimicrobial therapy, especially at a time when microbial resistance is a global threat and new strategies are mandatory in the fight against pathogens. Much of the photodynamic therapy is based on anti-cancer treatment and the optimization of molecules, as well as the search for natural bioactives in a context of sustainability, place PACT at



a potentially important level, whether in the treatment of infections or in the disinfection of surfaces, industrial, hospital and home environments.

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Cemeteries and the Environment: Analysis of a vertical cemetery in the Metropolitan Region of São Paulo

 <https://doi.org/10.56238/sevened2024.010-060>

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ABSTRACT

Due to the growing concern about the impacts caused by cemeteries, this study aims to present and analyze the characteristics of vertical cemeteries, through a case study conducted in a vertical cemetery located in the Metropolitan Region of São Paulo (MRSP). Information about the project was collected through a questionnaire conducted with the operations supervisor. The project was built in a Permanent Preservation Area. Since the cemetery was implemented prior to CONAMA Resolution 335 of 2003, it was exempted from the installation license. It is found that all by-products generated in the processes of human body decomposition are treated, not generating impacts on air, water, and soil; the waste generated in daily activities also receives proper disposal. It is noted that, despite the need for adjustments regarding space occupation, such as the restoration of riparian vegetation, the vertical cemetery presents itself as an excellent alternative to reduce the spaces allocated to graves, making much better use of the location, besides solving the problem of overcrowding in necropolises, it also generates fewer impacts on the environment, as the corpses are placed in drawers and thus do not come into contact with the soil, and there is no risk of the main contaminant, necrochorume, contaminating the soil and groundwater.

Keywords: Environmental impacts, Necrochorume contamination, Sustainability in cemeteries, Urban environmental planning.

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INTRODUCTION

The word cemetery, from the Greek *koimetérion*, "dormitory", from the Latin *coemeteriu*, meant the place where one sleeps. This meaning is explained by Greek mythology, according to which sleeping (losing knowledge or consciousness) is something decided by Hypnos, the Greek god of sleep who does not have the power to awaken. Hypno, according to the Greeks, was the twin brother of Thanatos, the god of death (Pacheco, 2012).

The interest in cemeteries is very old because they attract our attention by virtue of their symbolic relationship with death. It is not uncommon to see this fact in museums,

where quality pieces on display do not arouse the same interest of the visitor as the reconstruction of a grave or even the presentation of a mummy or a skull (Pacheco, 2012).

Cemeteries can be classified according to the form of burial and the type of construction, as follows:

- i)* Traditional cemeteries: these spaces are made up of semi-buried tombs, where the body is buried directly in the ground, which can generate environmental impacts on soil and water; In addition, the strong aesthetic appeal generates a high cost in the maintenance and construction of these buildings (Kemerich, *et al.*, 2014).
- (ii)* Park or garden cemeteries: these are cemeteries made up of drawers in the ground covered by lawns or trees, without buildings; burials are carried out by tomb and graves are identified by a small tombstone at ground level (Campos, 2007).
- (iii)* Vertical cemeteries: This typology consists of buildings with one or more floors, where the bodies are placed in tombs that are aerial locules and, therefore, without direct contact with the earth. These locules are constructed of reinforced concrete or other material such as fiberglass, arranged in columns and rows, similar to a bookcase. It avoids the contact of the deposits with the soil, in order to hinder the environmental contamination of the soil and the water table by the product of decomposition (Rocha; Assisi; Cortizo, 2017).

According to Saraiva (2011), the buried human body is subject to processes of degradation of matter, soon after death the bodies decompose, going through phases of tissue destruction by the action of bacteria and enzymes, resulting in their transformation into gases, liquids and salts.

According to Galli (2014) *apud* Carvalho (2019), the stages of decomposition of the corpse can be segregated into 4 stages: staining period, gaseous period, coliquative period, and skeletonization period (Chart 01).

Table 01 – Stages of the decomposition of the human body, second period and characteristic.

PERIOD	CHARACTERISTICS
Coloring Period	It usually starts from 18 to 24 hours after death and lasts approximately 10 days, a period that may be altered by weather conditions. It begins with a green spot in the abdomen, the color is justified by the presence of sulfomethaemoglobin (Galli, 2014 <i>apud</i> Campos, 2019).
Gaseous Period	It starts in the first week and lasts for approximately 30 days. The gases produced by putrefaction infiltrate the muscle tissue and modify the external shape of the body and the physiognomy (Galli, 2014 <i>apud</i> Campos, 2019).
Coliquative Period	It is the period of tissue reduction that begins at the end of the first month and can last 2 or 3 years. In this phase, disintegration occurs (Galli, 2014 <i>apud</i> Campos, 2019). and softening of the tissues, converting into a mass, semi-liquid, strong odor and dark, known as putrilage.
Skeletonization Period	At the end of the coliquative period, the putrilage dries up and becomes a powder, leaving the skeleton exposed, then the skeletonization period begins. The discovered bone skeleton can be preserved for a long time (Galli, 2014 <i>apud</i> Campos, 2019).

Source: Modified from Carvalho, 2019.

In the process of decomposition of the corpse, the necroleachate is released, according to Campos (2007), the necroleachate is a solution rich in mineral salts and degradable substances, aqueous, which is the result of the process of decomposition of bodies buried in cemeteries, as stated by Franco (2005). Its constitution is 60% water, 30% mineral salts and 10% organic substances, two of which are highly toxic to cadaverine and putrescine, which can also contain pathogenic microorganisms (Pacheco, 2012).

According to Pacheco and Matos (2005), cemeteries can be a source of environmental impacts. The inadequate location and operations of necropolises in urban areas can cause the contamination of water sources by microorganisms that proliferate in the process of decomposition of bodies. If the groundwater aquifer is contaminated in the internal area of the cemetery, this contamination can flow to nearby regions, increasing the risk of contamination of the water that will be captured through shallow wells, for example.

In this context, CONAMA Resolution No. 335/2003 (Brasil, 2003) provides for the environmental licensing of horizontal and vertical cemeteries, so that

establishes appropriate procedures and documentation for the licensing of these projects in a specific manner, covering several issues, such as: technical location with indication of accesses and road system (article 3, I, a); technical studies on groundwater levels (Article 3(I)(c)); studies of fauna, flora (Article 5, VI); minimal setbacks in burial areas in horizontal cemeteries (Article 5, IV); adoption of techniques that enable gas exchange for adequate decomposition of bodies in horizontal cemeteries (Article 5, III); environmentally appropriate treatment for any gaseous effluents in vertical cemeteries, etc.

CONAMA Resolution No. 368 of 2006 also provides for prohibitions on the installation of cemeteries in Permanent Preservation Areas (PPAs) or in other areas that require deforestation of primary and secondary Atlantic Forest:

(...) in a medium or advanced stage of regeneration, in predominantly karst terrains, which have caves, sinkholes or underground rivers, as well as in those whose use is restricted by current legislation, except for the legal exceptions provided for (Brasil, 2006).

Subsequently, CONAMA Resolution No. 368, of March 28, 2006, modified, in Resolution No. 335/2003, the article that prohibited the construction of cemeteries in areas of water source for human supply, in order to allow the municipalities inserted in these areas, and without space for the implementation of new cemeteries, to build their new Necropolises there. These must meet items to ensure that there will be no contamination of the preservation area (Pacheco, 2012).

In order to mitigate environmental impacts, vertical cemeteries appear as a promising option since there is control of the by-products generated in the decomposition of the human body.

Thus, this research aims to present and analyze the characteristics of vertical cemeteries, through a case study in a vertical cemetery located in the Metropolitan Region of São Paulo (RMSP), in which the techniques used and the identification of compliance with the current legislation are pointed out.

METHODOLOGY

For the development of the research, fieldwork was carried out in a cemetery unit. In order to preserve the identity of the enterprise, the cemetery was named with a fictitious name "Alpha".

CHARACTERIZATION OF THE STUDY AREA

Alpha Cemetery is a private enterprise and is located in the Metropolitan Region of São Paulo (RMSP); Construction began in 1997 and was completed in 1998. The cemetery has a total area of 14,776 m², and 4,342 m² of built area and approved by the Fire Department Inspection Report (AVCB). According to the manager, the project has 5 floors and has 3,800 tombs, of which 176 are intended for the remains and currently the estimated occupancy is 2,900. There are 19 employees working on site.

Regarding prices, a locule in this vertical cemetery can cost from six to nine thousand reais.

Part of the project area is part of a Permanent Preservation Area (next to the watercourse); around there is the presence of irregular occupations and the region has shops and residences, being a mixed zone according to the Municipal Master Plan (Guarulhos, 2019).

TECHNICAL AND OPERATIONAL PROCEDURES

The characterization and location of the area was carried out with the help of the geospatial data system made available by the city of Guarulhos – GuarugEO (Guarulhos, 2024), the platform allowed the download of cartographic bases as well as the characterization of land use and occupation and urban zoning.

The cartographic bases obtained from GuarUGeo (2024) and *Google Maps* (Google, 2024) were processed with the aid of the QGIS software (QGIS, 2024), generating a location map of the area.

In order to identify the burial and handling practices employed in the enterprise, on-site visits and interviews with the operations supervisor were conducted.

The questionnaire used (Chart 02) was structured according to CONAMA Resolution 335/2003 (Brasil, 2003). The answers were documented using handwritten notes.

Table 02 – Environmental questionnaire applied to the vertical cemetery.

No.	QUESTIONS
1	Which year of Inauguration?
2	What is the area of the development and the area occupied?
3	How many employees work in the venture?
4	Is the operating license up to date?
5	Is there any kind of environmental compensation?
6	Is there a need for waterproofing of the tomb? If so, how is it carried out?
7	What method or destination is used for the disposal of common solid waste?
8	What method or destination is used for the disposal of Liquid Waste (necroleachate)? Is it collected and treated inside or outside the cemetery?
9	Is there gas collection and treatment? How is it carried out?
10	After exhumation, are the bones cremated or do they go to the ossuary?

Source: Prepared by the authors.

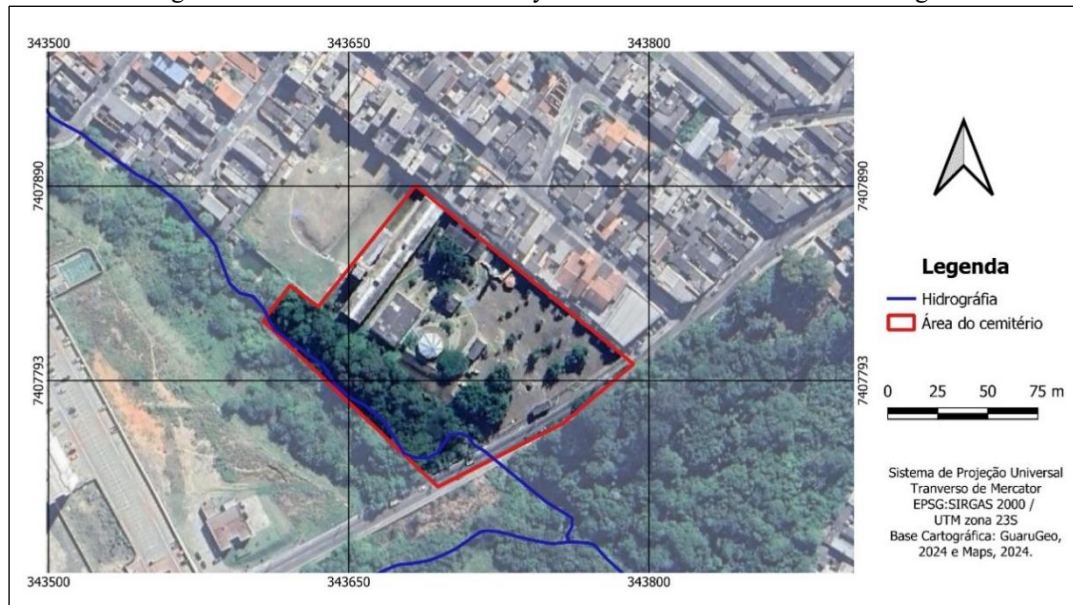
The answers obtained through the interview are presented in the form of discursive text in the results and discussion section.

RESULTS AND DISCUSSION

The Alpha project is privately owned and located in an area of high population density in the Metropolitan Region of São Paulo (Figure 01). It appears that the project was exempt from the installation license and the operating license is in the process of being regularized.

Parts of its facilities are part of a Permanent Preservation Area (APP) of a 1st order stream according to Strahler's hierarchical fluvial classification, a factor that indicates that this channel does not have any tributaries. It should be noted that according to Article 3 II of Federal Law 12.651/12 (Brasil, 20212), the Permanent Preservation Area is a protected area, covered or not by native vegetation, with the environmental function of preserving water resources, landscape, geological stability and biodiversity, facilitating the gene flow of fauna and flora, protecting the soil and ensuring the well-being of human populations. It is still possible to observe the presence of green area in the surroundings of the development, as well as signs of degradation and a very urbanized environment.

Figure 01 – Delimitation of the study area and its immediate surroundings.



Source: Prepared by the authors.

It should be noted that the areas that include the parking lot, the bathroom of the wake room and a wall of the cemetery are in the PPA area, as shown in Figure 02. It should be noted that the parking floor is interlocked, a factor that allows greater infiltration of rainwater; according to studies carried out by Benitez (2021) in which the infiltration capacity of pavements with interlocking floors in parking lots was analyzed, medium and low permeability degrees were identified, which can be compared to natural materials such as gravel sand, clean sand and fine sand, sand, dirty sand and sandy silt, presenting itself as an effective measure with regard to rainwater infiltration, contributing to less surface runoff and reduction of flooding intensity.

The entrance to the development has flowerbeds with permeable and landscaped areas and the parking lot, followed by the building with 5 floors, where the burials take place (Figure 03).

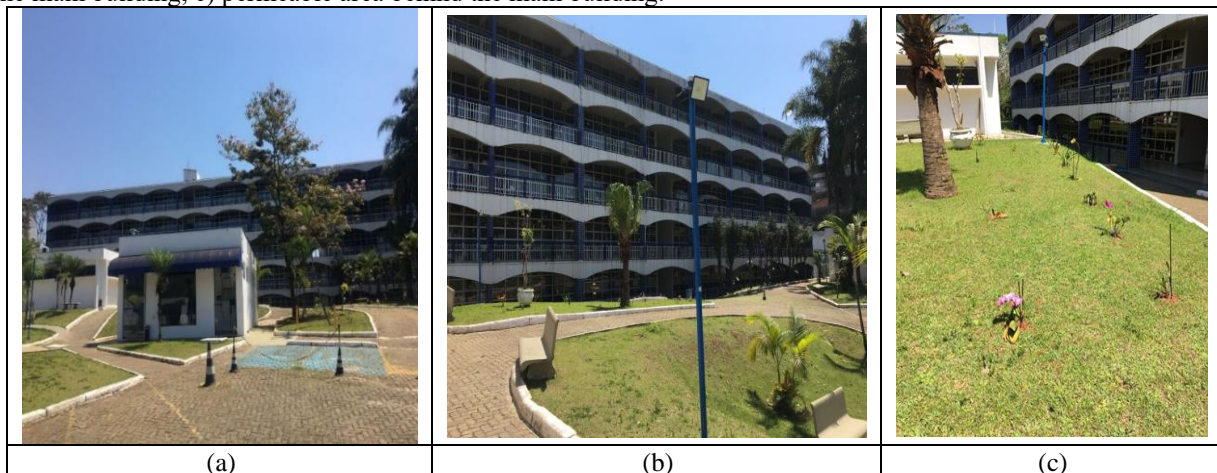
As for the burial, as it is a vertical cemetery, the grave is not in contact with the soil and does not harm the environment, so the necroleachate does not present a risk of crossing into the lower layers of the soil and subsoil and causing contamination. This type of burial is not very common, by way of comparison in the city of São Paulo, there are 22 traditional cemeteries and 4 vertical cemeteries. It is noted that vertical cemeteries present a new concept on the subject.

Figure 02 – Partial view of the parking lot of the Alpha development in the vicinity of the APP. a) emphasis on the end of the parking lot near the watercourse; b) highlight the other points of the parking area.



Source: Prepared by the authors.

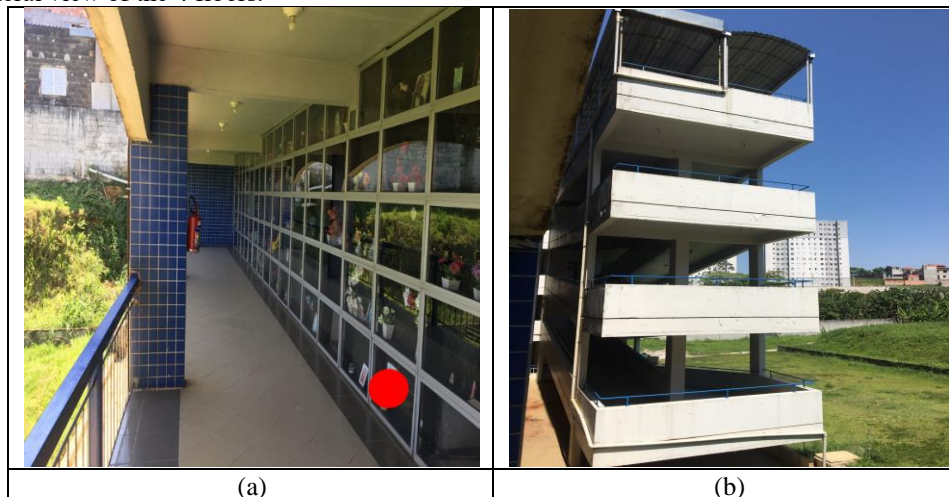
Figure 03 – Partial view of the entrance to the Alpha project. a) view of the entrance and parking guardhouse; and b) view of the main building; c) permeable area behind the main building.



Source: Prepared by the authors.

In the Alpha project, burials are carried out in drawers/vaults, associated with the building, which has a ground floor and four upper floors (Figure 04).

Figure 04 – View of the building of the Alpha development where the burials take place: a) Tombs – highlighted in red a unit, and b) general view of the 4 floors.

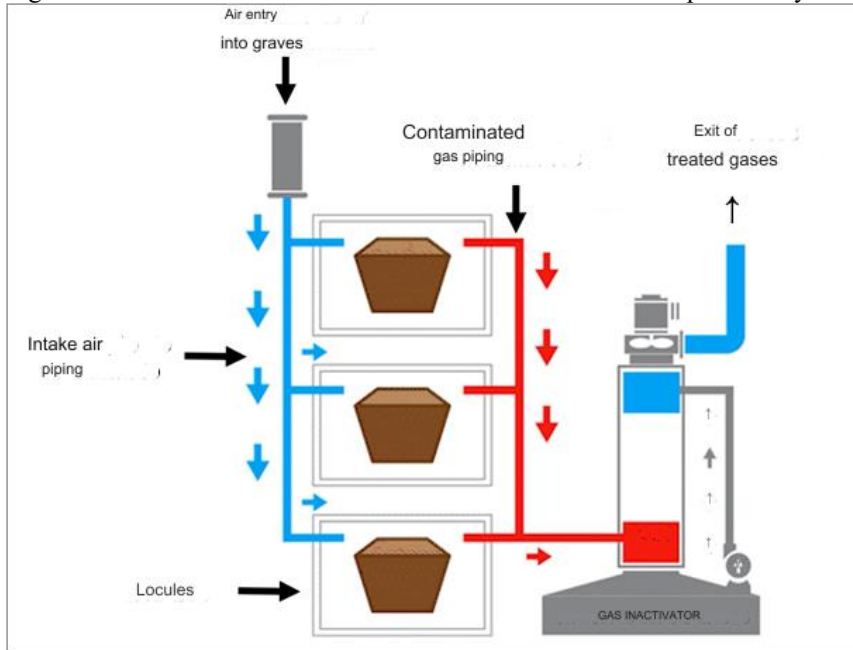


Source: Prepared by the authors.

The pollutants generated in cemeteries are associated with the anaerobic decomposition of matter, which results in gases and liquids (necroleachate). For the Alpha project, the technology employed presents a process based on the dehydration and evaporation of the necroleachate as soon as it is generated, obtaining a natural body decomposition system, predominantly aerobic.

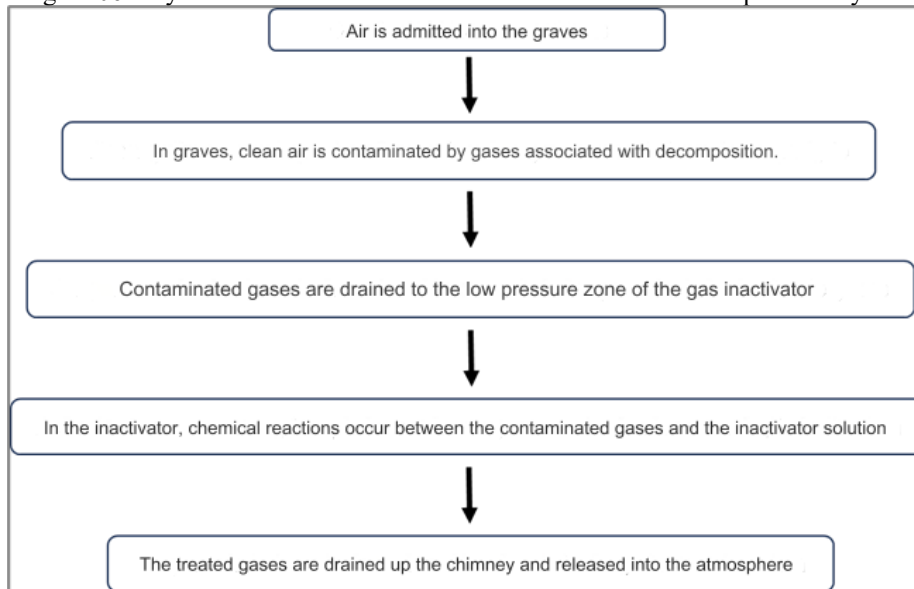
The burial system was implemented by the company VALFER Tecnologia, which presents a technique of Aerobic Assisted Decomposition at Low Pressure. In this system, three factors come together, exothermic decomposition, the negative pressure created inside the locules, and the presence of oxygen, which allow a faster evaporation of the necroleachate, enabling the acceleration of the decomposition process, which on average in the traditional system lasts 2 to 3 years and in this system takes 8 months (VALFER Tecnologia, 2024). The gases and vapors generated in this process are conducted to a device called Gas Inactivator, where Carbon Dioxide (CO₂) and hydrogen sulfide gas (H₂S) are transformed respectively into odorless and non-contaminating sodium carbide and sodium sulfide, figure 05 exemplifies the operation of the gas inhaler (VALFER Tecnologia, 2024) (Figure 05 and 06).

Figure 05: Sketch of the Low Pressure Assisted Aerobic Decomposition System.



Source: Adapted from Valfer Tecnologia, 2024.

Figure 06 – Synthesis of the Low Pressure Assisted Aerobic Decomposition System



Source: Adapted from Valfer Tecnologia, 2024.

As for the solid waste generated in the project, it occurs as follows: the waste is separated and properly packaged inside the project (Figure 07) according to the type of waste; After exhumation, waste such as coffins and clothes is collected and disposed of by a partner company, which sends the contaminated waste to a landfill. Class II-A and II-B waste (ABNT, 2004), such as wood, bricks, mortars, paper, plastics, metals, glass, if not contaminated, are sent for recycling.

Figure 07 - Partial view of the primary packaging of recyclable solid waste in the Alpha project.



Source: Prepared by the authors.

FINAL THOUGHTS

By analyzing the Alpha cemetery, it is verified that it has an efficient system of burial, collection and treatment of by-products associated with the decomposition of the human body, presenting itself as an environmentally appropriate alternative for the disposal of the human body.

The project also has a Solid Waste Management Plan, which includes common and hazardous waste.

Due to the current decomposition and treatment system, the main environmental impacts of the area consist of the generation of gases (which do not cause damage because they are treated correctly), and the physical allocation of the project, which is located on the water banks.

Thus, it is suggested the recovery of the riparian forest in the areas of the project as a form of environmental compensation and improvement of the physical and ecological stability of the area. Subsequently, the recovery of the riparian forest can be used as publicity for the area, which in addition to following an environmentally appropriate burial technique, also has a proactive stance towards environmental issues.

In short, vertical cemeteries are excellent solutions for burial, when compared to traditional techniques, because they occupy smaller physical spaces and have efficient treatment systems, but the system must be periodically monitored to ensure its efficiency.

Another way to minimize the impacts generated is the restoration of riparian forest to ensure the protection of water resources.

It is believed that the main contribution of this research lies in the systematic presentation of the burial processes and destination of by-products in a vertical cemetery.

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The influence of the leader in the formation of a high-performance team: A literature review

 <https://doi.org/10.56238/sevened2024.010-061>

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ABSTRACT

The objective was to know the main theoretical concepts about high performance teams and to analyze the role of the leader as a builder and performance evaluator. It is based on the bibliographic method, it will show that, although the relevance of the leader is indisputable, there is no one leadership model that is so much more efficient than another, but rather, that the effectiveness of the leader's style depends on the stimulus used, the situation presented, with which team profiles and in which environment. Due to business competitiveness, the formation of high-performance teams and a leader capable of developing it gains prominence on the global scene, in this way, it is essential to understand the advantages that these teams can provide to the organization, the leader and team are essential to increase productivity, however, it is necessary that its members are committed to the goals, have a synergistic relationship and jointly apply their skills.

Keywords: Institutional Management Teams, Task Analysis and Performance, Leadership, Applied Behavior Analysis, Emotional Intelligence.

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INTRODUCTION

Leadership is the art of commanding people, attracting followers and positively influencing mindsets and behaviors. Leadership can come naturally, when a person excels in the role of leader, without necessarily holding a leadership position. It's a kind of informal leadership. When a leader is elected by an organization and assumes a position of authority, he or she exercises formal leadership.

A great quality of an effective leader is knowing how to earn the respect of the team through influence, not by his position, but by the sensitivity of what is appropriate and ethical, by his example. The leadership style according to which everyone is treated appropriately always creates a sense of security. This is extremely constructive and a big factor in workplace satisfaction.

Leaders tend to be highly respected by their employees, and respect is much more effective than fear. The leader seeks not only results, but the best way for him and the team to achieve them, since he does not think of power as something centralized, but as an authority that must be divided. The success of a team depends, to a large extent, on the good work of its manager, because the team will only have good results if the leader knows how to lead his subordinates correctly. The manager who aims to obtain a successful leadership needs to know closely the needs, the degree of interest and desires of each employee. As motivation is individual, the manager must know how to mobilize the team. There are countless skills that managers must develop to keep their employees satisfied and engaged in the organization. Ethical attitudes, respect and loyalty are essential elements that must prevail in the professional environment. The leader must be aware that he is in a leadership position not to be served, but to serve as an example and inspiration to his subordinates.

The relationship between the development of leaders and the future of companies is closely related and the competition for these talents has intensified in recent years, especially for profiles with a wide variety of skills. Given this scenario, the importance of the leader's role within organizations is evident, as well as its relevance in the development of high-performance teams in the face of the complex challenges of today's business.

According to Robbins studies, teams represent a current tool that is compatible with the current organizational needs of serving increasingly fickle and demanding customers, in the face of the current and competitive business scenario^{1,2}.

Considering teams as the basis of structural changes in organizations and the indications that teamwork has become a constant and a reality in companies, the present study aims to know the main theoretical concepts about high performance teams and the role of the leader as a builder and evaluator of performance and in specificity to analyze the actions that have been created by leaders to form a high performance team performance.

Leading teams to achieve better performance is no easy task, even when the best individual talent can be assembled. Nevertheless, employment has shifted the focus from individual work in a specific position to collective work³.

According to the study, the scenario is one of change and companies are seeking, in the most flexible structures, subsidies to reach competitive levels⁴.

METHODOLOGY

In order to obtain scientific knowledge, it is necessary to know the mental constructions that make it possible to achieve the desired goals.

The methodology used is the bibliographic review, because theoretical references published in books and other documents such as articles on the subject were used. Books, scientific articles, including literature reviews, theses and dissertations were used⁵.

The temporal delimitation is the period in which the phenomenon to be studied will be circumscribed. We can define the performance of the research by situating our object in the present time, or go back in time, seeking to highlight the historical series of a given phenomenon⁶.

The instrument included the following data: journal of publication, authors, and year of publication. The selection was based on the similarity of the subjects to the objective of this study, disregarding those that, despite being revealed in the search results, did not address the subject and do not match the scope of the research.

RESULTS

High-performing teams are those that push traditional boundaries for the results achieved. Its members have high expectations and, therefore, it works as motivating stimuli for high performance. They strive for extremely high standards of performance, and as such their members need to have competencies, skills, and attitudes that match the team's purposes. Environmental conditions and the absence of many resources can affect performance, but a high-performance team overcomes all environmental difficulties⁷.

Personal and professional experiences play a fundamental role in people's maturity, as they actively interact with each person's ability to assume responsibilities and act in the establishment of new behaviors. As people change their behavior, they adapt to other new behaviors, transforming themselves and interacting with the productive environment.

Thus, the groups can be classified according to their mode of functioning and qualified according to the degree of maturity of the group^{8,9}. Pseudo-team: This type of group can define a job to be done, but it does not care about collective performance, nor does it try to achieve it. Member interactions inhibit individual performance, without producing any appreciable collective gain;



Working group: The members of this group don't see any reason to become a team. They may share information with each other, but responsibilities and goals, for example, belong to each individual; Potential team: this group wants to produce a joint work. However, members need clarification and guidance on their purpose and objectives; Real team: A real team is made up of a few people, but with complementary skills and committed to each other through a common mission and goals. Members come to trust each other; High-performance team: this group meets all the conditions of a real team and has a deep commitment among its members in order to achieve personal growth.

According to studies, there is a contextualization that the interaction of people in teams can become a very important competitive differential in the business environment. For teams, they are fundamental pieces for business performance in the face of a scenario of profound changes, that is, teams, their performance, can be used as a response to changes^{1,2,9}.

In the organizational context, teamwork is of paramount importance, as each individual contributes with his or her ability to achieve a common goal. According to the study, a team is defined as: a small number of people with complementary skills who are committed to a common goal for which they consider themselves mutually responsible¹⁰.

Teamwork makes it possible to achieve better results, because the union of all members in favor of a goal is essential, ideas can be shared and developed, there is collaboration and cooperation from all.

Teamwork is extremely important for organizations, because through this model it is possible to reach the expected results more quickly, therefore, according to what studies show, nothing significant was achieved by an individual acting alone, in other words, great feats in history were achieved thanks to teamwork¹¹.

The differential of the entire team is the way its members relate to each other, reinforcing the team spirit, but it is necessary to pay the price to achieve it and which presents four items that winning teams pay to reach the level of high performance: Sacrifice; Compromise; Personal development; Self-denial¹¹.

Organizations are currently looking for teams with a competitive advantage evidenced by their high performance, and that in this way the results can be achieved in an effective and agile way, the high performance teams according to studies conceptualize as being: High performance teams are those composed of members whose skills, attitudes and competencies allow them to achieve the team's goals. In high-performing teams, team members set goals, make decisions, communicate, manage conflict, and solve problems in an atmosphere of encouragement and confidence to achieve their own goals. In addition, the members of this team are aware of their own strengths and weaknesses and have the ability to change when necessary to improve the group's performance¹².



According to a study, high-performance teams promote competitive advantage and add value to the organization's production chain, performance is a consequence of maximizing the potential of each team member, and the skills and ability to adapt to the environment in which they are inserted¹³.

Before talking about high-performance leadership, it is necessary to remember and establish basic concepts and certain differences between leadership, coaching, and management. Leadership is linked to the future, to calling people to make this future real, it has to do with team spirit. The purpose of coaching is to help people by promoting enthusiasm for the execution of goals. Finally, management dialogues with the coordination of resources and people for the performance of specific goals for short, medium and long-term achievements.

To achieve high-performance leadership, it is necessary to perform an integrated action with these three competencies: leadership, coaching, and management. It is very common to find business managers who are skilled in management. However, only this isolated skill can be viewed negatively, creating a distance between employees. The professional may show intimidation, coldness and arrogance, excessive ambition and even an inability to think strategically or delegate and work in a team.

Acting in this way can lower productivity, demotivating the team. To obtain high performance, the appropriate behavior, it is necessary to channel some steps, namely: moments of fun in the work environment, giving the chance to the team members to make frequent choices, giving constructive feedback, promoting performance growth challenges and encouraging the team members to set personal goals.

The role of the leader is essential for the team to develop and achieve high performance, if the results are not continuously evaluated, the team will not know what stage it is at or the measures to improve its performance. The leader allows the growth and development of the team, instigates conflict resolution, cooperation, complementarity of knowledge, skills and attitudes that come from its members, contributing to these teams being effective and becoming a competitive differential for the organization.

To understand the role of the leader in building and developing high-performance teams and, consequently, the success of an organization, it is important to know leadership styles. The discussion about leadership and the types of leaders today arose from the need to understand these models and their importance in organizations. However, as important as knowing the profile of the leader, is to understand the level of development of his subordinates. To do so, it is necessary to understand how the level of emotional intelligence of a team members can influence the construction of teams with high or low performance.



In the current context, defining leadership is not an easy task, there are several conceptualizations, each built from different points of view, however, it has always been linked to the ability to influence, communication, integrity, service and vision.

According to the study, leadership is summarized as the process of exerting influence. Thus, leadership is the ability to influence people to work enthusiastically to achieve identified goals for the common good. This concept goes beyond the leader's role in achieving results through teamwork, but addresses the leader's ability to influence to achieve the goals desired by the group, the skill refers to a person's strength, and it is developed over the years, being responsible for the leader's experience, But the most important thing is how the process of influencing leadership takes place. It is through communication that the leader influences to achieve organizational goals, nothing happens without communication, without dialogue. Communication is the link to understanding, whether expressed verbally or synesthetically^{11,14}.

From the moment there is a rapport between the leader and the subordinates, the leader has enough influence to propose a greater goal, the vision, which is focused on a better future. From time immemorial there has been a need for a person who would guide, show the way, make the right decisions and work hard.

Therefore, organizations need to adopt a team model focused on performance and a leader capable of guiding these teams towards high performance, achieving greater productivity and profitability through these resources.

Faced with this scenario, the challenge for the leader is to be permanently aware of these variations. Diagnosing them accurately is a necessary condition to reconcile leadership styles with the levels of development of those led. Leadership is present in all times and situations, whether in personal or organizational life. In the book *The Monk and the Executive*, leadership is "the ability to influence people to work enthusiastically to achieve goals identified as being for the common good"¹⁴.

DISCUSSION

The results of this case study allowed us to identify the influences of maturity on the performance of teams in the production environment. The relationship is characterized in such a way that, if the teams, within an evolutionary sequence of functioning, increase their maturity, they tend to positively influence the productive environment in which they are inserted and improve their work performance.

As the maturity of the team increases, through commitment and trust among its members, group participants tend to pay attention to how it works and, as studies point out, can transform a



group into a team. Maturity is a determining and incisive factor in the performance of teams in the productive environment, as it influences the work and, consequently, the organization's results².

A basic task of leadership is to drive attention. Leaders tell us where to focus our energies, but they also need to manage their own attention. I also identified that, for a team to become high performance, you need a leader with some characteristics, they are: self-awareness, self-management, empathy and social skills.

CONCLUSION

High-performance teams promote competitive advantage and add value to the organization's production chain, performance is a consequence of maximizing the potential of each team member, and the skills and ability to adapt to the environment in which they operate. The role of the leader is essential for the team to develop and achieve high performance, if the results are not continuously evaluated, the team will not know what stage it is at or the measures to improve its performance.

The leader allows the growth and development of the team, and instigates conflict resolution, cooperation, complementarity of knowledge, skills and attitudes that come from its members, contributing to these teams being effective and becoming a competitive differential for the organization.

This work showed that each leadership style has its peculiarities, advantages and disadvantages. The leader will be able to use all leadership styles, according to the need, the task and the people. It is up to each good leader to know how to balance these practices and when to apply them. There is no ideal, single, and definitive style of leading. The best style that the leader should adopt, with a person or a group, is the one that best fits the level of development of the people he wants to influence. Good leadership is always noticed by followers, if they are motivated and achieve the intended goals, this demonstrates that there is a good leader guiding the group.

The leader must reconcile the interests of the organization with those of the work team, aiming at a favorable environment for development. Therefore, regardless of your own style, being a leader implies knowing how to exercise leadership and this is done on a daily basis, together with the work team. Thus, knowing how to live harmoniously, tolerantly seeking balance becomes one of the first steps for those who want to be a true leader. If a leader treats all his subordinates the same, he is not coherent. A leader must know his people and the maturity of each one, to know how to treat each of his employees.

It can be said that leadership is linked to the way the leader performs his functions in front of his team. Respect for the individual, this is the primary dimension of leadership. Treat everyone with respect, noticing individual differences. Even the most unpleasant measures can and should be done with respect.



The leader is the complete opposite of the boss, he can turn boring activities into pleasurable ones. He leads his team lightly, his command is clear and objective, he is fully aware that he is not in this position to boast or to compete for his knowledge with his subordinates. It gives confidence to your team, that is, team members feel free to ask, not to understand, to dare, because they know they won't be ridiculed.

The effectiveness in the result of the leader's style depends on the situation in which it is used, it is known that any of the basic styles can be effective or ineffective, depending on the situation or the impact on the environment. It is the interaction of a certain style with the environment that produces the degree of effectiveness or ineffectiveness. We can conceive, then, that the leader's style is a particular stimulus, and the response to that stimulus is what can bring about superior reach and results.

The high-performance leader is a leader in communication, he is aware of the process of discourse and can, through this bridge, encourage, understand and guide his subordinates for the common good of the team, and of each individual individually. It is important to emphasize that this performance is directly linked to the concern with the uninterrupted growth of the company, the team and each person led, in a sincere and genuine way. And the success of this path is only achieved through clear, objective and fluid communication.


One of the most appreciated attitudes in teams that achieve very high performances is the commitment to the result. High Performance Professionals commit to performing their tasks with the feeling that the overall result is their responsibility and seeks to captivate teamwork within the company, as they believe that the dedication of time and energy of the team ensures that the result will be achieved. He also makes his skills, competencies and resources available for the development of the team.



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ATLAS.ti® in qualitative research: Expanding horizons in oral history analysis

 <https://doi.org/10.56238/sevened2024.010-062>

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ABSTRACT

This article aims to explore the importance of the ATLAS.ti® software as an essential tool in the field of qualitative research, specifically in oral history studies focused on thematic analysis. The functionality of ATLAS.ti® in the collection, organization and analysis of qualitative data is highlighted, illustrating its effectiveness through a practical case. The focus is on the way in which software contributes significantly to the preservation of the integrity of narrative data and the promotion of the generation of scientific knowledge. The methodology used for the collection and analysis of personal narratives is strongly based on the use of ATLAS.ti®, which is aligned with the Oral History techniques of Holanda and Meihy (2015). This software not only simplifies the organization and categorization of data through the coding of themes as per Braun and Clarke (2006), but also improves the analysis of interviews with detailed accuracy. It enables the creation and synchronization of networks of codes, improving the visualization of connections between themes and aiding in the discovery of important insights and connections. In addition, its functionalities include linguistic analysis and the synchronization of textual transcriptions with audiovisual files, enriching the research with paralinguistic nuances. Despite an initial learning curve, ATLAS.ti®'s capabilities are essential for systematic and detailed qualitative research, evidenced by preliminary results that highlight its effectiveness in capturing deep connections and the importance of collaboration with skilled research assistants to maximize the benefits of the software.

Keywords: ATLAS.ti, Qualitative research, Oral history, Thematic analysis, Education, Software.

¹ Article presented to the Graduate Program in Education of the Center for Human Sciences and Education – FAED, of the State University of Santa Catarina – UDESC, as a partial requirement to obtain the title of Master in Education. Line of research: Curriculum, Difference and Inclusive Education.

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INTRODUCTION

In the realm of modern scientific research, qualitative research rises as a fundamental paradigm in the exploration of complexities inherent in social, cultural and human phenomena. This type of research, characterized by its interpretative and contextual depth, requires methodologies that transcend simple data collection, demanding meticulous procedures of organization, detailed analysis and rigorous interpretation. The emergence of technological advances, particularly in the development of specialized software, has represented a significant milestone, providing researchers with tools that amplify the precision and analytical depth of qualitative studies.

Within this evolving technological landscape, ATLAS.ti® stands out as preeminent software for researchers seeking a sophisticated tool for the manipulation of non-numerical qualitative data. This application offers a range of features designed to optimize processes of encoding, querying, retrieving and analyzing vast volumes of data, whether textual, graphic, auditory or visual. ATLAS.ti®'s ability to adapt and integrate with various investigative methodologies consolidates it as an indispensable resource in the set of methodological tools of the contemporary researcher.

Thus, this article aims to explore the importance of the ATLAS.ti® software as an essential tool in the field of qualitative research, specifically in oral history studies focused on thematic analysis. Through a case study, it is intended to illustrate the functionalities and advantages of the software in the treatment of highly complex qualitative information. The synergy between the technological tool and the methodological strategy is examined, highlighting how the use of ATLAS.ti® can enrich the research process and contribute to the elaboration of deep conclusions and consistent results.

The research is developed on the collection of personal narratives, based on oral history according to authors such as Holanda and Meihy (2015), Thompson (2002) and Portelli (2012), which are submitted to a thematic analysis following the techniques proposed by Braun and Clarke (2006), assisted by software, allowing the identification of patterns, themes and emerging categories essential for the understanding of the meanings and perspectives of the participants. Through ATLAS.ti®'s networking functionality, connections are established between the identified themes, facilitating the visualization of the conceptual structure underlying the data.

The study emphasizes the importance of ATLAS.ti® in preserving the integrity of qualitative data, ensuring the faithful representation of participants' voices throughout the investigative process. In addition, the potential of the dialogue between researcher and software to promote a critical reflection and a deeper analysis of the collected data is discussed, culminating in the generation of high quality scientific knowledge.

THE SOFTWARE ATLAS.TI®

Originating in Germany in the late 1980s, ATLAS.ti® was conceived and developed by Thomas Muhr at the Technical University of Berlin in response to the growing need to analyze large volumes of qualitative textual data efficiently. This need arose due to the limitations of the manual methods of coding and analysis existing at the time, which proved to be insufficient for the treatment of complex and voluminous data.

Initially, ATLAS.ti® was proposed as a solution to facilitate the organization, coding, and extensive exploration of large text corpora. However, during the 1990s and early 2000s, the software underwent a significant expansion in its scope. The development team has enriched ATLAS.ti® with functionalities that encompass the analysis of multimedia data, marking a crucial evolution that has made it possible to include audio, video and graphic elements as analyzable materials, in parallel with traditional texts. This innovation has allowed researchers from a variety of disciplines to access and analyze a broader spectrum of data sources.

Qualitative research methodologies have experienced a direct and significant impact with the introduction and evolution of ATLAS.ti®. This software has established itself as an indispensable tool for conducting in-depth and multifaceted qualitative analyses, demonstrating particular effectiveness in methodologies such as Grounded Theory, content analysis, discourse analysis, and thematic analysis. The use of ATLAS.ti® in qualitative research has redefined the possibilities of interpreting and understanding data, significantly enriching the analytical landscape.

Notwithstanding its wide range of functionalities and notable contributions to the field of qualitative research, ATLAS.ti® presents challenges, such as a steep learning curve and potential technological dependence on the part of researchers. In some cases, the need to recruit research assistants to handle the software efficiently reflects that, despite its power, mastering its use can require a considerable investment of time and dedication.

Today, ATLAS.ti® aligns with the digitization trends of qualitative research, offering support for cloud computing functionalities, team collaboration, and integration with other digital tools. This support extends to the ability to capture and analyze data from social media platforms and the management of theoretical references, positioning the software as a contemporary solution adaptable to the dynamic demands of qualitative research in an increasingly interconnected era.

The ATLAS.ti® software allows the improvement and refinement of the emerging research themes. The researcher, by using this tool, is able to carry out a careful review of the previously identified codes and themes, thus operationalizing a process of restructuring and redefinition that is necessary to ensure that the proposed themes are in line with the data collected and with the objectives of the study.

In addition, ATLAS.ti® offers resources for the registration and organization of the researcher's analytical reasoning. The use of memos and annotations proves to be a prominent feature, as it enables the documentation of impressions, methodological decisions and critical reflections on the progress of the work. This practice contributes to the transparency and traceability of the analysis process, which are fundamental for the credibility of the results obtained.

In addition, ATLAS.ti® has mechanisms for the safe and efficient storage of the project file, which encapsulates all the collected material. The possibility of cloud storage is especially relevant, not only because of the security and ease of access it provides, but also because it makes it easier to share the research data with other analyzers. This feature of the software is particularly important for studies that require validation and peer review, ensuring that the analysis process can be independently reviewed and validated, which is a crucial aspect for the validity of scientific research.

In the context of qualitative data analysis, the ATLAS.ti® software stands out for its graphical visualization of data, allowing the researcher to explore the interrelationships between different themes and emerging concepts. Through networks and diagrams, it provides an elucidative view of the collected narratives, with visual representations that can be adjusted and customizable according to the needs of each study. This adaptability is crucial for discerning patterns, trends, and connections that might otherwise go unnoticed in superficial analysis. The integration of ATLAS.ti®'s annotation and encoding functionalities into graphical representations enriches the analysis, revealing the complexity of the data.

The value of ATLAS.ti® lies in its ability to provide the researcher with an interactive and intuitive work environment, where data manipulation becomes a powerful tool for in-depth qualitative research. The expanded understanding of the relationships and structures present in the dataset is, therefore, a direct consequence of the use of these advanced visual aids.

The coding and thematic organization enable a richer and more multidimensional apprehension of the data, while the visualization of patterns helps in the identification of links and trends that are fundamental for the understanding of the phenomenon studied. Therefore, these capacities are important for the production of qualitative knowledge that is both rigorous and meaningful, consolidating it as a valuable resource for the present study, providing a sophisticated means for the exploration and interpretation of the complexities that characterize qualitative data.

Finally, ATLAS.ti® enhances thematic analysis, offering a set of features that help in the management, interpretation and presentation of qualitative data in a systematic and replicable manner. The adoption of the software, therefore, not only facilitates the analytical process, but also contributes to the elaboration of a qualitative study with high standards of quality and methodological rigor.

ORAL HISTORY AND THEMATIC ANALYSIS

The investigation adopted Oral History as a method, recognized for its effectiveness and valued by influential academics such as José Carlos Sebe Bom Meihy, Paul Thompson and Alessandro Portelli. Meihy, distinguished for his studies on social phenomena in the context of colonization at UNIGRANRIO, and Thompson, a pioneer in the integration of Oral History in sociology with his work "The Voice of the Past: Oral History" (2002), established solid foundations for its application in qualitative research. Portelli, for his part, explored the nature of memory and historical significance, highlighting the literary character of Oral History.

In the specific scope of the study, which explores personal experiences in an educational institution, the method was employed following the guidelines of Garnica (2005) and Holanda and Meihy (2015). Thematic analysis, according to Braun and Clarke (2006), is a method that identifies, analyzes, and reports patterns or themes within data. ATLAS.ti® serves as a powerful tool to assist in both processes. To this end, the software has features that allow researchers to organize, codify and analyze large volumes of qualitative data in an efficient and systematic way, making it possible to import various types of data, such as texts, images, videos and audio files, facilitating work with different content formats.

Thus, the use of the software for thematic analysis with a focus on historical narratives was structured in clear and simplified stages, facilitating the analysis process through the following themes, created *a priori*, according to the context investigated.

THEMES & CODES

Theme 1: Interdisciplinary Practices in Mathematics Teaching

Curricular Integration: According to Morin (2001), mathematics integrated with technical disciplines, such as agriculture, forms a learning structure that highlights the interconnection between disciplines, promoting a more holistic and relevant learning.

Teaching Methodologies: The adoption of methodologies that transcend traditional disciplinary boundaries, focusing on projects that promote meaningful learning, as discussed by Morin (2001).

Projects and Activities: Descriptions of projects or activities that exemplify interdisciplinarity, showing how mathematics operates in conjunction with other areas of knowledge.

Challenges and Barriers: The difficulties faced in implementing interdisciplinary practices, including institutional resistance and difficulty in modifying established curricular structures.

Theme 2: Contextualization of Mathematics in Everyday Life and in the World of Work

Practical Applications: Discussion on the application of mathematical concepts in real agricultural situations, as discussed by D'Ambrosio (2009), who emphasizes the importance of connecting mathematics to students' daily lives.

Professional Relevance: The importance of mathematics for future careers in agriculture and how it motivates students, based on the ideas of D'Ambrosio (2009).

Contextualized Teaching Strategies: Techniques to contextualize the teaching of mathematics, making it relevant and stimulating for students, inspired by the work of D'Ambrosio (2009).

Theme 3: Inclusive Education

Inclusion Strategies: Strategies to meet the needs of students with diversity, according to approaches proposed by Mantoan (2015).

Student Feedback: The importance of considering student feedback in order to continuously improve inclusive practices.

Inclusive Learning Resources: The use of learning materials tailored for inclusion, reflecting a commitment to diversity and access to knowledge for all learners.

Theme 4: Pedagogical Impact of Teaching Practices

Pedagogical Contributions: Reflections on teachers' contributions to interdisciplinary and inclusive teaching.

Evaluation and Feedback: The importance of evaluation and feedback to measure the success of teaching practices.

Professional Development: The need for continuous professional development of educators to stay current and respond effectively to educational demands, as highlighted by Mantoan (2015).

Theme 5: Teachers' Perceptions and Experiences

Motivations for Interdisciplinary Practices: The reasons for adopting interdisciplinary approaches, based on the personal experiences of teachers.

Personal Experiences: Teachers' personal stories and experiences related to interdisciplinary and inclusive teaching.

Vision on Inclusive Education: Teachers' opinions and beliefs about inclusion in technical education.

Theme 6: Challenges and Opportunities

Obstacles in Inclusive Education: Specific challenges faced in the context of inclusive education.

Opportunities for Improvement: Suggestions for improving teaching practices.

Institutional Support: The importance of institutional support in facilitating or obstructing pedagogical innovation initiatives, discussed by Santos and Almeida (2018).

METHODOLOGY

In the present research, we employed a qualitative methodology as described by Lüdke and André (1986), focusing on the direct interaction between researcher and school environment to capture nuances of the educational context and pedagogical practices. Oral History, endorsed by theorists such as José Carlos Sebe Bom Meihy, Paul Thompson and Alessandro Portelli, was chosen as the main methodological tool. Thompson (2002) and Portelli (2012) emphasize the ability of this approach to capture the essence of human experiences, valuing interpretation and meaning over the exact accuracy of historical events.

Data were collected exclusively through interviews, favoring this method for its ability to provide a deep understanding of the participants' perceptions and experiences, as indicated by Creswell (2010) and Thompson (2002). This methodological choice stands out for allowing a detailed and humanized exploration of the phenomena studied.

During the data collection phase within qualitative research, the investigator is faced with the challenge of not only collecting the necessary information, but also preparing it in a way that facilitates subsequent analysis. This process begins with structured interviews, which are recorded to ensure the fidelity and integrity of the information provided by the participants (Thompson, 2009). These recordings, due to their perennial nature, are valuable because they capture the richness of the experiences and perceptions of the interviewees, constituting the core of the empirical material to be examined.

After the collection stage, the audiovisual recordings obtained are subjected to a detailed transcription procedure. Transcription is a critical step as it converts speech nuances, contextual details, and linguistic expressions into written text, enabling deeper analysis of the content. In the current study, transcriptions are not performed manually or through third-party services, but rather through the application of a programming script using Google's Whisper® library.

The script in question was created to optimize the transcription process, ensuring that every word spoken by the participants is captured accurately. This automated procedure not only saved significant time that would otherwise be spent on manual transcription but also reduced the possibility of errors, ensuring greater reliability of the transcribed data. Accuracy is of paramount

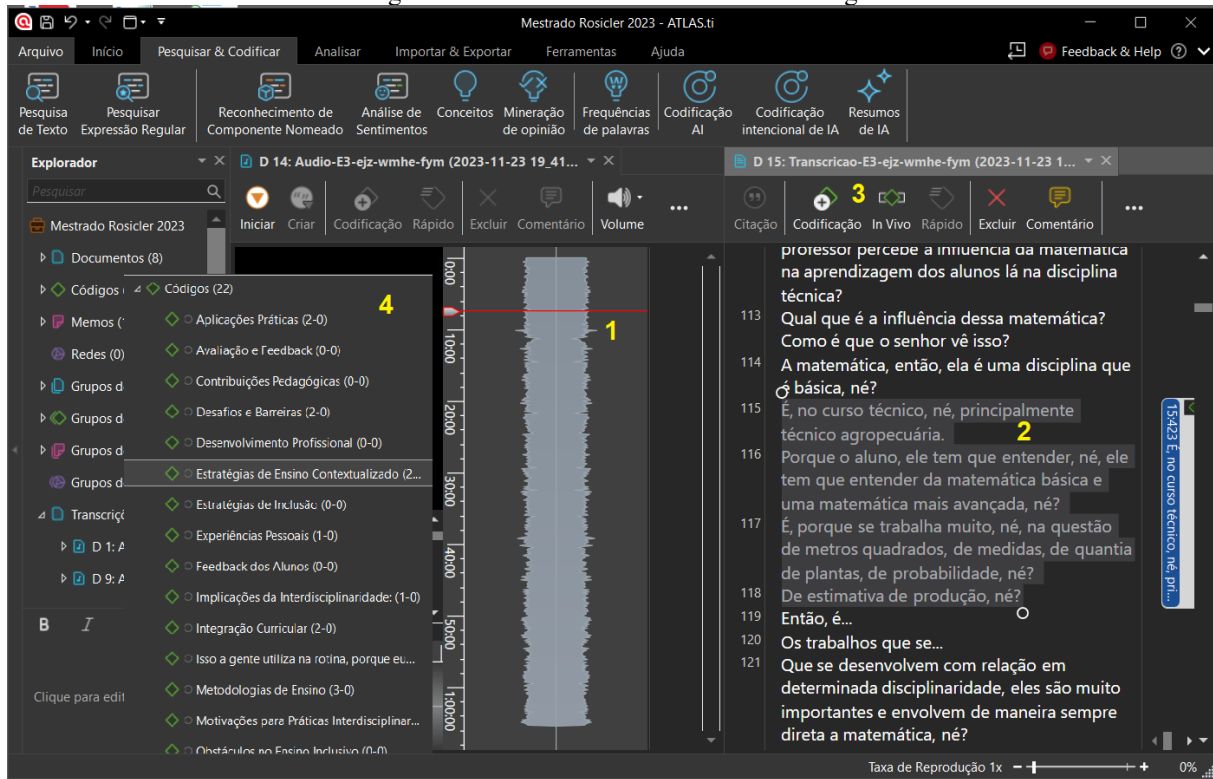
importance, as any discrepancy in the transcript can lead to misinterpretations during the data analysis phase.

Once transcribed, with the proper timestamps, the interviews are imported into the ATLAS.ti® software which has as one of its efficiencies, the ability to import the transcriptions carried out in an effective way, along with the ability to aggregate the original audio and video files and synchronize them with the transcription.

The import of the data into ATLAS.ti® allows the researcher to synchronize the textual transcriptions with the specific moments of the recordings, enabling a richer and more detailed analysis. This function is particularly useful for the analysis of non-verbal and paralinguistic aspects present in the interactions, such as pauses, intonations and gestures, which are crucial elements for the full understanding of the communicative nuances present in the interviews. After data collection, they are imported into the ATLAS.ti® system, inaugurating a crucial phase in the investigative process: analytical coding. Codification, within the scope of Thematic Analysis, is a task that demands a careful and reflective reading of the textual corpus, a process during which the researcher identifies and marks excerpts that highlight key concepts or themes pertinent to the scope of the investigation. This marking is carried out by means of 'codes', which are symbolic labels used to represent ideas and themes emerging from the text (Braun; Clarke, 2006).

ATLAS.ti® software is equipped with tools that optimize and refine the coding process. The *in vivo* code creation functionality allows the researcher to select segments directly from the transcribed text, as shown in figure 1, assigning them codes that are often derived from the participant's own lexicon, thus preserving the essence of the original discourse. Alternatively, the option adopted was the definition of a *priori* codes, established based on the pre-existing theoretical framework or on hypotheses outlined prior to the analysis.

Figure 1 - Atlas.ti® Software Screen - Coding



Source: Prepared by the author (11/2023).

Figure 1 shows that the encoding occurs in a transcribed and synchronized excerpt (1). The Researcher selects the excerpt (2) and applies the code (3), selected from the list of codes defined *a priori* (4).

As the coding process progresses, ATLAS.ti® makes it easier to identify patterns and emerge recurring themes. This is made possible by both the intuitive nature of the software's interface and the analytical capabilities it offers. One of these features is the ability to group semantically related codes into 'code families', which helps in structuring and hierarchizing the thematic and sub-thematic categories that emerge throughout the analysis. Through these resources, ATLAS.ti® offers the researcher the possibility of carrying out a deep, systematic and rigorous thematic investigation, in accordance with the requirements of contemporary scientific methodology.

ATLAS.ti® also provides a 'concept cloud' feature, which graphically visualizes the frequency and relevance of the codes, enabling an immediate understanding of the predominant themes. In addition, the software has advanced search and retrieval mechanisms, which allow the researcher to quickly and accurately access all text excerpts linked to a specific code or theme.

Through these resources, ATLAS.ti® offers the researcher the possibility of carrying out a deep, systematic and rigorous thematic investigation, in accordance with the requirements of contemporary scientific methodology.

FIELD OF RESEARCH AND PARTICIPANTS

Within the scope of this investigation, we will describe in detail the methodology used for the analysis of textual data, from a semi-structured interview conducted with a teacher of coded identification "E1", who has a two-year career in the Center for Professional Education (CEDUP) Vidal Ramos. The material from the transcription of this interview proved to be a textually rich corpus, providing an adequate substrate for a detailed thematic analysis.

The first stage consisted of defining codes and themes a priori, establishing them with direct anchoring to the specific objectives outlined by the generating research, as well as to the guiding question that permeates the study. The procedure adopted involved the careful reading and segmentation of the text into units of meaning, followed by the attribution of initial codes that captured the essence of the concepts and phenomena expressed in the interviewee's statements. This preliminary phase was decisive for the configuration of a comprehensive list of potential topics, which were registered and organized in the ATLAS.ti® software environment. The themes and codes were established in such a way as to directly reflect the dimensions and nuances of the phenomenon under study.

Concomitantly with the coding, the iterative revision of the codes and the redefinition of themes allowed a purification and analytical refinement, ensuring the alignment of the results with the theoretical and methodological guidelines recommended by the research. In this sense, ATLAS.ti® offered advanced resources for the manipulation and organization of data, including the possibility of creating code families, performing precise textual searches and establishing relationships between codes, facilitating the emergence of patterns and the construction of a solid and coherent analytical framework.

Through the use of the software, it was possible not only to categorize the data, but also to visualize connections between the themes, the elaboration of conceptual networks and the synthesis of the findings in a contextualized analytical model. The tool proved to be fundamental for the systematization of a process that excels in precision and analytical depth, enabling the emergence of interpretative deductions aligned with investigative purposes. This process resulted in the creation of a comprehensive list of potential themes, along with corresponding codes.

DATA ANALYSIS

For the analyses, each code was created with the aim of being flexible enough to capture a range of experiences and perspectives, allowing for a comprehensive and in-depth thematic analysis. The use of these codes, however, was only the first step in unveiling the layers of meaning present in the interviewee's narrative.

Next, we illustrate the use of the software in different stages of the analysis, demonstrating its functionalities in the application of real data. The functionalities explored in the use of the software in this phase of the research were the following:

ENCODING

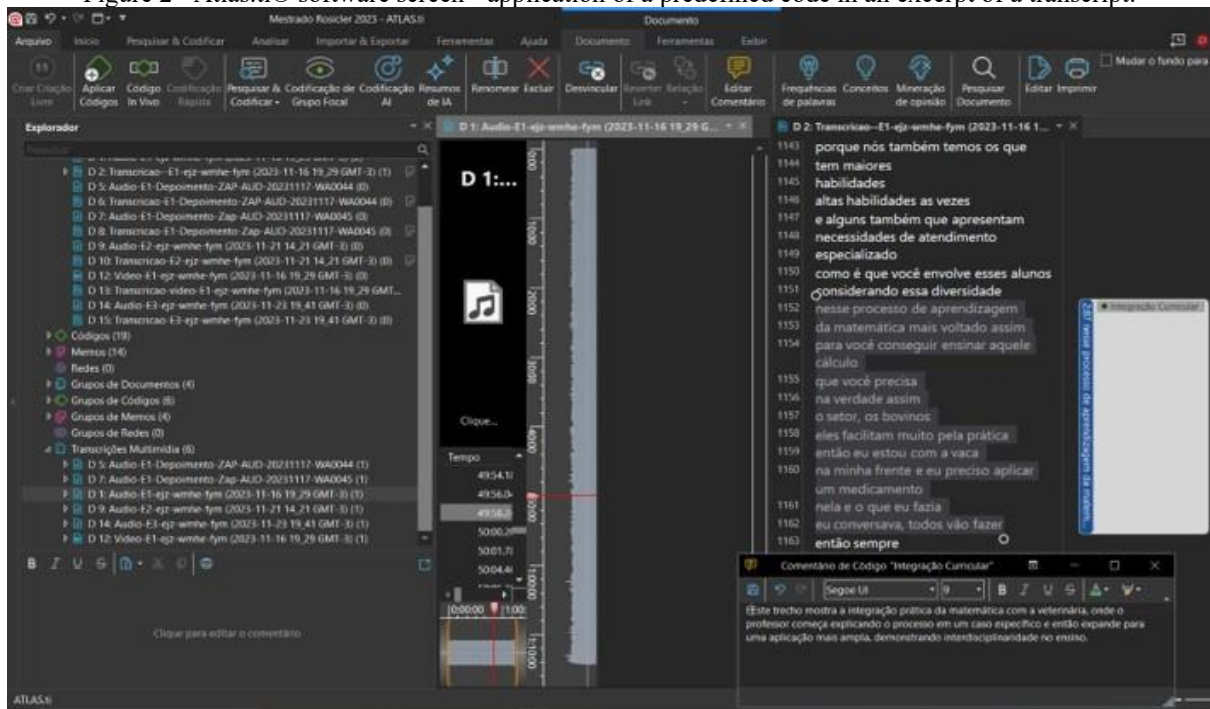
The initial coding, carried out from the application of the codes defined *a priori* already mentioned, has so far allowed the researcher to organize the data into significant units of analysis and connected to the research problem. The coding supported and organized by the software helps in identifying emerging patterns and concepts. For example, the frequent use of terms associated with "difficulty in mathematics" or phrases that refer to this code by context may reveal not only the teacher's perceptions of the challenges faced by students, but also point to the need for pedagogical changes or additional support in technical education. This identification supported by the tool is particularly useful in thematic analysis, as it provides clues to the formation of broader categories.

LINKING CODES TO A TRANSCRIPT SNIPPET

This functionality allowed a given part of the transcription to be interactively selected and encoded by applying it to one or more codes of the pre-defined list *a priori* stored in the software and to search for emerging themes, according to the thematic analysis methodology proposed by Braun and Clarke (2006). The goal is to refine these themes through iterative and reflective analysis, ensuring that the final themes are representative.

In figure 2, an excerpt of the transcribed text was selected by the researcher and a predefined code was applied. Automatically, the code is linked to the selected excerpt, making it easier to navigate through the codes later and later view the transcribed excerpts by themes.

Figure 2 - Atlas.ti® software screen - application of a predefined code in an excerpt of a transcript.



Source: Prepared by the author (11/2023).

The defined codes and emerging themes found using this tool were:

Interdisciplinary Practices in the Teaching of Mathematics:

There is evidence of significant potential to foster interdisciplinarity, which is supported by the practical application of mathematical concepts in agricultural activities, such as livestock management. However, the effective implementation of these concepts still faces significant challenges.

Contextualization of Mathematics in Everyday Life:

The connection between mathematics and the practical reality of agriculture is evident, for example, in the calculations of areas for pasture and dosage of medicines. These practices not only make it easier for students to retain content, but also reinforce the relevance of mathematical learning to their future professional lives.

Inclusive Education:

Inclusive strategies are being successfully implemented, adapting teaching methodologies to reach all learners. Positive feedback from parents and students has been noted, which suggests a growing recognition of the needs of inclusive education.

Pedagogical Impact of Teaching Practices:

The pedagogical practices adopted by the teachers seem to have a positive impact on the students' understanding, especially the application of mathematical concepts in real situations such as the rule of three and functions.

Teachers' Perceptions and Experiences:

Teachers are motivated by an approach that values active learning. They face challenges, but they also see significant opportunities for professional growth through the adoption of interdisciplinary practices.

Challenges and Opportunities:

The difficulty of aligning theory and practice is evident, and there is a clear need to improve teaching practices to better integrate mathematical concepts into practical reality, in addition to institutional support considered essential to promote continuous improvements.

WORD CLOUD

The word cloud represents a significant tool in identifying keyword frequencies in textual transcriptions. This method provides researchers with a quick and visual way to detect prevalent terms and language patterns, aiding in the qualitative interpretation of data with evident quantitative support. The use of this option in oral history research has analytical and interpretative value and complements traditional qualitative approaches with innovative technological resources. Portelli (2012) emphasizes the importance of not seeing oral and written sources as mutually exclusive, but as complementary, each with its own specific characteristics and functions that, when combined, enrich historical analysis. Thus, we can conclude that this technological aspect, as suggested by Portelli's (2012) reflection, expands the scope of textual analysis by providing a new layer of information that supports the researcher's interpretation.

In addition, as Portelli (2012) indicates, oral history focuses not only on events, but on the meanings attributed to them by individuals, which can be highlighted through the prevalence of specific terms in word clouds. This tool can reveal aspects of material culture and personal experiences that more traditional methods might not immediately capture, thus becoming a valuable resource in the methodological arsenal of oral history researchers.

The integration of these technologies does not replace the fundamental analytical skills of the researcher, but complements them effectively, allowing for a richer investigation of historical narratives, which by their nature, can be heterogeneous and eventually ambiguous. The use of both oral and digital sources fulfills a specific function that enriches historical analysis, thus supporting a deeper and more detailed understanding of the past.

In fact, in the research, the use of the word cloud allowed us to obtain a view of the predominant ideas of the interviews from the frequency with which certain words or expressions were repeated, establishing a relationship that also allowed us to create a view of the cultural aspects of the content of the interviews and to show the particular universe of each interviewee and the material analyzed as a whole. This universe is defined by a combination of expressions that refer to

a common thought. In the object of analysis, words such as "students", "teach", "people", etc. were identified.

Figure 3 - Atlas.ti® software screen - word cloud (verbs, nouns and adjectives).



Source: Prepared by the author (11/2023).

VERBAL DISCOURSE ANALYSIS AND ASSESSMENT FOR LINGUISTICS

Verbal discourse analysis and paralinguistic assessment occupy central roles in the study of oral history, standing out as fundamental for the deep understanding of the collected narratives. These methods of analysis help researchers interpret not only the explicit content of words, but also the implicit subtleties that convey additional meanings through nonverbal elements.

Verbal discourse analysis focuses on the explicit content and structure of the words used by the interviewees. As Alessandro Portelli suggests, oral sources reveal much about the meanings attributed to events by the narrators, which can be deeply personal and culturally rooted (Portelli, 2012). This analysis allows historians to access not only the facts narrated, but also the perceptions, beliefs, and emotions associated with those facts.

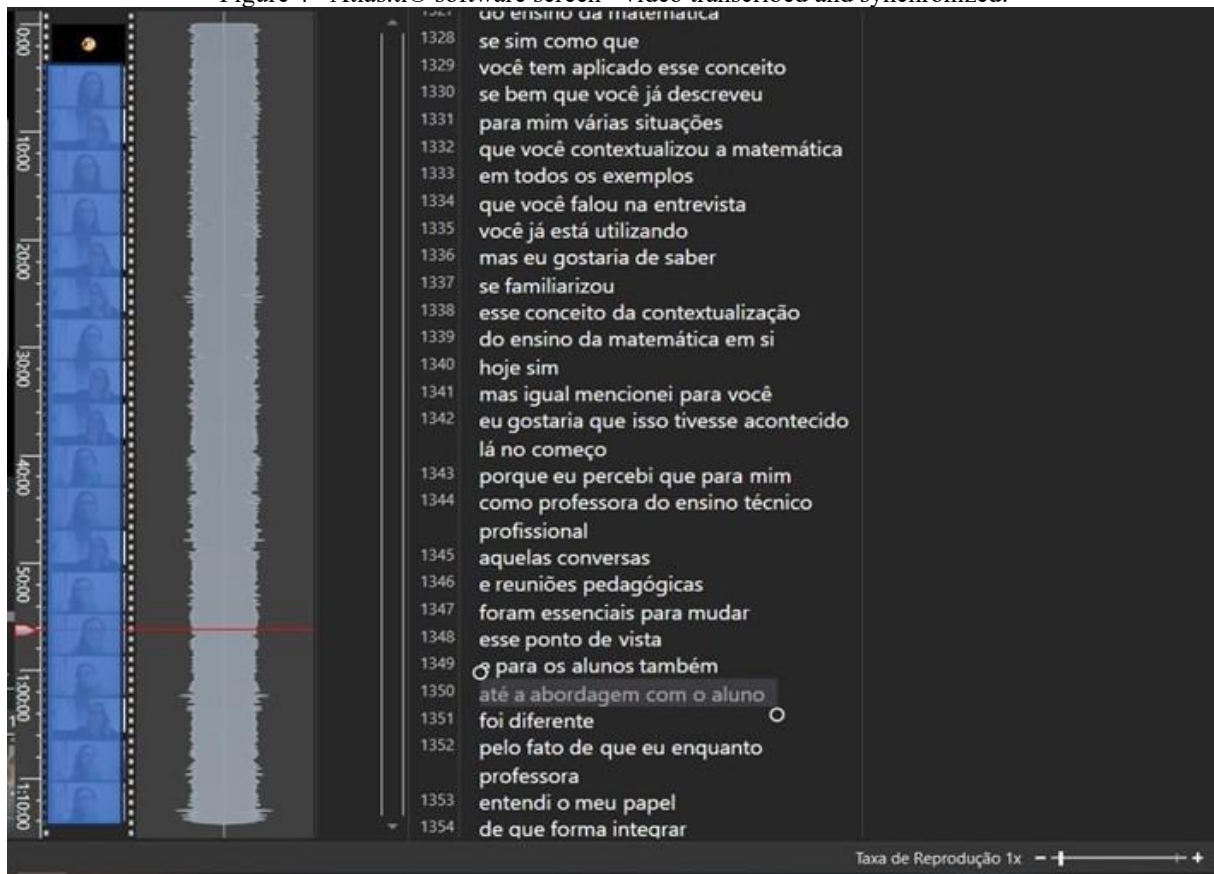
At the same time, paralinguistic assessment—which includes tone of voice, intonation, rhythm, pauses, and other vocal nuances—is crucial to capturing the "voice" of respondents more fully. Portelli (2012) emphasizes that paralinguistic nuances can indicate the narrator's attitudes and emotions, which are often not expressed directly through words, but rather through the way they are spoken. For example, hesitation, increased voice volume, or a change in speech rate may indicate a point of emotional stress, a particularly significant memory, or an attempt to emphasize the importance of an event.

These analysis techniques are essential for a thorough understanding of narratives in oral history, as they provide a richer and more detailed view that goes beyond the transcribed text. This is particularly important when we consider that oral history often seeks to give voice to marginalized groups whose histories may not otherwise be adequately documented.

As Portelli (2012) points out, by ignoring the paralinguistic aspects of interviews, one runs the risk of missing crucial information about how narrators perceive their own story. Therefore, these analyses not only enrich our understanding of historical events but also strengthen our ability to appreciate the diversity of human experiences and the complexity of personal memories.

This type of analysis was possible within the software. To facilitate this task, the software allowed the transcribed text to be synchronized with video excerpts of the interview, as shown in figure 4.

Figure 4 - Atlas.ti® software screen - video transcribed and synchronized.



Source: Prepared by the author (11/2023).

CREATION OF MEMOS

Essential to the process of thematic analysis (Braun; Clarke, 2006) is the use of memos and annotations, which play a crucial role in the organization, interpretation, and analytical deepening of data. These practices not only facilitate the documentation of initial ideas and reflections on possible codes and themes, but also increase the transparency and rigor of the analysis, allowing the

researcher to explore diverse interpretations, question their own assumptions, and critically reflect on how their perspectives influence the results of the analysis.

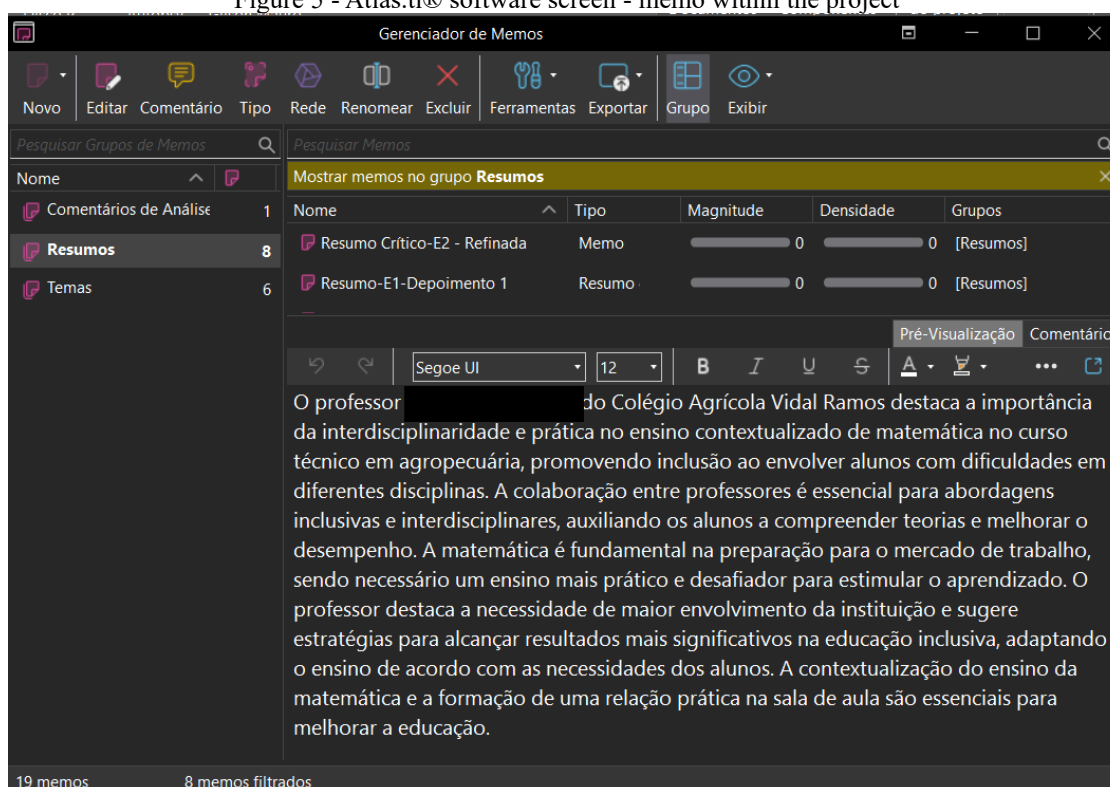
The functionality of memos and annotations extends beyond the mere organization of data, as they capture emerging insights and insights, refine understanding of the data, and document the analytical reasoning process, which is essential for the validity of the study. In addition, these records offer a solid basis for the discussion and justification of methodological decisions, both in academic publications and in thesis and dissertation defenses, contributing significantly to the methodological integrity of research.

The benefits of memos and annotations are palpable in the interpretive quality of the study. They promote deeper analysis by avoiding superficial approaches and encouraging deeper immersion into the data. Thus, these records are not just ancillary; They are integral to the analytical process, enriching the final narrative and ensuring that the analysis is both reflective and systematic.

In conclusion, the maintenance of memos and notes is indispensable in thematic analysis, supporting the structuring and methodological execution of qualitative research. They not only facilitate the organization of data, but also strengthen the rigor and transparency of research, which are central to the validity and reliability of analytical results, as highlighted by Braun and Clarke (2006).

The following figure shows a memo with a synthesis written by the researcher about the interview as a reference of the initial perception.

Figure 5 - Atlas.ti® software screen - memo within the project



Source: Prepared by the author (11/2023).

REVIEW OF PRE-DEFINED CODES AND THE CREATION OF IN VIVO CODES

In this aspect, the Atlas.ti software reveals a differentiated potential, especially through the functionality of *in vivo* codes. This feature allows you to capture expressions and terms directly from the interviewees, providing a contextualized anchor to the narratives. Braun and Clarke (2006) point out that thematic analysis is a flexible and detail-rich method that contributes significantly to the generation of an interpretative analysis of data. *In vivo* codes are essential not only to preserve the authenticity of the interviewee's voice, but also to explore nuances and complexities that could otherwise be lost in pre-defined or generalizing categorizations. Thus, these codes strengthen the qualitative analysis by providing a more in-depth view of the material analyzed, respecting the integrity and uniqueness of the discourses collected.

SETTING UP THEMES AND CONNECTION NETWORKS

This functionality of ATLAS.ti allows you to establish and visualize connections between different codes and thematic categories was instrumental in exploring the complexity and interconnectedness of qualitative data.

Using ATLAS.ti, it was possible to identify, analyze, and report patterns within the data in a way that not only captures the essence of respondents' experiences, but also reveals how different themes intertwine and influence each other. This ability to visualize complex relationships between topics facilitates the understanding of the dynamics underlying the perceptions and experiences reported, contributing to a more complete and contextualized analysis. The ATLAS.ti interface supported this process by providing tools that allowed an intuitive and visual manipulation of the codes, highlighting the interrelationship between them and highlighting how such connections can elucidate new patterns and deductions about the analyzed material. This tool was effective in building a more comprehensive and interconnected understanding of narratives, which was essential to deepen qualitative knowledge, generating meaningful and well-founded research results.

FORCE MAP

The establishment of the connection strength between the themes, another of the software's functionalities, was a critical step and the "force map" functionality of the Atlas.ti software was used, an essential tool that established and quantified the strength of the connections between the identified themes. This functionality made it possible to measure the relevance and frequency with which certain themes appeared in the interviewees' speeches. Such quantification was critical to prioritize the central themes and identify those that were secondary or peripheral to the experiences narrated. This directly interfered in the determination of the results of the research, as the clear visualization of the thematic relationships helped the researcher to understand how different aspects of the reports

interconnected and influenced each other. The ability to measure the intensity of the connections between themes not only made it easier to focus on the most influential aspects of the data, but also informed the research's interpretations and conclusions in a well-informed way.

DESCRIPTIVE ESSAY

Finally, the elaboration of the descriptive essay of results will consolidate the analyses in a document that should articulate the findings based on the first interview. This essay should present a synthesis of the main themes, demonstrate the relationships established between them, and interpret these findings in the light of the theories and the broader context of the study, seeking to answer the central question of the research (Minayo, 2010)

It is possible to affirm that the use of ATLAS.ti® in the technique of Oral History and Thematic Analysis offered, in this first evaluation, a solid structure to support the methodology for qualitative research.

It is necessary, however, to highlight, even if in a preliminary way, the learning curve, which requires training, dedication and a high level of technological familiarity, requiring, in addition, the availability of equipment capable of processing and storing data from different sources and in large volumes.

The amount of information and functionalities offered by the software allows the researcher to dive deeply into the data, maintaining a systematic and integrated approach, which honors the complexity of human narratives and the integrity of the interviewee's voice, in addition, keeping all documents organized and ready for consultation, reanalysis and eventual verifications.

It is noticeable that the quality and quantity of the software's analysis tools do not make the results easy or promote the quality of the research in an automatic way. The depth of the analysis, the quality of the results and the final product depend fundamentally on the researcher's performance and knowledge on the subject, from the adequate formation of the codes and themes, through the definition of their relationships within the context, to the process of synthesis and conclusion, with the software being a tool that allows in an outstanding way the amplification of these skills through the access to a significant number of automated ways to carry out the verification of the currents of thought and knowledge manifested by the interviewees.

Finally, due to the already mentioned technological dependence and arduous learning curve, it is recommended that the research with the use of this software be supported by a research assistant who can perform the training in the software and together with the researcher, and following his/her guidelines, set up the project and use the software, allowing the researcher to carry out the investigation without worrying about learning the software.

FINAL THOUGHTS

This article sought to explore the relevance and potential of the ATLAS.ti® software in the context of qualitative research, emphasizing its application in the oral history method and in the thematic analysis technique. Qualitative research, by focusing on the complexity of human and social phenomena, demands tools that allow a systematic and in-depth approach to the data collected. In this sense, ATLAS.ti® emerges as a robust resource, offering a set of functionalities that facilitate the organization, coding, analysis, and interpretation of qualitative data.

Throughout this study, it was possible to verify that the software not only optimizes the transcription and coding process, but also contributes significantly to the creation of a coherent and grounded analytical structure. The advanced functionalities of search and retrieval of information, as well as the data visualization tools, enable the researcher to explore the detailed and interactive exploration of the emerging themes and categories, enhancing the density and richness of the information collected.

The importance of the ATLAS.ti® tool for the preservation of data integrity and the voice of participants was emphasized, evidencing the software's commitment to the fidelity of the reports and the authenticity of the shared experiences. The ability to synchronize the transcripts with the original audio and video files is one of the distinguishing features of the program, which enriches the qualitative analysis by allowing the consideration of paralinguistic and non-verbal aspects essential for the full understanding of the narratives.

However, it is necessary to recognize that mastering ATLAS.ti® implies a learning curve that requires training, dedication and technological familiarity from the researcher. In addition, technological dependence and the need for high-capacity equipment for data processing and storage pose challenges that must be considered in the planning and execution of qualitative research.

In terms of results, the initial thematic analysis carried out in the transcription of the interview, through the software, reveals that the codes defined *a priori* were significant, as described below:

Interdisciplinary Practices in Mathematics Teaching: The curricular integration between mathematics and agricultural practices is underdeveloped, although it has the potential to enrich interdisciplinarity. The practical application of mathematical concepts in activities such as cattle handling makes it easier for students to understand, although there are challenges in effectively incorporating mathematics in such contexts.

Contextualization of Mathematics in Everyday Life and in the World of Work: Educational practices link mathematics with its practical applications in agriculture, such as calculations of areas for pasture and dosage of medicines. This approach not only helps with content retention, but also underlines the relevance of mathematics to professional practice.

Inclusive Education: Inclusion strategies are implemented to adapt teaching methodologies to all students, with reports of positive feedback from parents and students. These practices point to a growing recognition of the needs of inclusive education and the necessary adaptation of pedagogical methods.

Pedagogical Impact of Teaching Practices: Teaching practices are perceived as impactful for students' understanding, with practical examples such as the rule of three applied in real contexts. The need for practical assessment and guided feedback is highlighted, as is the continuous professional development of teachers to meet the challenges of more interdisciplinary and contextualised teaching.

Teachers' Perceptions and Experiences: Motivated by teaching that values "learning by doing," teachers face challenges and identify opportunities for growth by adopting interdisciplinary practices. Inclusive education emerges as a field for which many still feel unprepared.

Challenges and Opportunities: The difficulties in adapting reasoning and pedagogical practices to an inclusive educational environment are notable. There is a recognition that practical application often diverges from theory, suggesting a need for improvement in teaching practices. Institutional support is seen as essential to foster continuous improvement.

This set of themes found in the first interview analyzed, evidences the complexity and richness of mathematics teaching in an interdisciplinary and practical context, highlighting both the opportunities and the challenges faced by educators in the field.


The software allowed a refined and assertive understanding of the topics addressed, demonstrating feasibility as a means of enriching the investigative process. The integration between the technological tool and the methodology of Qualitative Research, Oral History and the techniques of Thematic Analysis enabled the production of scientific knowledge of excellent quality, with significant and consistent results and perceptions.

It is concluded, therefore, that ATLAS.ti® is a valuable and indispensable tool for modern qualitative research, capable of expanding the analytical capacities of the researcher and of promoting a study with high standards of quality and methodological rigor with remarkable use of the researcher's time and ability to centralize resources and document the research. It is recommended that researchers consider the possibility of having research assistants trained in the handling of the software, in order to maximize the potential of ATLAS.ti® without learning the tool becoming an obstacle to carrying out scientific research.

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Strategic planning for exports: Methodologies applied for insertion in the international market

 <https://doi.org/10.56238/sevned2024.010-063>

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ABSTRACT

For a company to be successful in its internationalization process, it is necessary to have a careful evaluation of its export capacity, having established its mission, vision and values, it is possible to observe more clearly all the pillars of the company's organizational culture. It is also necessary to identify the main challenges encountered both in the internal and external environment. Defining your market positioning and bargaining power is crucial for you to be able to export competitively and in a competitive manner, monitor export performance, evaluate results and make adjustments as necessary, standing out internationally. Technical planning for export is essential to ensure the success and sustainability of the operation, maximizing growth opportunities in the international market. Based on this, this work presents a theoretical discussion about the importance of an export plan, based on analysis and corporate management techniques.

Keywords: Export capacity, Export, Market analysis, Strategic planning.

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INTRODUCTION

The internationalization process is extremely important for companies that seek to expand their business using their insertion in the foreign market. As it is a procedure in which the company will be exposed worldwide, it is necessary to develop a strategic plan, where it will be possible to evaluate crucial issues, such as; the export capacity, the degree of competitiveness and the differentials it will present against its competitors.

According to Minervini (1997), it is essential that the company evaluates its capacity for export, so that it is possible to position itself in the market, after analyzing its environments, both internal and external.

Strategic export planning (PEE) consists of the elaboration of an organized and systematic process that aims to develop strategies for the success of an export. With it, the entrepreneur will acquire knowledge about the strengths of his company, information about the market he wants to enter and what improvements should be made before effectively starting the export process.

The plan will also allow the company to clarify its position in the market, through the use of analyses that allow the identification of the main risks involved and, thus, be able to mitigate potential problems.

Based on the methodologies of SWOT analysis, Porter's 5 forces and Mintzberg's Strategy Conception, the present work presents a theoretical discussion about the importance of strategic planning for exports so that the potential exporter can face the world market, overcoming the challenges present in the export process and remaining active in the foreign market.

This work also has information on international trade procedures of public and private institutions in Brazil and how the elaboration of an export plan takes place with the help of the Operational Center (NO) created by the Federal Government and provided through the performance of the Brazilian Agency for the Promotion of Exports and Investments (APEX).

STRATEGIC PLANNING

Strategic planning for exports is a complex process that involves several steps and requires specific knowledge. According to Mintzberg et al., (2006, p. 23.) "There is no single, universally accepted definition" so different scholars present different concepts regarding the definition of strategy. It is worth mentioning that the strategy must be analyzed within a specific context, in our case within the export scenario.

According to Porter (1986), strategy consists of developing different activities, placing oneself in a unique position of value, which will provide prominence to the company, in order to obtain competitive advantage.

For Oliveira (2002), it is necessary that planning is based on the analysis of previously obtained results, so that a more efficient way to reach the desired point can be found, using all the resources available within one's current situation.

Research and preparation can offer valuable insights into strategic planning best practices for export, as well as provide up-to-date information on the international market and industry trends.

SWOT ANALYSIS

In the previous paragraphs it was possible to introduce the analysis of some aspects of strategic planning, in them we saw how several authors see strategic planning and now we can interpret and apply them in the context of exports.

When Minervini says that it is essential that the company evaluates its export capacity, in order to be able to position itself in the market, through the analysis of its internal and external environment. It can be concluded that without a full view of the internal and external environment, it is impossible for the company to position itself in the market.

To identify the internal environment, it is necessary to understand everything that is under the company's command and can be changed by it, such as: staff, administrators, organizational culture, technological development, organizational structure and physical facilities.

In the characterization of the external environment, it is necessary to identify and understand advents that have the potential to impact the company and the situation in which organizations exist and operate, it is composed of elements that are external to the limits of the organization, such as economic crises, legislative changes and market competitors.

Having the definition of internal and external environment, the next step is the elaboration of the SWOT analysis, the SWOT analysis is a strategic planning technique used to help people and/or organizations. SWOT analysis was developed in the 1960s by Albert S. Humphrey, a management consultant at the Stanford University Research Institute. He understood that strengths and weaknesses are directly linked to events in the internal environment, so they are under the company's control and decisions. However, opportunities and threats are related to events in the external environment, so they are not under the control and are not defined according to the institution's decision-making.

Figure 1: SWOT analysis.



Source: <https://resultadosdigitais.com.br/marketing/analise-swtot/#:~:text=As%20forças%20e%20fraquezas%20dizem,interno%20e%20ambiente%20externo%2C%20respectivamente>

Strengths – These refer to the advantages that the company has over the competition. Your competitive differentiators, stronger business skills. They also concern internal elements that benefit the enterprise and/or factors that are under the company's control. In which, she can decide to keep or not.

Weaknesses – Includes points that may harm and/or negatively interfere with the company's progress and performance. The weaknesses found, then, must be examined and observed on an individual basis. Thus, it will be possible to solve the problems generated by them. If a short-term solution is not possible, it is recommended to try to reduce its effects, or at least circumvent them. By making these weaknesses have the opportunity to become a strength for the institution.

Opportunities – This refers to any and all external forces that positively impact the company. It is not possible to have control over them, but there is the possibility of enjoying them. As long as they are real and have a basis in research and studies. In addition, they can arise at any time, such as: A partnership with the competition, a passing fad that results in an increase in consumption of the products offered by the company, government incentives, among others.

Threats – Opposing opportunities, threats are considered to be all external forces and/or changes with the potential to negatively influence the business. Any events that could harm profits and ventures as a whole. We can take economic crises, pandemics, market saturation, etc. as examples.

Having defined the main points related to the business reality within the parameters of the SWOT analysis, it is possible to start questioning the business situation in the macro environment. For a better visualization of the important points, it is necessary to structure a framework that

represents the relevant aspects regarding the strengths, weaknesses, opportunities and threats of the company.

Table 1: SWOT analysis.

FORCES	WEAKNESSES
What is the level of quality of the service and/or product offered by the company? Is the chosen location suitable? Does the company have relevance in the market? What are the competitive advantages? Is the team competent enough?	What are my company's weaknesses? Is my communication efficient? Is the team fully empowered? What is the company's market positioning? Why did my client choose the competition? Were there any flaws in the planning?
OPPORTUNITIES	THREATS
What are the market trends? What innovations can add to my business? Where do competitors fail? In which countries is there a market for my product and/or service?	What are the impacts of the economy on the development of the company? Who are my direct competitors? Do I agree with the legislation in force in the country?

Source: Survey Data

The example above demonstrates possible questions that can be asked for the elaboration of a SWOT analysis. It is worth mentioning that these questions may not match the reality of your company, as the variables used as a parameter refer to specific details of each institution. For example: Companies that operate in the same sector are not necessarily direct competitors, the market niche in which it is inserted has more influence than necessarily the sector in which it operates.

Companies that operate in the same field can propose to serve different audiences. A company that proposes to serve the class A public does not compete directly with a company that proposes to serve a class C public, although both may operate in the same field and have the same type of product. Therefore, it is extremely important to identify and define your place of operation in the market to also be able to identify your direct currents, among other possible threats.

After the clear definition of the impacting points in relation to the internal and external environment of the company and its positioning in the market. To define in depth the external elements that substantially affect the organizational environment in which the company is inserted, the 5 forces defined by Porter can be used as a parameter of analysis.

PORTER'S 5 FORCES

Figure 2: Porter's 5 forces



Source: <https://blog.egestor.com.br/5-forcas-de-michael-porter/>

1 – Threat of substitute products

- What is it?

Competing products that meet the same needs as your customer, either in the same way or even better.

- How to identify?

In general, substitute products are goods that are not necessarily part of the same market as another product, but that compete for the same type of consumer, as they have the ability to partially and/or completely satisfy a specific customer need.

- How to solve?

Through market research focused on the competitor's product, it is possible to establish the strengths and/or weaknesses of the product offered. Thus, it is possible to structure improvement and innovation strategies based on the embezzlement found.

2 – Threat of entry of new competitors

- What is it?

This threat refers to the likelihood that a new company will enter the existing market and start competing with the incumbents in it. The intensity of this threat varies depending on the factors of the product and/or service offered.

- How to identify?

The identification of new entrants in the market can be done through analytical techniques, such as: monitoring news and media related to the specific product or service,

market research, professional networks and industry groups, searching for existing patents, and analyzing the competition – whether physical or online.

- How to solve?

Through the drafting of patents, it is possible to establish a higher barrier to entry for competition, using specific technologies for product development and/or alternative forms of service provision.

3 – Clients' bargaining power

- What is it?

Defined as the ability to choose between divergent companies that offer similar products or services, it is based solely and exclusively on the customer's perception of the chosen option.

- How to identify?

The analysis of customer behavior is essential to understand their choices, it is fully possible that, even when faced with options that better meet their needs, the customer chooses the company that he already has a positive opinion about.

- How to solve?

It is possible to change the customer's perception of the product or service offered by investing in marketing, differentiation, quality improvement, application of sustainable practices, customer loyalty techniques, among others.

4 – Bargaining power of suppliers

- What is it?

Factors that can increase or decrease the bargaining power of suppliers can vary from the degree of differentiation between them, production cost.

- How to identify?

The supplier's bargaining power is directly linked to the number of suppliers available in the market and how dependent the company is on them. A company that establishes vertical integration with only one supplier is in a position of dependence on it, increasing the supplier's bargaining power. If it decides to change its price or fails to deliver, all other processes of the company will be compromised.

- How to solve?

The adoption of strategies that aim to balance or reduce the influence of the supplier in negotiations is the main way to equalize this situation, these attitudes can be taken through diversification of suppliers, strategic partnerships, elaboration of rules regarding price and contractual definitions.

5 – Rivalry between competitors

- What is it?

The greater the rivalry and saturation of the sector, the more difficult it will be for new competitors to enter, given the fact that companies that are already in the market already have a defined audience with large investments in market research and marketing, in addition to the practice of lower margins.

- How to identify?

A company only puts itself in a position of rivalry with companies that are at its level of direct competition. This definition is mainly based on the analysis of its market positioning, specifically evaluating the environment in which the company operates.

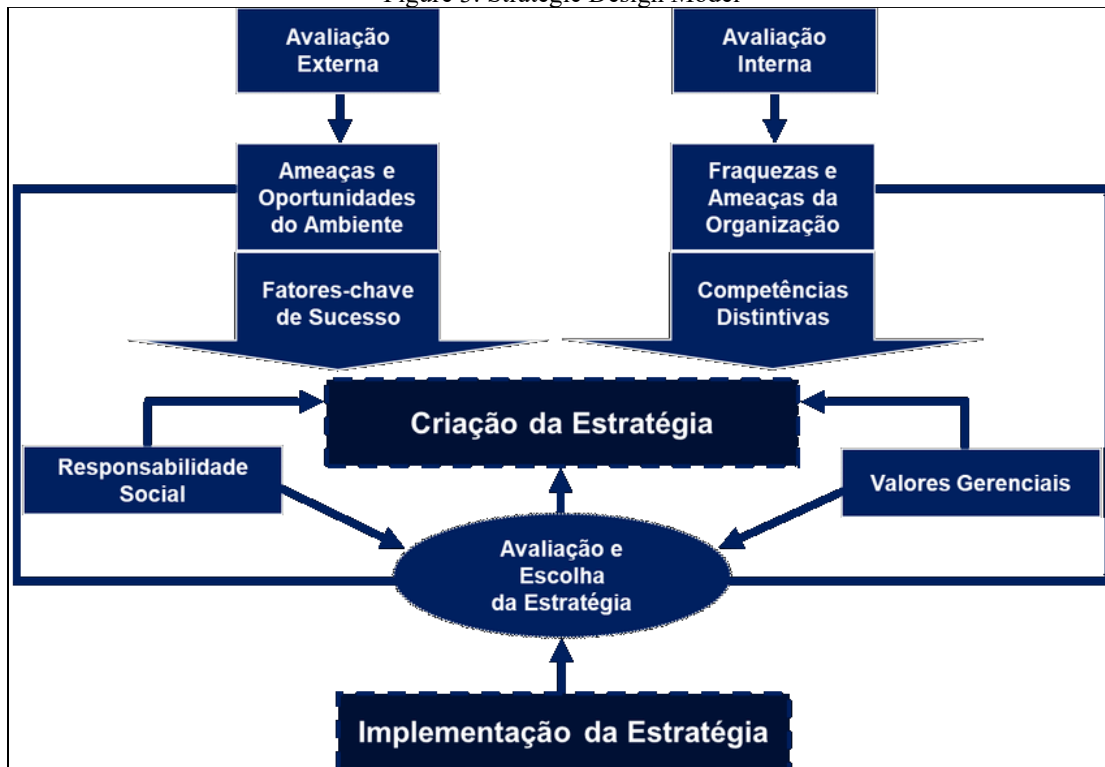
- How to solve?

Rivalry between competitors is one of the fundamental parts within market competition, so it cannot be solved in the sense of eliminating it. However, companies can adopt strategies that allow them to deal with this rivalry effectively while maintaining or improving their competitive position. This can be achieved through actions such as: differentiation of products and services, culture of innovation, expansion aimed at reaching new markets and improving operational efficiency.

STRATEGIC DESIGN

Given the definitions of the main aspects that influence the organizational environment and establishing which are the most relevant in the field in which the company is inserted. It is necessary to start the process of elaboration of the strategic planning for insertion in the international market, as a basic structure for the conception of strategy, the model proposed by Mintzberg can be used:

Figure 3: Strategic Design Model



Source: Scheuer, Luciane. (2020). Manual of the Individual Microentrepreneur - Guidelines for coping with Covid-19.

According to Mintzberg, for the design of an efficient corporate strategy it is necessary to ensure that it is in accordance with the social responsibilities and managerial values of the company, these pillars can be defined as:

- **Social Responsibilities:**

A company's social responsibility is its commitment to act responsibly and ethically through the social, economic and environmental impacts caused by its operation. These approaches must take into account the interests of all parties belonging to the corporate hierarchy, as well as local communities and the environment.

- **Managerial Values:**

They are defined through the ethical principles and beliefs that guide the decisions and actions taken by the institution's leadership. The act of establishing solid values is extremely important for the company, since they are able to determine the organizational culture and influence employee behaviors.

Having defined these points according to the company's vision, the strategy moves on to the evaluation and choice phase, Mintzberg emphasizes that the process of evaluating and choosing a strategy is not purely rational and analytical, and must often emerge in an organic and not strictly logical way. Mintzberg categorizes the strategy as either deliberate or emergent.

A deliberate strategy is one that is planned in a systematic and conscious manner. It is usually taken in response to analysis and consideration of previously observed patterns. In turn, the emerging



strategy is developed organically as the organization interacts with the challenges that exist in its operating environment.

The importance of analysis in the process of designing a strategy is undeniable, but it must be in accordance with the context and reality of the organization itself. This means that the data and information that provide the basis for the analysis must be complemented by knowledge of the organizational culture and the internal dynamics of the institution. Finalizing the process with the long, medium or short-term implementation of the defined strategy.

EXPORT

EXPORT CONCEPT

Export is defined as the sale of products, goods, or services from one country to another, being a fundamental operation for the economy of any nation. When domestic companies decide to export, they not only sell their products abroad, but also engage in a process that increases productivity, innovation, and competitiveness. This process involves the temporary or permanent departure of these products from the customs territory, subject to criteria established by the importing country.

The decision to export brings a number of internal benefits to companies, including increased production, both in quantity and quality. This occurs through the revision of production processes and the reduction of idle capacity. In addition, by adapting their products to the requirements of foreign markets, companies significantly improve the quality of their products. Entering the international market also allows companies to acquire new technologies and adopt new managerial and technological standards, which improves their image both internally and externally. This internationalization process requires greater competence and quality from companies, since they need to meet the standards of the foreign market, managing new conditions and obtaining gains in competitiveness.

ADVANTAGES OF INSERTION IN THE INTERNATIONAL MARKET

Exporting allows companies to reach new markets and audiences, strengthening their position in the market and establishing their brand internationally. Among the advantages of starting the export process are increased sales, productivity growth, tax incentives, improved product quality, increased market share, decreased dependence on the domestic market and access to new technologies. In addition, the strategy of dividing production between domestic and foreign markets allows companies to expand their customer base, reducing risks and becoming less dependent on a single market.



Exports not only benefit companies, but also the country as a whole, promoting the inflow of foreign currency, job creation, an increase in the qualification of human resources and the growth of the industrial park. In the Brazilian context, where the domestic market has already been considered sufficient for many companies, exporting emerges as an important strategic decision for business development. Internationalization therefore represents an opportunity for companies to expand and become more competitive, not only in the domestic market but also on the global stage.

GETTING STARTED WITH EXPORTING

INTERNATIONAL MARKET RESEARCH

Before starting exporting, it is essential to conduct an international market study. This study should consider aspects such as market potential, purchasing power, and lower risk offered by the target country. Analyzing demographics, age group, and audience segmentation are key to identifying the similarities between the domestic market and the target market, facilitating expansion with minimal adaptation. Additionally, it is important to analyze the economic, social, and technological aspects of the country, as well as its existing trade practices and trade barriers.

Assessing the company's production capacity is crucial to ensure that it can meet the demand generated by exports. It is necessary to check if there is idle installed capacity that can be used or if investments are needed to expand this capacity. Additionally, consideration should be given to the logistics involved in the export process, including choosing the most appropriate mode of transport to ensure the safe and on-time arrival of the cargo.

To export, it is necessary to comply with a series of regulations and obtain specific certifications. Documents such as the Single Export Declaration (DU-E) and license verification are essential to the process. Certificates of origin, both preferential and non-preferential, are also important to prove the origin of goods and can influence the reduction or exemption of import taxes in destination countries. Additionally, it is crucial for businesses to make sure that all necessary documents are notarized and verified by trusted entities. These initial steps are critical for businesses that want to start the export process and expand their operations internationally.

PRODUCT ADAPTATIONS

Before starting the export process, it is essential for companies to consider adapting their products to the requirements and particularities of the international market. This involves analyzing a variety of factors, such as technical standards, cultural preferences, and trade barriers. Adapting products to meet the legal, regulatory, and cultural requirements of different countries is a crucial step in ensuring compliance and success in the foreign market. Additionally, it is important to check



if the product is naturally competitive by evaluating attributes such as quality, design, innovation, and price.

Choosing the right packaging is critical to the success of the export, as it must not only protect the product during transport, but also comply with all the legal and cultural requirements of the destination market. Packaging must be designed to withstand handling during transport and ensure the integrity of the product to the end consumer. It is necessary to consider technical specifications, such as backlight, water and gas barriers, and choose materials that can withstand transport conditions. In addition, labelling should include clear and precise information, respecting the labelling standards of the destination country, and may need to include details such as the origin of the product and instructions for use in the local language.

To ensure the quality of exported products, it is essential to implement strict quality control during the production process. This includes the adoption of systems and concepts aimed at reducing inventories, times between production steps, and product defects. These practices not only improve quality but also reduce costs and increase error traceability, which is crucial for meeting international customer expectations. In addition, it is important to consider quality management as a competitive advantage in the international market, requiring stricter control to meet the demands of a more demanding public.

INTERNATIONAL MARKETING STRATEGIES

Brand positioning in the international market is crucial for the success of marketing strategies. It is essential for companies to create a global brand plan, considering the cultures and countries in which they want to operate. This planning must be flexible enough to adapt to local specificities, as is the case with Coca-Cola, which even adapts the taste of its products to specific markets. In addition, it is important that the brand conveys its core values, such as quality and responsibility, in a way that is clear and adapted to local perceptions and language.

The choice of distribution channels is critical to success in international marketing strategies. Companies can opt for direct export, where the sale is carried out directly between the manufacturer and the final consumer abroad, or indirect export, using local intermediaries. This choice will depend on several factors such as the size of the market, the structure of the company and the knowledge about the foreign market. Additionally, it is important to establish strategic partnerships with local distributors, who can facilitate the entry and adaptation of products to international markets.

EXPORT ADMINISTRATIVE REQUIREMENTS

After the conclusion of the initial structuring of the export, the feasibility of the operation is defined based on several factors that may interfere with the company's productive capacity and the



peculiarities existing in the selected destination are understood. One of the main priorities to ensure the success of the operation is to be aware of the legal regulations and administrative requirements related to the export process.

RADAR

The Environment System for Registration and Tracking of the Performance of Customs Agents – RADAR – is a system that makes it possible to monitor, in real time, information of a customs, tax and accounting nature of companies operating in Foreign Trade.

This platform is a fundamental tool in the fight against fraud, as it allows the inspection and identification of risks in operations.

So that a company can operate in the international market. It is necessary to obtain authorization from the Brazilian Federal Revenue Service (RFB) by registering with RADAR. The main documents required are:

- a) Personal identification document of all partners of the company (RG and CPF);
- b) The company's articles of incorporation;
- c) Certificate of Registration of the Company with the Board of Trade;
- d) Operating License Permit;
- e) Lease agreement and/or deed of the property in which the company is located;
- f) Electricity and/or telephone bill;
- g) Proof of payment of property tax for the previous year;
- h) Declaration of Federal Tax Debts and Credits (DCTF);

The RADAR is valid for 6 months if the company does not carry out any import and/or export operations during this period. In cases of movement, the registration is automatically renewed.

SISCOMEX

In Brazil, exports must be registered in SISCOMEX (Integrated Foreign Trade System) to be analyzed, virtually, by the agencies that manage the system. They are: The Federal Revenue Service of Brazil (RFB), the Central Bank of Brazil (BACEN), the Ministry of Development, Industry and Foreign Trade (MDIC) and the Secretariat of Foreign Trade (SECEX). This export registration can be done either by the exporting company itself or through customs brokers, foreign exchange brokers, bank agencies that operate with foreign exchange and other authorized entities.

To gain access to SISCOMEX, the company must register in the Environment System for Registration and Tracking of the Performance of Customs Agents.

At the moment the company registers the first export operation in SISCOMEX, the registration in the REI (Registry of Importers and Exporters) will be automatically completed, once it



has it, it is up to the company to classify its goods according to the Mercosur Common Nomenclature.

COMMODITY CLASSIFICATION

In order for a company to be able to market a certain product abroad, it is necessary to be identified. In Brazil, the Mercosur Common Nomenclature – commonly known as NCM – is used to standardize, designate and codify goods.

The NCM consists of 8 digits (all numeric) and its classification structure, which can contain up to 6 levels of aggregation, namely: Chapter, Heading, Simple Subheading, Composite Subheading, Item and Subitem.

1. Chapter – Indicated by the first two digits of the NCM.
2. Position – The position within a given chapter is represented by the first 4 digits of the numeric code.
3. Simple subheading – Represented with the 5th digit of the NCM.
4. Compound subheading – Represented with the 6th digit of the NCM.
5. Item – is the subdivision of the Harmonized System, represented by the 7th item of the code.
6. Sub-item – is the subdivision of the item, represented by the last digit of the NCM.

In addition to its role in the characterization of the product, the selected nomenclature will directly interfere with the tariffs, taxes, costs on the product and its freight.

DOCUMENTATION REQUIRED FOR EXPORT

In order to ensure the success of the export operation, it is necessary that the company has all the mandatory documentation. So that the legality and security of all transactions linked to the export process can be guaranteed.

PRO-FORM FATURA

It is the document resulting from the negotiation process between importer and exporter. The invoice will indicate all the conditions of sale of the goods, and must contain the following information:

- a) Name of the parties
- b) Description of the goods, quantity, gross weight, net weight, unit price and value;
- c) Minimum and maximum quantity of goods allowed for shipment;
- d) Type of packaging and presentation of the product;
- e) Payment method;



- f) Terms and conditions of sale;
- g) Date and place of delivery of the goods;
- h) Place of loading and unloading of the goods;
- i) Deadline and validity of the proposal;
- j) Signature of the exporter;
- k) Place for the importer's signature (if there is agreement with the proposal);

The invoice can also be replaced by a quotation sent by letter, as long as it contains the information described above.

COMMERCIAL CAPACITY

Considered one of the most important documents in an export operation. This document, which will be used at the time of clearance of the goods (already at the place of destination) must contain all the elements related to the operation. With the following information:

- a) Name and address of the exporter;
- b) Name and address of importer or purchaser
- c) Specifications of the commodity in the official language of the General Agreement on Tariffs and Trade;
- d) Marking and numbering of volumes;
- e) quantity and type of volumes;
- f) Gross weight;
- g) Liquid Weight;
- h) Country of origin – the country in which the goods were produced;
- i) Country of acquisition – the country from which the goods were purchased;
- j) Country of origin – where the goods were at the time of purchase;
- k) Unit price of the goods;
- l) Transportation costs and other expenses;
- m) Payment condition and currency;
- n) Terms of Sale – Incoterm;

The air bill of lading is equivalent to a commercial invoice, as long as it contains all the information regarding the quantity of goods and values.

PACKING LIST

In order to facilitate the identification of products within the same batch, the packing list is a document used both in the loading and unloading of goods. The packing list should contain a list of the following elements:



- a) Document number;
- b) Name and address of both parties;
- c) Date of issue;
- d) Description of the goods containing quantity, unit, gross weight and net weight;
- e) Place of loading and unloading of the goods;
- f) Carrier's name and date of shipment;
- g) Number of packages, identification of them in numerical order, type of packaging, net and gross weight per volume and dimensions of each package.

TAX NOTE

The Invoice must accompany the goods in all stages of the export that occur from the departure of the goods from the exporter's establishment. This document must be issued in national currency, based on the conversion of the FOB price into reais. The Note must be issued in the name of the importing company in cases of direct export.

SINGLE EXPORT DECLARATION (DU-E)

The DU-E is a document that must present information of a customs, commercial, administrative, financial, fiscal, tax and logistical nature that characterizes exports. Its preparation takes place using only the number of the access key of the electronic invoice and the system will automatically load the data imported from the NF-e.

The DU-E shall have the following information:

- a) CNPJ of the Declarant;
- b) Export terms;
- c) Single load reference;
- d) Currency of the trade;
- e) Clearance unit and corresponding customs area;
- f) Boarding unit and corresponding enclosure;
- g) Means of transport;
- h) Description of Items (Containing NCM, Description, Quantity, Net Weight, Condition of Sale, VMCV & VMCE, Agent's Commission)
- i) Name and address of the importer;
- j) Country of destination;



BILL OF LADING

The Bill of Lading is a document that aims to formalize the contracting of the transport operation, proving the receipt of the cargo at the origin and guaranteeing the obligation to deliver the goods at the destination. The bill of lading shall contain the following information:

- a) Name and address of the parties;
- b) Place of loading and unloading of the goods;
- c) Quantity, brand and type of packages;
- d) Description of the type of packaging;
- e) Description of the commodity and its code (NCM)
- f) Gross and net weight;
- g) Value of the goods;
- h) Dimensions of the volumes;
- i) Freight cost;

It is also important that this document contains information regarding the conditions in which the goods were shipped, which can be: Shipment without restrictions, goods received apparently in good condition, among others. This statement states that the goods must be delivered to the importer in the same condition in which they were made available by the exporter.

TRANSPORTATION INSURANCE POLICY

In negotiations in which the exporter is responsible for contracting the insurance, it is also necessary to have a policy, proving that it has contracted. The insurance aims to cover possible damages that may occur with the transported cargo.

CERTIFICATE OF ORIGIN

The Certificate of Origin serves to prove that the product does indeed originate in the exporting country. It is extremely important in operations involving countries that grant tariff preferences and are provided by accredited entities. It is the duty of the certificate of origin to contain the following information:

- a) Value of national inputs in dollars;
- b) Value of imported inputs in dollars;
- c) Description of the production process of the goods;
- d) Regime and/or rules of origin;



LETTER OF CREDIT

The letter of credit is a payment method that relies on the intermediation of banks, thus ensuring the security of the commercial transaction. The letter of credit guarantees the exporter that the payment will be made in full, in addition to reducing production risks, in cases where the importer cancels the order.

The letter of credit has 5 parties involved, namely: Importer, issuing bank – the one that will issue the credit at the request of the importer, warning bank – has the responsibility of accessing the credit at the request of the issuing bank, confirming bank – the bank that will act as guarantor, confirming the credit and the exporter.

CONCLUSION

According to research carried out through the works already mentioned above, it is concluded that the elaboration of the strategy is not based on a single aspect, but must be adapted to the reality in which the evaluated company is inserted.

In summary, when evaluating the choice of strategy, one must take into account the complexity of the process, which involves both rational elements and intuitive, political and emergent elements. Generally speaking, strategy is something that evolves as the organization learns and adapts to its environment. Therefore, the process of formulating strategies is not strictly linear or predictable, but rather a dynamic and continuous process, elaborated in an organic manner.

Oliveira understands that it is necessary to carry out an analysis of previous results so that the desired results can be achieved in a more efficient way, carrying out the steps already explained for the analysis of its internal and external environment and definition of its market positioning, it is possible to create a solid strategy that contributes significantly to the insertion of the company in the international market.

In this way, using SWOT Analysis, it is possible for the company to obtain a broad view of its market positioning, thus being able to establish specific metrics of the environment in which it operates. By complementing this observation with Porter's 5 forces, the company will be able to mitigate and solve risks present in both its internal and external environments.

Based on the results obtained in the initial analyses, the company will begin the preparation of its specific export planning. Where it will evaluate the best destination options and what are the peculiarities of the chosen country to assess if there will be a need for modifications in the products offered and even have a concrete parameter on the feasibility of the operation.

These methodologies precede the elaboration of a specific strategy so that the export directed to its target audience is carried out with greater assertiveness. In this way, it is possible to regularize



according to all the necessary documentation. Thus, it is possible to carry out the entire export process in an assertive way, mitigating errors and ensuring the success of the operation.


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Citizenship training: Rescuing citizenship

 <https://doi.org/10.56238/sevened2024.010-064>

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ABSTRACT

The object highlights that the teenager, from an excluded family, studying in a precarious school, finds in the Young Apprentice Program an opportunity for professionalization. The general objective is to understand the cultural, family and school contexts of adolescents. The specific objectives are to describe the cultural context; talk about the family scenario; explain the school environment. The methodology highlights that the research in its structure is qualitative, considering that the data collection procedures are classified in the participant observation modality. The results highlight that from the wealth of testimonies heard, it is possible to obtain a change in the reality of young people in view of the opportunity to become professional. Self-esteem, posture, behavior, dress and improved communication with colleagues and institutions were added. These teenagers emphasize the importance of the course in this awakening for the world of work. The conclusion highlights that adolescents, through the Young Apprentice Program, obtain benefits such as better technical quality, inclusion in labor market, social integration, citizenship rescue and citizen formation, building an equitable society.

Keywords: Adolescent, Culture, School, Family, Apprentice.

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INTRODUCTION

Culture is a perspective of the world that people come to have in common when they interact. The family, as a class of individuals with an *innate stigma*, is hindered, excluded and made invisible by society. School, with a precarious scenario, excluded students, overloaded faculty, gives rise to social inequalities.

The object of this study is the Young Apprentice Program, which facilitates the finding of the first job and links work with education. The problem reflects why do teenagers want an opportunity in a Young Apprentice Program? The general objective is to understand the cultural, family and school contexts of adolescents. The specific objectives are to describe the cultural context; discuss the family scenario; explain the school environment. The hypotheses are: the seriousness of the situation of misery for the poor family represents the instability of affective bonds and the fraying of solidarity; the family environment hinders the emotional health and cognitive development of adolescents; Language, habits, customs, and family values are distinct from the school community.

THEORETICAL EMBEDDING

Andrade; Santos and Jesus (2016) argue that the Young Apprentice Program is an initiative of the Federal Government built through public policies and mainly by incentives, opening paths for young people to obtain their first job.

Borges (2010) corroborates that young workers, who start a work activity at an early age, bring desires to be someone, to be happy from their work.

Oliveira and Godoy (2015) demystify that the social appreciation of being employed and the support of positive fraternal figures are the main protective factors, as well as the main coping strategies are rationalization and investment in close relationships.

Freitas and Oliveira (2012) point out that young people suggest improvements and indicate paradoxes in the work-training relationship, using a citizenship education, differentiating *The student who works* and *the worker who studies*.

Moura (2009) reflects that work for most young people represents a transformation in their lives, because through it they consume, contribute to the family income and come to be valued by society.

Culture, shared in interaction, constitutes a consensual perspective on the world and directs acts in this universe.

Culture distinguishes those with whom one interacts. The social institution signifies a single universal vision.



Community organizations are the vehicles of culture. If you are socialized to accept the suggestions of those who have many years of history on your side, a long tradition. Institutions also have a genesis, as do communities and groups.

A sapience is a common perspective, a set of ideas that people develop and learn in social interaction.

Every society develops a culture that has a set of truths, and so does every community in society, every formal organization, group, and dyad.

The ideas are *Cultural*, are formed in social institutions and taught to people as members of them. Even if true to a certain extent, they are also limited in capturing reality, because each is a focus, exaggerating certain aspects of reality and belittling others.

In Brazil, there are opportunities for those who *works decisively*. It's a place where this kind of person can rise to the top. It is based on competition, which brings out qualities, efforts and competitive characteristics of the human being. If one succeeds in this system, one will be able to maintain what one has achieved. If it is not successful, there are chances that this actor has not performed enough. These suggestions are *Cognitive*. They function to protect the economic system and social inequality.

Culture is also made up of ideas about the things worth striving for (ends). They are of two types: values and goals.

One *value* It is a long-term commitment on the part of the institution or the individual. It is a strong preference, a building principle around which goals are set and action takes place. One *purpose* It is a short-term goal of an individual or community organization in a specific situation.

An intense commitment to a social organization means that the institution itself becomes an important value for the individual. If you can be willing to give your time, money, or even your life for it: you can see that the whole purpose of life is connected to it.

Values serve a purpose: they mobilize individuals around desirable ends and lead them to act in ways that help the organization. They reflect what is useful and taught by those at the top of the social structure.

The relationship between values and action is complex. Equality, for example, is a value that is often held, but clearly not respected in relation to racial minorities.

The country as a society has a system of values that it shares throughout history. This set is composed in part of the precepts of individualism, equality, and material success. Enumerating the purposes of a country is a difficult task, as there are numerous exceptions and contradictions.

However, on a very general level, each country does have a common value system, especially if analyzed in contrast to other societies.



Within a country, each community also has a set of purposes, influenced by the wider society, but also unique by virtue of the interaction that occurs in a given community over time. Each shares the dominant wisdom, but each is in some way unique in the precepts it emphasizes. Each formal institution also develops a value system, and the same is true for each group.

Goals, like purposes, are the ends that people work for. Goals are practical goals, precepts are moral goals. Targets must be hit and replaced by others; Values are general guides for action. Designs are the specific outcomes around which the action is organized, the shots that create the problems that are being tried to solve.

Values are important to goals. It is the abstract long-term commitments that act by overseeing the targets. We work towards designs that are consistent with the commitments of purposes.

Values and goals are two components of culture. They arise between people as interaction occurs over time.

In interaction, one agrees on the rules of the game (the means employed to achieve the ends), and agrees to observe them while being in the social organization. They can be simple procedures to follow, or informal expectations, traditions, laws, or moral positions.

Norms exist in every social institution and are part of the pattern called culture. They influence, shape, or control (depending on the situation) the action of the individual.

The concept of *subculture* testifies that there are many markedly distinct groups and communities in a society. At the same time, the term implies that it does not develop in a vacuum, but is influenced by broader wisdom in various complex and subtle ways.

The term *counterculture* It is used to designate other cultures within the dominant wisdom in society. The Counterculture Explicitly *It rejects the norms and values that bind the dominant culture, while the subculture finds ways to assert the national wisdom and fundamental orientation of purpose of the dominant societal system.*

Reality can exist *Outside*, regardless of how the person perceives it. However, the way you see it, what you think about it, or what you consider correct, originates from the social construction of truthfulness. It is through social life that one comes to know what exists, that one learns what is real, what to name it and how to use it. Between the *axiom as it is* and *authenticity as the person sees it* There is a social organization and its culture, the social lenses through which one looks.

Souza (2009) argues that the real social disturbances that cause pain, suffering and daily humiliation for tens of millions of Brazilians are made invisible.

To hide the non-economic factors (social, emotional, moral, and cultural preconditions) of inequality is to make invisible the two issues that allow *understand* The phenomenon of social nonconformity: its genesis and its reproduction in time.



The Brazilian modernization process constitutes an entire class of individuals devoid of the social, moral and cultural preconditions that allow this appropriation.

This social stratum is only perceived in the public debate as a group of needy or dangerous individuals, treated fragmentarily by superficial topics of discussion, data that never even name the real problem, such as *violence, public safety, public school hardship, lack of public health, fight against hunger, etc.*

Class of actors with a *Inhaled Estigma*. These are the people who are always one step away from delinquency and abandonment. This layer is modern and is created by the affective, emotional, moral and existential impossibility of *incorporation* of the indispensable assumptions for the appropriation of both cultural and economic capital.

Although there are always economic and political interests behind ethnic and religious differences, the absence of a shared solidarity of national adhesion is decisive, where rivalries are resolved in a violent, cruel and genocidal way.

An efficient national identity builds the foundations not only of the dominant group solidarity, but it is also an indispensable source, in modern conditions, for the very constitution of the individual symmetry of each one.

Without institutional and social practices that stimulate and guarantee the possibility of criticism and independence of opinion and action, there are no free individuals. The problem is that it is not easy to understand the insidious ways in which the practices of the dominant powers construct the illusion of freedom and equality.

Is it, then, the family' *s fault* for the reproduction of inequalities and injustices?

The lower classes in Brazil, or more properly their socially inferior level, often do not have even one type of apprenticeship. Sometimes, even if any parent encourages their children to go to the institution, the reasons for this choice are *cognitive, paying lip service*, since most of these parents also did not go to the organization or did not have any personal experience of school success.

It is the conflict, the struggle between contradictory needs, interests or ideas that makes the individual acquire and form his own unique personality. It is also altercation that makes it possible for an entire society to perceive and criticize the perverse and inhuman consensuses that permeate it and influence its history. Without explicit dissent, both a person and a societal system are doomed to blindly repeat conventions and ideologies.

Social *action theory* is a set of concepts and notions that explain why individuals behave the way they effectively arrogate to themselves. It must explain why actors and societies are different from each other.



Ingrained prejudices and outdated concepts go hand in hand in order to prevent a more elaborate and sophisticated verification of the causes and consequences of peripheral modernization and its sequelae, such as abyssal inequality, marginality and sub-citizenship.

Racism, although disguised, continues in the culturalist vision that also *essentializes* and homogenizes individuals and entire societies.

Economic progress is perceived as a panacea for solving problems such as inequality, marginalization, and sub-citizenship. There is a *fetishistic* belief in financial ascension, which makes us expect the expansion of the market to solve all Brazilian problems.

Liberalism has always been the ideology of the expanding market and the classes that gain from this extroversion. Since the nineteenth century, but especially in the twentieth century, there has been an evident polarization between defenders of the State, as the driving force behind the social development of a backward societal system in all dimensions of life, and the heralds of the free action of the market to achieve the same ends.

There is an intimate relationship between poverty and scientific debate *versus* the capacity for public reflection. The ideas that inhabit the minds of politicians, media men, opinion makers of all kinds, etc., are, for the most part, the conceptions of intellectuals and thinkers. It was science that inherited the *prestige* and *authority* that were once the privileges of religions and the great religious prophets. It is good to remember this in a country so colonized by economic data that only perceives the material reality that money builds. Even this axiom of *hyper-economism* that populates the nation is, above all, a product of representations, precisely of a kind of petty and reductive liberalism, which under the guise of *social criticism* actually reproduces a societal consensus responsible for one of the most unjust and perverse global societies.

Ceccon; Oliveira and Oliveira (1984) state that parents are very concerned because not all children are able to get a place in the organization and, even those who do, begin to have bad results. They fail, have to repeat the year and run the risk of leaving without having learned anything.

Parents feel guilty because they are not able to help their offspring as they would like with homework and exam preparation. They arrive exhausted from work, still have to take care of the minors, and often do not master the knowledge and subjects that the school requires.

Teachers, in turn, feel overworked and undervalued in their work. Their working conditions are bad: overcrowded classrooms, lack of teaching materials, very extensive and complicated programs, etc.

Everyone wants the academic community to be a kind of ladder that leads to a higher floor, to an improved life, to a good job with a high salary.

This expectation regarding what the school can and should do is even stronger in the poorest social strata. For the people, it is practically the only means of economic ascension, of ascent in life.



Success in studies would be the great opportunity offered to everyone to compensate for societal inequalities.

The great hope of those who fight for compulsory and free institutions is that with an equal starting point for all and with the same path, nine years of basic education, they would now have equal opportunities to succeed.

There is a chasm between these promises and reality, between intentions and facts, between what the organization should be and what it actually is.

It is above all children from the lower classes and the rural areas who fail in school and are forced to interrupt their studies.

The fate of the vast majority is to take the hardest, lowest-paid jobs with the highest risk of unemployment at the time of crisis.

Poverty and misery have a major influence on institutional outcomes.

The work impairs the organizational performance and the student ends up failing in repetition and dropping out of school.

School regulations and requirements are seen as the cause of many of the problems that children and parents have to face: there is the problem of lack of places, not all students are able to enroll in the first year at the right age.

Then there is the problem of the location of the institution. Mothers often can't get a place in the organization closest to their home. Children are forced to make long journeys to and from each day every day.

Many of the embarrassments pointed out could be solved if the school had a different attitude towards innocence. To this day, the institution has treated the *lazeira* as if it were people's fault, a birth defect that only gets in the way of the work in the organization. And, in fact, it is entangled because it was not designed for the poor.

There is no attempt to adapt the school to the needs of the deprived, which would be perfectly possible; but, on the contrary, they are asked to fit into an institution that was not made for them, which is practically impossible. And since they can't do this *miracle*, they are gradually eliminated, which makes *the problem* disappear.

Minors arrive at the organization in an unequal situation.

To end the mass failure of the poorest children, it is necessary to see and understand how the school is arranged from within. It is necessary to know the mechanisms and the way in which this gear works, which makes a few succeed and the vast majority fail.

The law says that the institution is the same for everyone. But in reality, there are big differences between them: there are the *good* ones and the *needy ones*.



In *underserved* organizations, teachers are overworked and dissatisfied. Because of this, they spend little time in school. The didactic material (primers, books, etc.) is inadequate and insufficient. Classes are overcrowded and the younger ones have less class time. In these institutions, educators are absent more often, students are rebellious or disinterested, and there are more problems of discipline.

Within the organization, everything changes. These same children who have always known how to fend for themselves, who have learned by observing and doing, who at home and on the street are smart and talkative, at school do not understand what the teacher says, feel incapable of learning, close in on themselves, become silent, sad and passive.

As soon as he enters the institution, the poor child has to learn to express and write in a language other than the one in which he has always spoken, at home, with his parents and friends.

The organization does not seek to know or value everything that the child already knows, all his life experience that he has learned at home and on the street and that he brings to school. For the institution, the minor has insignificant knowledge, does not bring anything positive, quite the opposite. He brings ways of speaking and behaving that need to be corrected.

Academic exercises are almost always done around problems that don't exist in real life. When the teacher asks a question, she already knows the answer and only accepts as a correct statement what she knows. The institution does not help the students to solve concrete problems, situations that they really understand and for which they are interested in seeking the solution.

The way the organization teaches does not help the learner to learn how to learn. It does not instruct what to do to recognize the existence of a problem, how to look for possible deciphering, choose and test the solution that seems best, and verify the result that has been reached.

The school, as it is organized, does not encourage solidarity, mutual help among students, or teamwork. The fundamental rule of the institution is that everyone should make do as they can.

The small minority of students who succeed in the organization attribute these good results to their own merits and talents. This causes them to consider themselves superior to the vast majority who fail.

The purpose of the school, as it exists today, is to form a privileged minority that will later think, direct, plan and give orders to others. On the other hand, the destiny of the majority marginalized by the institution will be to carry out the orders and plans made by the owners of power and knowledge.

The way in which the school is organized is the result of the composition of society as a whole.

The poorest are marginalized by the organization in the same way that they are exploited at the level of labor relations and prevented from participating in political life.



The school is not democratic because society is not yet truly egalitarian. The owners of power are also the controllers of knowledge, and the poor are excluded both from the institution and from participation in decision-making.

The social system is not only the landlords of the condon, it is also all those who, until now, have had no time or voice.

The corporate system can and should change.

Changes will only come if key stakeholders move. Transformations are always the result of the actions of those who protest against the unfair treatment they have been receiving from the organization and demand a different school that truly meets the interests of the majority.

As it is the poorest children who need the organization the most, it is urgent and a priority to adopt measures that ensure *that all* of them *enter* school and *remain* in education for as long as possible.

Some of these practical measures, with an immediate positive effect, are the following: extension of the duration of the institutional workday; adaptation of the school timetable and calendar to the needs of working children; Free distribution of all academic material.

After these administrative measures, which have an immediate impact, it would be necessary to face the more complicated and difficult question of changing the content and methods of teaching.

It is necessary to adapt the institution to the real conditions experienced by the vast majority of its students who come from the most disadvantaged homes.

In this sense, it is very important to help teachers to consider teaching more and better. Often it is because they do not know how to deal practically with the difficulties encountered by poor children in learning that educators blame the victims. With this excuse, they do not take into account the real situation of their students, nor do they question their own way of instructing.

It is necessary to ensure that all students can learn essential things such as knowing how to read and write their mother tongue well; develop mathematical reasoning well; acquire basic knowledge of history, geography and the social environment.

The path to be followed for the change of the organization is the same route that the people have already been treading in search of solutions to so many other problems of their daily lives.

Instead of waiting for solutions to come from above – from the authorities, from the government, from the experts – the people themselves decided to act. Discussing together, in small groups and communities, he began to become aware of his own strength and his ability to unravel recent decipherments. It is by discovering new solutions together and helping each other instead of each one being quiet and silent in their own corner that people have come to understand how to organize themselves to defend their rights. In this daily struggle for survival and a better life, they *learn* and *teach*.



He knows to the extent that he understands how society works and dismantles, little by little, this complicated mechanism of which the school is only a part. The people identify when they try to understand together why their children do poorly in the institution and discover that the problem is not individual, but collective and that its solution depends on the whole community.

Seeing, judging and acting together, the people are educated and show that education does not happen only in the organization. We educate ourselves every day, throughout our lives, learning from the experiences we live and assimilating even more if they are discussed in common.

But when the people come together to look for new solutions to their problems, they also teach. Throughout their journey, people shed light on the lesson of hope and solidarity. They explain how it is possible to find ways out in situations where there is apparently no way. They elucidate how to survive when unemployment and poverty could lead to despair. They clarify how it is possible to invent solutions from oneself.

It is in this process of organization from the bottom up, tempered in the struggles of each day, in the victories and defeats that have so much to argue, that lies the seed of a new attitude and a new way of acting: trusting in one's own strengths to find the answers and put them into practice.

This creativity and solidarity are not learned in the life of the school as it is today, but in the school of life. The challenge, then, is to tackle the problem of organization in the same way that the people have faced much more complicated challenges. It is necessary to bring into the institution lessons that people have learned and taught in the school of life.

METHODOLOGY

The method was rational inductive (knowledge from the particular to the general), with ascending direction and apodictic causal demonstration. The analysis (from the least to the most complex) and the synthesis gave the knowledge a global meaning with qualitative, bibliographic, ethnographic, applied, descriptive and participatory research. The documents were drawn from primary sources. Primary data collection occurred with universal selection, coding, tabulation, and interpretation. The techniques used were participant observation and content analysis with independent and continuous variables, and non-probabilistic sampling for accessibility.

Science condemns subjectivism (which includes the argument from authority and expediency as criteria of truth) because, instead of enlarging, it diminishes or denies the rationality and objectivity of knowledge. Science only accepts as true what is verifiable by verification compatible with the scientific method.

Inductive reasoning describes knowledge from the particular to the general. The upward direction is typical of this method. Apodictic causal induction is the syllogism that enunciates in the



antecedent the necessary causal relation between two phenomena and, in the consequent, generalizes this relation into a truly valid statement.

Qualitative research considers that there is a dynamic relationship between the real world and the subject, that is, an inseparable link between the objective universe and the subjectivity of the individual that cannot be translated into numbers. The interpretation of phenomena and the attribution of meanings are basic in this process.

The bibliographic argument highlights a general overview of the main works already carried out, which are important because they are capable of formulating current and relevant data related to the subject.

Ethnographic inquiry emphasizes the study of the qualities and characteristics of the object of study through participant observation.

Descriptive scrutiny highlights the explanation of the characteristics of a given population, phenomenon, or the establishment of relationships between variables.

Participatory disquisition accentuates the development based on the interaction between researchers and members of the situations investigated.

The primary sources are historical and bibliographic data.

Core data is data that is collected directly at the source.

Coding is the operational technique used to categorize data that relate to each other. Thus, they are transformed into symbols, which can be tabulated and counted.

Tabulation is the arrangement in tables, making it easier to verify the interrelationships between them.

Participant observation is based on the fact that the researcher-observer becomes an integral part of a social structure and, in face-to-face relations with the subjects of the argument, collects data and information.

Independent variables are those that affect others but need not be related to them, and continuous variables are those that can take on an ordered set of values within certain limits.

Non-probabilistic sampling depends solely on the researcher's criteria, and in the accessibility demonstration, the specialist selects the elements to which he has access, assuming that they can, in some way, represent the universe.

RESULTS AND DISCUSSION

The research problem: *why do teenagers crave an opportunity in a Young Apprentice Program?* It follows comprehensive and complementary paths of this important undertaking of being an apprentice.



The target audience was adolescents between fourteen and eighteen years old, who were regular at school, and who had been enrolled in some apprenticeship program. They should have an available workload of four days. Have a family income of up to half a regional minimum wage per capita, preferably from a family benefiting from federal government social programs aimed at the low-income population. They were in their first year of high school, with fifty students in the classroom. Ten percent of them were enrolled in apprenticeship programs.

From the richness of the testimonies heard, it was observed that the reality of the young people was changed in the face of the opportunity to become professional.

The sponsoring entities spare no effort to see their inclusion objectives achieved in the face of an exclusionary society. This exclusion is caused, among several factors, by school failure, since successive failures aggravate the situation of the less favored, who, because they do not have a degree, present themselves to the recruiters of the companies at an almost insurmountable disadvantage. Many, considered by corporations as incapacitated, are permanently excluded from the world of work and deprived of any possibility of social inclusion.

It is gratifying for all professionals who work in the young apprentice programs to feel, at the end of the modules, the growth of adolescents demonstrated by the increase in self-esteem, posture, behavior, way of dressing and improved communication with colleagues and institutions.

It is noted that the simple observance of the apprenticeship legislation, articles 428 to 433 of the Consolidation of Labor Laws and the inclusion of adolescents in these programs, has the power to produce significant changes in the lives of youth. In fact, it is proven that in the face of their professional initiation, combined with schooling and specific professional training, young people have grown integrally, as human beings and citizens.

The theoretical basis confirmed the *hypotheses*: The seriousness of the situation of misery for the poor family represents the instability of affective bonds and fraying of solidarity; The family environment hinders the emotional health and cognitive development of adolescents; Language, habits, customs, and family values are distinct from the school community.

It is necessary to realize that innocence surrounds us: it persists within schools, in the news, and in various social studies. In the classrooms, this reality is evidenced by the hungry and impoverished bodies of children and adolescents who arrive at schools, who are, in many cases, also *lazeiros*. Due to such a significant presence, this issue has become the object of public policies, such as *eradication of poverty*.

The possibilities of reflection and action, problematizing the theme of innocence and social inequalities in the educational context, underpin the recognition of the situation of social exclusion.

It is considered that in the face of discussions and laws that plead for equal rights for all, education in the 21st century is still not considered a priority in government policy, which translates



into the challenges of financing and managing education. Perhaps these are political, administrative, or cultural issues. Or, in addition to all the real difficulties that poverty brings, there is also the behavioral barrier of self-indulgence, thinking that it has always been like this, that it is not possible to change, a thought that comes both from the subject and from the educational community itself.

In the course of this scientific work, I observed in my relationship between what I analyzed and my self-analysis as a researcher, mediated by interactions with other professionals (specialists, authors, experts) that there were conflicts that dynamized the research process. I interpret this as a relational perspective as a condition for the operation of the so-called *humanities* when it comes to qualitative scrutiny methodologies. Here I point out ways of thinking, judging and giving opinions as evaluative indications. Perhaps, in this recognition, the attribute I have highlighted is located.

Josviak and Bley (2009) point out that it has already been observed that youth is a time of transition in which one passes from complete dependence, which characterizes childhood, and, going through a series of stages, reaches the full autonomy of adult life.

In the process of transition from childhood (dependency and studies) to adulthood (autonomy and work), the process of insertion in the labor market plays a fundamental role, which is conditioned by the aforementioned aspects, giving them their own connotation.

For years, in several legal systems, including the Brazilian one, in the approach to work, a distinction was made between the phases of the lower age, up to eighteen years of age, and the adult phase. In recent decades, in Brazil, work and professionalization have been placed in the perspective of 14 to 24 years, taking into account their specificity in this age group.

The ILO (International Labor Organization) reveals that within the youth there are several excerpts about living in the urban and rural sectors, about gender, about the total young population, about which they work and study, who only study, who only work, about work modalities, including informal work, about the importance of *entrepreneurship* On the need for professionalization in the globalized world in which the productive process is changing, on youth unemployment with causes and effects.

Several factors make governmental and non-governmental programs propose to include young people also in other modalities of legal labor relations: the associative modality of which the cooperative is a modality, the autonomous, the family regime, the entrepreneurship.

The most correct approach emphasizing education at the elementary and secondary level is being given by the Pro-Youth Program inserted in the National Youth Policy, to be executed jointly by the Municipal and Federal Governments with the objective of providing young people (from 14 to 24 years old), in a situation of social inclusion and vulnerability: the increase in schooling, with the completion of elementary school; professional qualification, with a certificate of initial training; digital inclusion, with the development of community actions of public interest.



Professionalization of young people is a relevant issue in the current conjuncture when it comes to their insertion in a highly competitive and demanding market regarding the required capabilities.

The current technological transformations and the effects of the globalization of the economy on the productive sector are demanding a multi-skilled professional with multifaceted employability.

The most perfect of the technical-professional training alternatives is provided by school learning, regulated by articles 39 to 42 of Law 9.394/96 – LDB.

Law No. 11,180 of 2005 institutes the Escola da Fábrica project as a modality of initial and continuing professional training for low-income young people aged 14 to 24 years (monthly per capita income of up to one and a half minimum wages), as long as they are enrolled in basic education in the public network (elementary and high school, art. 21, Item I of Law No. 9,394/96) or in supplementary courses for young people and adults (art. 37 of Law No. 9,394/96).

CONCLUSION

The adolescent, throughout the history of humanity, has always been seen as a miniature adult. Rescuing their rights, constitutionally guaranteed by article 227, is a duty that they impose on everyone and, among these, acquiescence to professionalization. Among the various occupational forms, learning emerges as an efficient, legal means that provides real equality, as it enables the excluded to have access to it.

The recovery of citizenship, through citizenship education, where the understanding of the cultural, family and school contexts of adolescents is solidified through the richness of the testimonies heard. I observe the achievement of a change in the reality of young people in the face of the opportunity for professionalization. This is demonstrated through its

There is an increase in self-esteem, posture, behavior, way of dressing and improved communication with colleagues and institutions. These young people, when asked, highlight the importance of the course in this awakening to the world of work. They say they are aware of the transformations that have occurred in this process and of the new market possibilities that are opening up, thus improving their quality of life and that of their family.

Today's world of work demands people with professional qualifications, critical thinking and proactivity. Such requirements are far from young people from low-income families, due to the low level of education and access to job training. In this context, learning returns to its origins as an alternative to change this situation.

The fragility of public policies greatly contributes to the process of exclusion of thousands of adolescents from the qualification process, further increasing social inequalities. Increasingly, the



impoverished layer of the population has survival as its main objective and, in the face of this scenario, talking about the guarantee of fundamental rights is an almost inoperative discourse.


Thus, through the Young Apprentice Program, adolescents obtain benefits such as better technical quality, inclusion in the labor market, social integration, recovery of citizenship and contribution to an equitable society.



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Prototype to automate the screwing process in motion on the back covers of televisions using the conveyor tracking technique

 <https://doi.org/10.56238/sevned2024.010-065>

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ABSTRACT

This article aims to address the automation of the screwing process of the back cover of televisions. Currently, this task is performed manually, which results in slow production, repetitive effort, and intense concentration on the part of operators. The proposed solution involves the development of a prototype that uses the conveyor

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tracking technique to automate on-the-go bolting. During the development of the project, several challenges were faced, such as: precise torque control to ensure that the bolts are tightened with the correct force, implementation of a vision system to use cameras to identify screwing points, synchronization with different models on the conveyor belt to adapt the system to handle different types of televisions, automatic feeding of the screws to ensure that the screws are supplied continuously, compliance with the current line times (Takt Time) to maintain the proper production rhythm and confirmation of screwing at each point of the product to verify that all screws have been correctly tightened. The methodology used in the development of the bolting module included the following steps: specification of requirements and planning that aims to identify the functionalities of the prototype and planning of activities, the mechanical design that allowed the creation of 3D and 2D drawings of the bolting module, the automation project responsible for the preparation of a bill of materials or commercial items and the software project stage responsible for programming the automation of the module, including control logic and communication with other systems. The successful implementation of this project will result in a number of benefits for the production line, including increased productivity, reduced operator fatigue, and improved product quality. In summary, scientific research not only enhances industrial processes but also enriches society and strengthens the academic knowledge base.

Keywords: Automation, Bolting, *Conveyor Tracking*, Vision System.

INTRODUCTION

Industrial automation has been increasingly used in industry, with the aim of increasing efficiency and reducing costs. One of the applications of industrial automation is the bolting technique, which can be carried out using robots or automated systems.

According to Andrade Jr (2021), screwdriving is a technique that requires precision and care to ensure a firm and secure fixation. It is critical to choose the type of bolt that is suitable for the material to be fixed and the force required to support the applied load. The process involves drilling a hole in the material, followed by inserting the screw into the hole and tapping it with the help of a tightening tool. When the screw thread comes into contact with the material, the fastening becomes firm, resulting in a strong and durable joint.

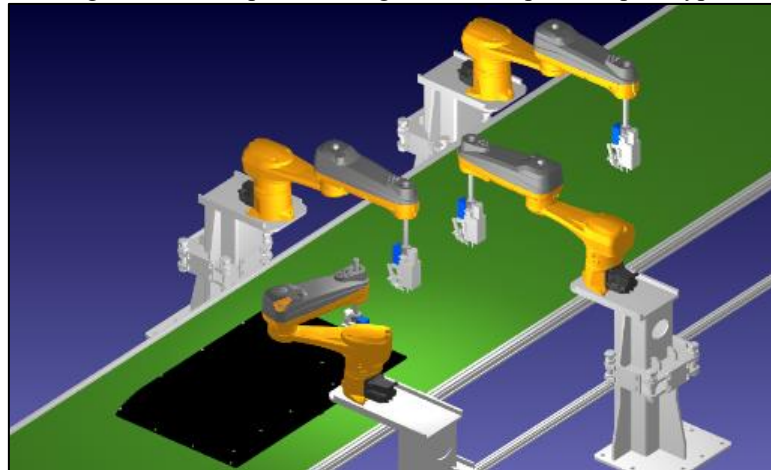
Fastening by means of screws is a versatile technique that finds application in several areas, such as in (Costa, Penteado and Filippin, 2020), the fixing of components in electronic equipment, in the automotive industry, in Gaspar (2017) the screwing of the panoramic roof of an automotive vehicle, in (Carvalho, Medeiros and Carvalho, 2018), the screwing and fixing of aeronautical wing fasteners, in (Martinez, Al-Hussein and Ahmad, 2020), in the construction of structures in the area of civil construction and in Oliveira et al. (2022), in the area of screwing the rear cabinet of televisions.

In addition to the diverse application areas, the work of (Dharmara, Monfared, Ogun, and Jackson, 2018) presents the development of an automated assembly solution to perform the screwing of screws of different sizes into threaded holes of corresponding size, which can be located in random positions within a defined workspace.

Bolting can be tiring and repetitive for workers, requiring precision and consistency to ensure product quality and safety. An effective solution is the use of *conveyor tracking*, a technology that automates the tracking of the position of screws on the production line, making the process more efficient and automated.

This article aims to develop a prototype that uses the *conveyor tracking* to accurately identify the location for automatic screwdriving on TVs from 32" to 86" during movement. The Figure 1 It illustrates the initial concept of the prototype, showing the belt in motion with the product starting the screwing process. In addition, the text addresses the process of selecting the materials and methods to be used in the development of this automated system.

Figure 1 – Conception of the general concept of the prototype



Source: Prepared by the authors (2023)

METHODOLOGY

In this section, the methodology used in the development of the bolting module is presented, covering the requirements specification and planning, the mechanical design, the automation design and the *software design* as follows:

- Research Application: Regarding the research approach, the qualitative method was adopted and, according to (Terence & Escrivão Filho, 2006), the objective is to improve knowledge about a given topic, taking into account the perspective of the individuals involved who had direct experiences with the research problem, without worrying about the numerical representation. The next phase was to carry out the planning and gathering of requirements.
- Planning and Requirements Gathering: This stage involved the team responsible for the progress of the FPFtech project (Project Manager, *Product Owner*, Mechanical Engineer, Automation Engineer and Electrical Engineer) who visited the production line to gather requirements and also to collect data, such as: product models, *takt time* of the line, types of bolts used, torque control, among others. In addition, collaborative workshops were held for requirements planning, based on *Lean Inception practices*, which, according to Caroli (2018), deals with the alignment of a team on the product to be built. The *workshops* allowed the elaboration of a development plan that includes a macro schedule that involves the projects of mechanics, automation, *software*, assembly and integration of modules, among others.

After identifying and planning the necessary requirements, the next step was to start development which involved design and assembly.

- Development - Design and Assembly: Based on the studies carried out, the prototype modules were developed, including the screwing module that comprises the selector,

dispenser, screwing head and centralizer. For the mechanical development of these modules, the *CREO* Parametric modeling *software was used* , which allows the rapid development of products according to Gladkova, O. et al. (2021). From this tool, the 2D and 3D drawings of each part of the cutting and machining module were created.

- Automation project: With regard to the automation project, initially, the BOM (*Bill Of Material*) was prepared, that is, a list of materials or commercial items that would need to be purchased for a compliant product to manufacture or assemble (Tozawa & Yotsukura, 2009), such as servo motors, sensors, robots, vision system, among others.
- Software *design*: the automation of the module was programmed using a PLC (Programmable Logic Controller) using the Ladder diagram language explained in Villagomez et al. (2018). After the mechanical parts were manufactured, the bolting module was assembled.
- Results and discussions: This stage is the phase in which each module developed is checked to ensure that it meets the specifications of the problem, through the elaboration of test scenarios by Sommerville (2015) and the collection of results.

The next steps in the development process led to the results and discussions of the article as follows.

DEVELOPMENT OF THE BOLTING MODULE

In this section, the current bolting process and its limitations are described, as well as the survey of the prototype functionalities, the detailed design of the project, the research, the simulations, the development of the mechanical and automation design for the construction are carried out.

PLANNING AND SURVEY AND REQUIREMENTS

Manual screwing process

As shown in Figure 2, bolting is carried out by several operators while the belt is moving. Each operator has his or her own attachment point according to the size of the television, as is the example of an 86" TV: operators 1, 2 and 4 fix 4 screws; Operator 3 fixes 3 screws and Operator 5 fixes 4 screws. This amount of screwing and operator positions are defined according to the positions of the screw entries on the tailgate. of the bolting module and the application of *the conveyor tracking* technique.

Figure 2 – Manual process scenario



Source: Prepared by the authors (2023)

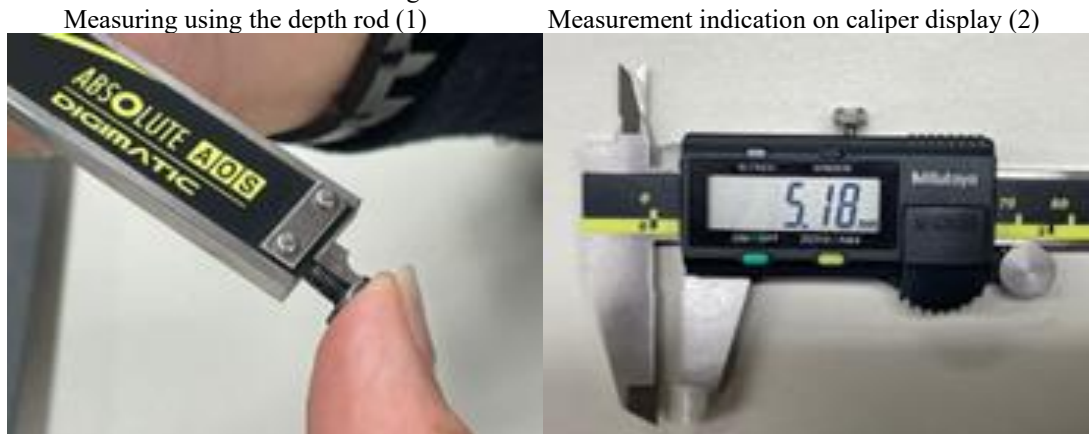
Automating the bolting process is essential to overcome operational productivity limitations, eliminating bottlenecks on the production line and significantly increasing production capacity. In addition, according to Moura & Moura (2019), this manual production generates "pains" such as ergonomic risk, Repetitive Strain Injuries (RSI), Work-Related Musculoskeletal Disorders (WMSD), in addition to the risk of late detection of assembly error.

BOLTING MODULE DESIGN

The project envisages sharing the same screwdriver for three different types of screws. To propose the sizing of this flow, Screw – Conduction Pipe – Screwdriver, the measurement method was carried out through the caliper, considering the most critical screw model of this implementation, which is the M3x5.5 mm screw with the shortest thread length.

The first measurement, according to the Figure 3, was performed with a digital caliper with an approximate tolerance of 0.03 mm (1), and the length of the screw thread body was first measured using a depth rod, which resulted in an approximate measurement of 5.18 mm (2).

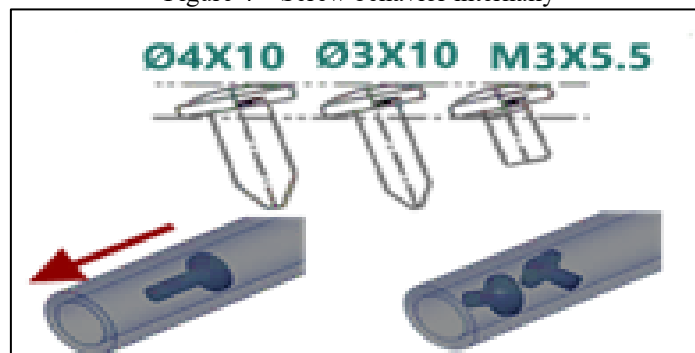
Figure 3 – Screw Measurement



Source: Prepared by the authors (2023)

Once the sizing was done using the smallest screw as a parameter, it moved on to the next step, which was screwing, where it was realized that the conventional method of screwing would cause an unwanted side effect of involuntary internal movement of the screw because the model has a thread body smaller than the internal diameter of the pipe, as illustrated in the Figure 4.

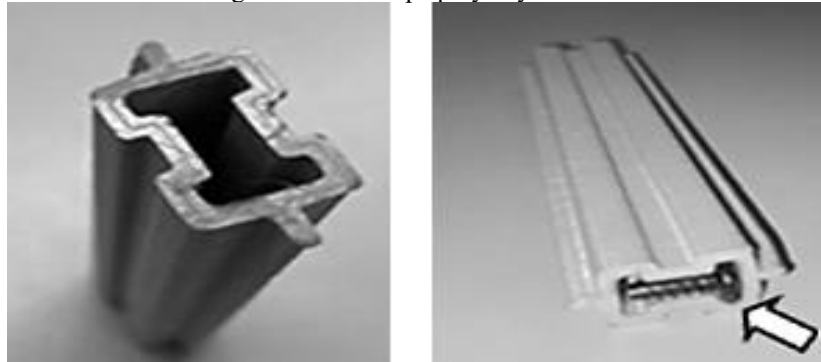
Figure 4 – Screw behavior internally



Source: Prepared by the authors (2023)

A solution has been developed to prevent the screws inside the pipe from rotating, allowing the screw to follow the correct path to the screwdriver nozzle. In contrast to conventional methods, the innovative project proposes the manufacture of a conductive tube with an extruded internal profile that corresponds to the dimensions of the screws. This tube has the appropriate dimensions for the three models and ensures the precise routing of the screw to the nozzle of the screwdriver for screwdriving, according to the Figure 5.

Figure 5 – "I" shape polyethylene hose



Source: Prepared by the authors (2023)

The use of the solution in the form of a polyethylene hose in the shape of a "T" shape raised the need to carry out a study to determine the appropriate torque for the screwing process in different models of televisions, which range from 32" to 86", and use different types of screws. The purpose of this study is to ensure that the product is properly fastened, avoiding possible failures during use.

It is essential to find the ideal torque value, as applying excessive force can result in the breakage of the screw head or the deformation of the parts involved in the process, as mentioned by Matos (2011).

Correct torque sizing is crucial to ensure the quality of the bolting work, preserving the durability of the product and avoiding future problems. To this end, it was decided to design the study based on the proportions of the M3x5.5 screw model, as illustrated in the Figure 6.

Figure 6 – Selection of bolt type and torque

ESPECIFICAÇÃO	M3x 5.5 mm	Ø3x 10mm	Ø4x10mm
TORQUE (kgf.cm)	5~7	6~8	5~7
DESENHO			

Source: Prepared by the authors (2023)

After completing the studies on the behavior of the screws and torque, the next step was to choose the robotic arms and dispensers.

After the TS2-80 robotic arm model was selected, computer simulations of the bolting process were performed to determine how many robotic arms would be needed to perform the task with the same current production volume. The parameters were evaluated using 4 and 5 arms, as shown in Table I, which shows a comparison between two configurations of robotic arms.

Table I – Simulation Parameters

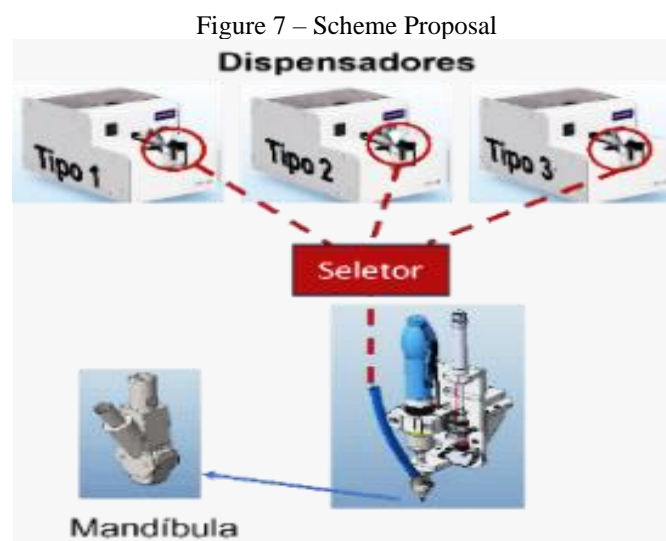
Parameters	Configuration	
	4 robotic arms	5 robotic arms
Number of apparatus per unit. Stole	5 (approx.)	4
Overload	0	-20
Speed	2.5s	2.2s
Takt Line Time	17.5s	17s
Efficiency Capacity being utilized	100%	80%

Source: Prepared by the authors (2023)

The decision was made to configure it with 4 robotic arms because it was more suitable for the company. The choice achieved the same *takt time* as the simulation with 5 robotic arms, even using 100% of the capacity of each arm. The simulation demonstrated that a system with 4 robotic arms is feasible for the application in question and that the addition of a fifth robotic arm would make the system costly.

Once the number of robotic arms was defined, a solution for bolting variability was devised with the use of dispensers and screw selectors as follows.

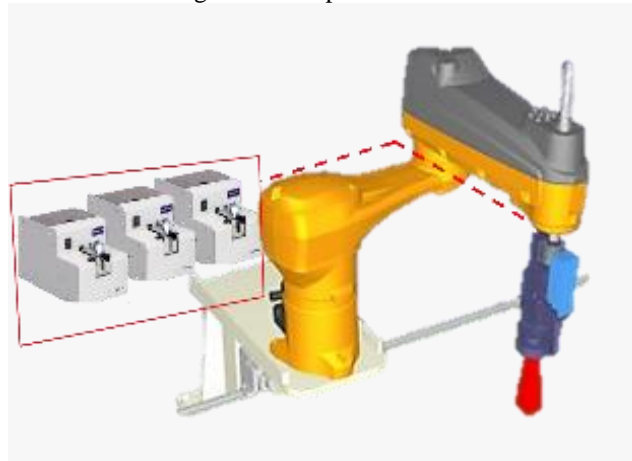
The dispensers are designed to distinguish between the three different types of screws, which resulted in the need to implement a system that integrates 3 dispensers that share the same screwdriver and jaw, as illustrated in the Figure 7.



Source: Prepared by the authors (2023)

This allowed the same robot to connect to this jaw system with dispensers, serving different models of televisions, according to Figure 8. This solution adds great value due to the versatility of screw feeding and the autonomy of carrying out the screwdriving activity in different models.

Figure 8 – Dispenser scheme

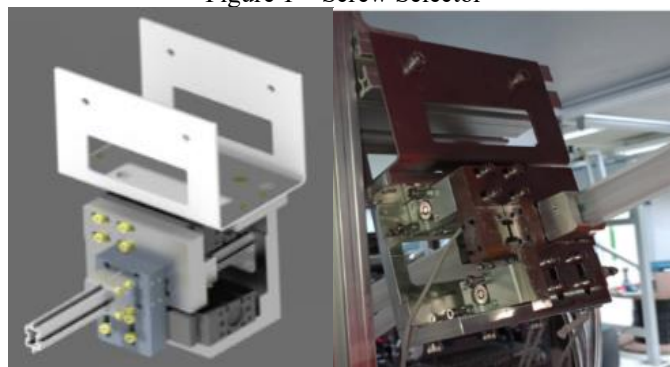


Source: Prepared by the authors (2023)

The selector is responsible for automating the process of selecting and guiding screws. The bolt selector of the extruded pipe model will be used in the bolt selection process that requires both a support and coupling structure.

To this end, the mechanical assembly that will be part of the bolt selection process was developed, as illustrated in the Figure 9. The mechanical structure of the screw selector has the function of interconnecting the hose of the three dispensers with the hose of the robot by switching the positions between them.

Figure 1 – Screw Selector



Source: Prepared by the authors (2023)

The next step was the mechanical structure of the screw dispenser screwing module.

MECHANICAL STRUCTURE OF SCREW DISPENSER MODULE

The screw dispenser from Figure 10, is one of the parts that has been developed in order to accommodate the different types of screws used in the screwdriving process. It is specifically designed to connect to the screw selector mechanism presented earlier.

Figure 10 – Screw Dispenser



Source: Prepared by the authors (2023)

After machining the parts of the selector and the screw dispenser module, the two parts were assembled on one *rack* Designed for the purpose of grouping each component for each type of screw, according to the Figure 11.

Figure 11 – Dispenser rack



Source: Prepared by the authors (2023)

Once the mechanical structure of the module was done, the next step was the integration of the modules.

INTEGRATION OF AUTOMATION MODULES

In agreement with the company, the TS2-80 robotic arm from the Scara brand was chosen Illustrated in the Figure 12, due to its compliance on the X and Y axes and rigidity on the Z axis, making it a popular option for small-scale assembly applications. The Scara configuration is unique and designed to handle diverse material handling operations, according to Carvalho et al. (2018).

Figure 12 – TS2-80 Robot



Source: Prepared by the authors (2023)

After the mechanical design of the screwing module, *conveyor tracking* was started, which will transport the televisions to be screwed.

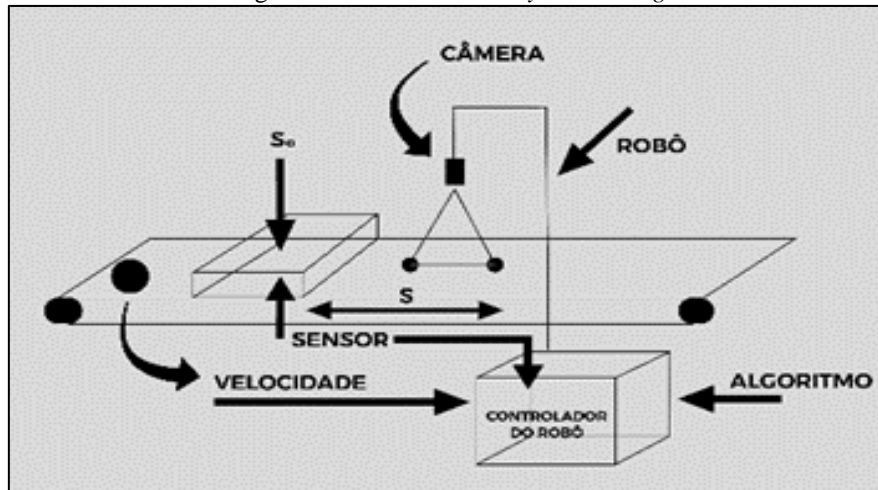
CONVEYOR TRACKING

The *conveyor tracking* system consists of a horizontal conveyor belt that moves products along a certain path and at a certain speed. Along the conveyor, presence sensors and a vision system have been integrated that capture information about the position and orientation of the products in real time and send it to the robot's controller.

The sensor detects the markings by generating electrical pulses that are converted into position data by the system. This data is then used to control the speed, direction, and precision of the robot's arm movement.

The Figure 13 shows in the *conveyor tracking* the presence of a presence sensor(s), speed control (*Encoder*), the screwdriver where the vision system (camera) and the robot were attached. The sensors are responsible for detecting the presence of the products on the conveyor belt and providing data on their precise location. Meanwhile, the computer vision system analyzes the captured images to identify the specific points on the televisions where the screws should be inserted

Figure 13 – How the *Conveyor Tracking*



Source: Prepared by the authors (2023)

According to Milan (2022), the vision system is an area of artificial intelligence that uses algorithms and techniques so that machines can interpret and understand images and videos. In the vision system, a red illumination was attached to the mechanical structure of the screwdriver because it highlights both plastic and metallic objects. The aim is better image contrast for bolting target identification.

By using red illumination, it is possible to reduce unwanted interference and reflections that could hinder the detection and analysis of the bolting target. In addition, the contrast provided by red illumination can help differentiate the target object from the rest of the environment, making it easier for the vision system to identify and track it.

The integration of the bolting system with the real-time vision system enables precise identification of the bolting points, even when the products are moving on the conveyor, as the actuation of the *conveyor tracking* allows this integration.

However, in order to achieve the appropriate screwing point, in addition to the development of the mechanical part, a parameterization study of the heights of each *back cover* was carried out. This study was necessary as the design needs to be configured to accommodate different television models.

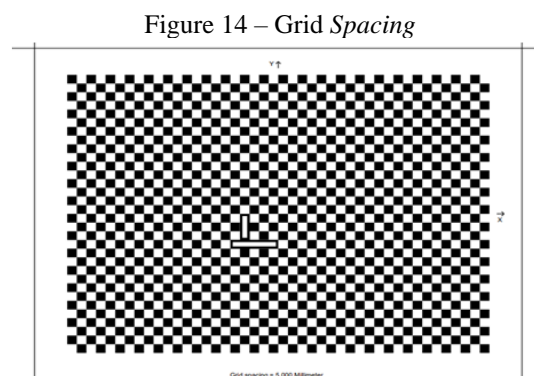
According to Moura (2019), parameterization is the process of configuring parameters in systems, devices, or computer programs. These parameters are adjustable variables that influence the behavior, characteristics, and settings of the system. In industrial environments, parameterization is used to adjust parameters of equipment, machines, and automated systems, such as speed, power, safety limits, and tolerances.

In the project, this parameterization was carried out through the human-machine interface. The values of the x and y coordinates of each screw are passed to the robot so that the z-axis can descend correctly.

To establish the synchronism between the camera and the robot, an alignment process was carried out in the Cartesian plane, following the steps below:

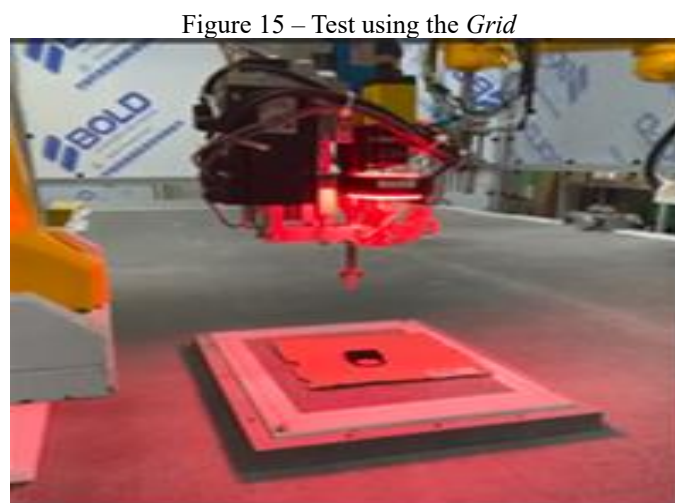
1. Definition of a coordinate system using a reference point as the origin.
2. Adoption of units of measurement in millimeters for precise scaling.
3. Creating a grid with reference lines to facilitate visual alignment.
4. Marking of the relevant reference points on the grid.
5. Positioning of the robot and camera according to the coordinates of the grid.
6. Fine-tune the camera to align it perfectly with the grid.

The Figure 14, shows the point of origin that should serve as a reference for the robot's movement of the screwdriver. The high contrast between the black and white grids allows cameras and sensors to accurately identify the robot's location and orientation relative to the standard.



Source: Prepared by the authors (2023)

The Figure 15 It shows the screwdriver attached to the mechanical arm with the red vision and lighting system. This alignment enabled efficient communication and coordination between the robot and the camera, allowing them to work together in a synchronized manner.



Source: Prepared by the authors (2023)

The development of the bolting module led to the result and discussion of the aforementioned project.

RESULT AND DISCUSSION

To evaluate the performance and ensure the functionality of the bolting system, unit and modular tests were conducted in a laboratory and functional environment to ensure the effectiveness of this integration.

TESTE LABORATORIAL

The test began with setting the robot's range to perform the screwing. Based on the strategic positioning of the robots, an area of action was defined for each one, aiming to reach specific bolting points in the product as illustrated in the Figure 16. Here is the distribution of the points of each robot:

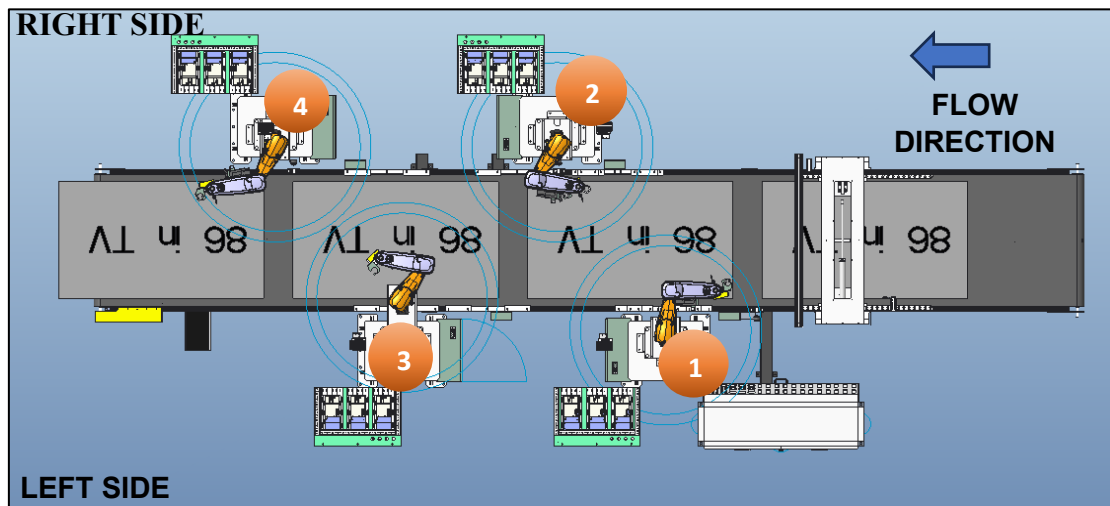
Robot 1: Responsible for the left side points of the product.

Robots 2 and 4: Responsible for the points on the right sides of the product.

Robot 3: Responsible for the central points of the product.

This division allowed for an efficient and coordinated approach, ensuring that all bolting points are properly serviced.

Figure 16 – Dimension Jig and Dots Tv 65"

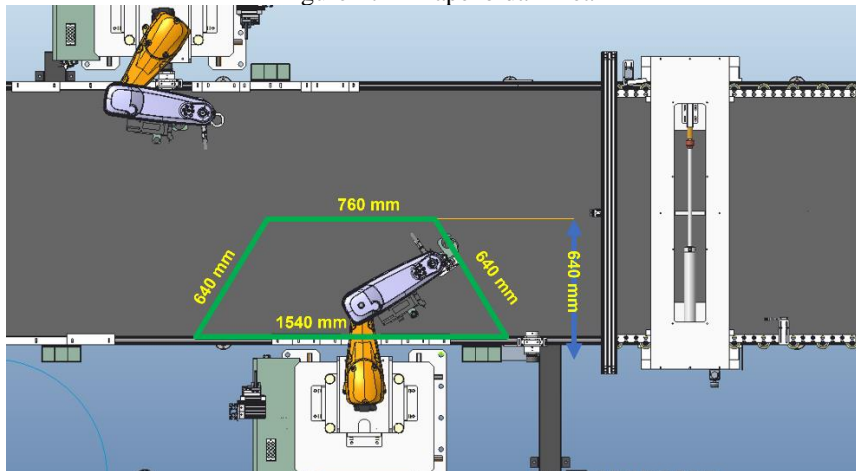


Source: Prepared by the authors (2024)

To evaluate the trapezoidal area, the 65" TV model was defined with its respective dimensions and points that need to be screwed. Each robot was designed to occupy a specific trapezoidal area, which delimits its region of action according to the Figure 17. During the design process, possible collisions were also evaluated. The trapezoidal area marked in green is the work

zone. The measurements of 1540 mm and 760 mm are the bases of the trapezoid, while the measurements of 640 mm represent the non-parallel sides.

Figure 17 – Trapezoidal Area



Source: Prepared by the authors (2024)

During these tests, the repeatability in relation to the **cycle**, the **height** and the **number of screws** to be fixed, as well as the failures were evaluated. These results are illustrated in Table II, which shows the performance of four screwdriving robots in several test cycles, highlighting the failures that occurred during the process. Each robot faced specific challenges, such as bolts that got stuck at a 45° angle, and the table records the total number of bolts involved in the test, as well as those that failed or fell out.

For example, for Robot 01, there were no failures in the recorded test cycles. Robot 03, on the other hand, had several failures in different cycles, highlighting a test in which 3 screws were stuck at the 45° angle, with one screw falling in the 10-screw cycle at a height of 51 mm.

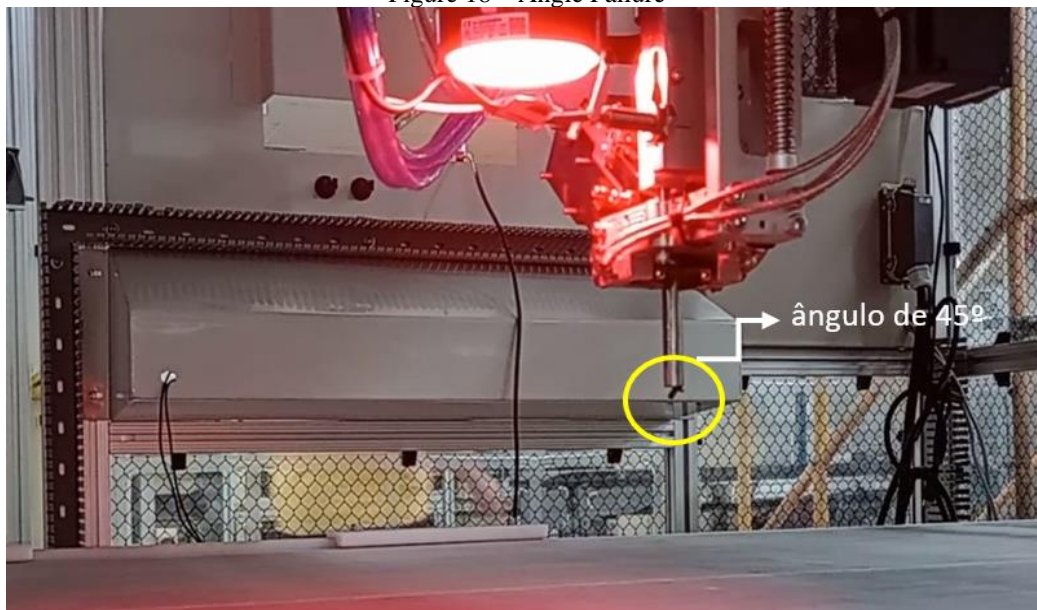
Table II – Test Parameters

TESTS PERFORMED WITHOUT THE PRODUCT					
Robot	CYCLE	HEIGHT (mm)	SCREWS	FAILURES (quantity of screws) / (screws that fell off)	
Robot 01	8	48	4	1 - It got stuck at the 45° angle	0
	25	51	4	3 - Got stuck at the 45° angle	0
	30	47	4	0	0
Robot 02	CYCLE	HEIGHT (mm)	SCREWS	FAILURES (quantity of screws) / (screws that fell off)	
	30	48	3	0	0
Robot 03	CYCLE	HEIGHT (mm)	SCREWS	FAILURES (quantity of screws) / (screws that fell off)	
	10	51	3	3 - Got stuck at the 45° angle	1
	30	49	3	1 - It got stuck at the 45° angle	2
	30	49	2	2 - Got stuck at the 45° angle	1
	30	50	2	Using timed still had 2 - Got stuck at the 45° angle	0
	30	47	2	1 - It got stuck at the 45° angle	1
	30	57	2	3 - Got stuck at the 45° angle	2
	30	50	2	Performing jaw alignment still had 1 - It got stuck at the 45° angle	0
	40	47,5	2	3 - Got stuck at the 45° angle	0
	30	46	2	0	0
Robot 04	30	47	2	0	0

Source: Prepared by the authors (2024)

During the tests, the heights corresponding to the vacuum position were adjusted in order to achieve a zero failure rate. This is due to the fact that certain failures were associated with improper angulation of the screws. In Figure 18, illustrates the moment the screw is stuck at the 45° angle.

Figure 18 – Angle Failure



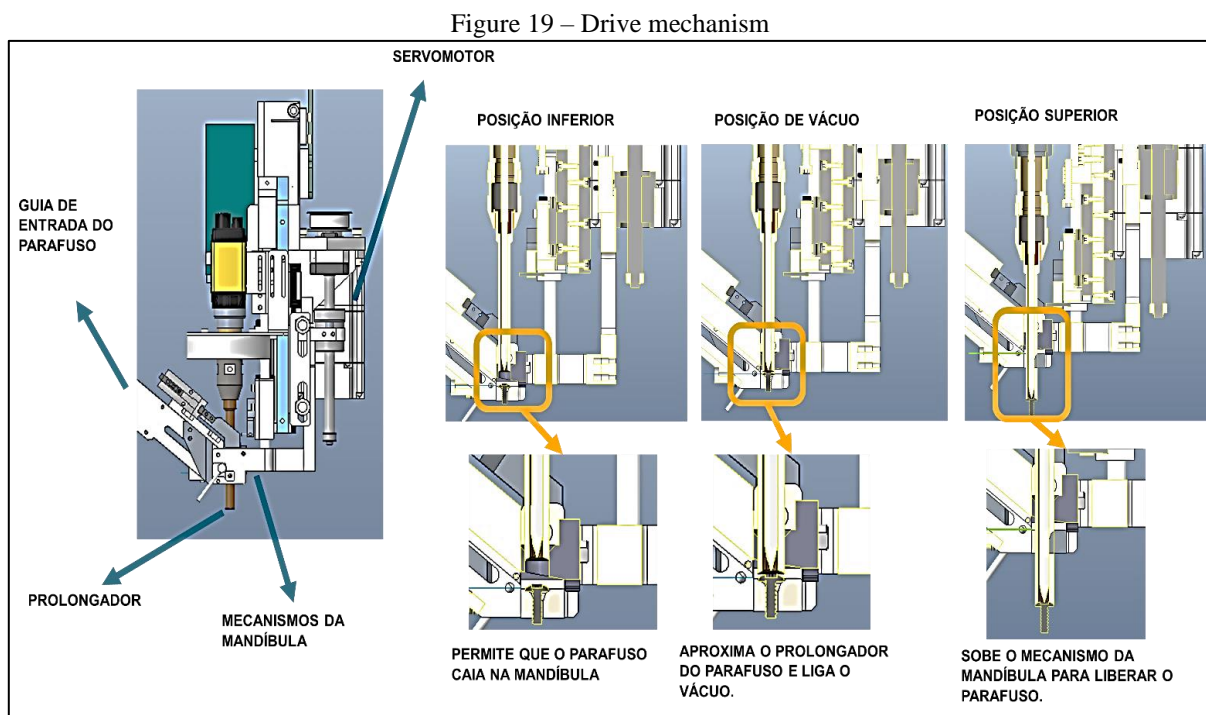
Source: Prepared by the authors (2024)

To exemplify the operation of a vacuum positioning system for screws, the Figure 19 It presents a detailed diagram with the main components.

1. On the left, we have a detailed view of the internal components of the system:

- BOLT ENTRY GUIDE: Allows the bolt to be routed correctly.
 - PROTRACTOR: Makes the screw approach and turns on the vacuum.
 - JAW MECHANISMS: Makes the ascent to release the screw.
2. In the LOWER POSITION, the screw falls into the jaw.
 3. In the VACUUM POSITION, the extension comes closer to turn on the vacuum.
 4. In the TOP POSITION, the jaw mechanism rises to release the screw.

The orange arrows indicate the process flow, and the orange rectangle points to the part of the machine that performs the critical bolting action.



Source: Prepared by the authors (2024)

Further tests were carried out after making adjustments to the jaw and the heights corresponding to the vacuum position, using the same 65-inch, 12-screw television model with the 4 robots. The results achieved can be seen in Table III.

Analyzing the table, it is observed that for Robot 01 and Robot 03, the result was 0/0, indicating that there were no failures or bolt falls. Robot 02 had a recorded failure (a bolt stuck at the 45° angle), but no bolts fell out. Robot 04 had a fault recorded, indicated by the number 0/1, meaning that there were no faults during bolting. But a bolt fell off. With a significant reduction in failures from table II to table III, it is expected to make fine adjustments on the production line.

Table III – Results after correction

Robots	CYCLE	HEIGHT (mm)	FAILURES (quantity of screws) / (screws that fell off)
Robot 01	30	47	0/0
Robot 02		48	1 - Got stuck at the 45°/0 angle
Robot 03		46	0/0
Robot 04		47	0/1

Source: Prepared by the authors (2024)

TESTS ON THE BOLTING MODULE

At the beginning of the screwing cycle, the alignment test of the *back cover* on the conveyor belt so that it enters the centralized module regardless of the size of the television model, as illustrated in the Figure 20.

Figure 20 – Centering the 65" Model TV



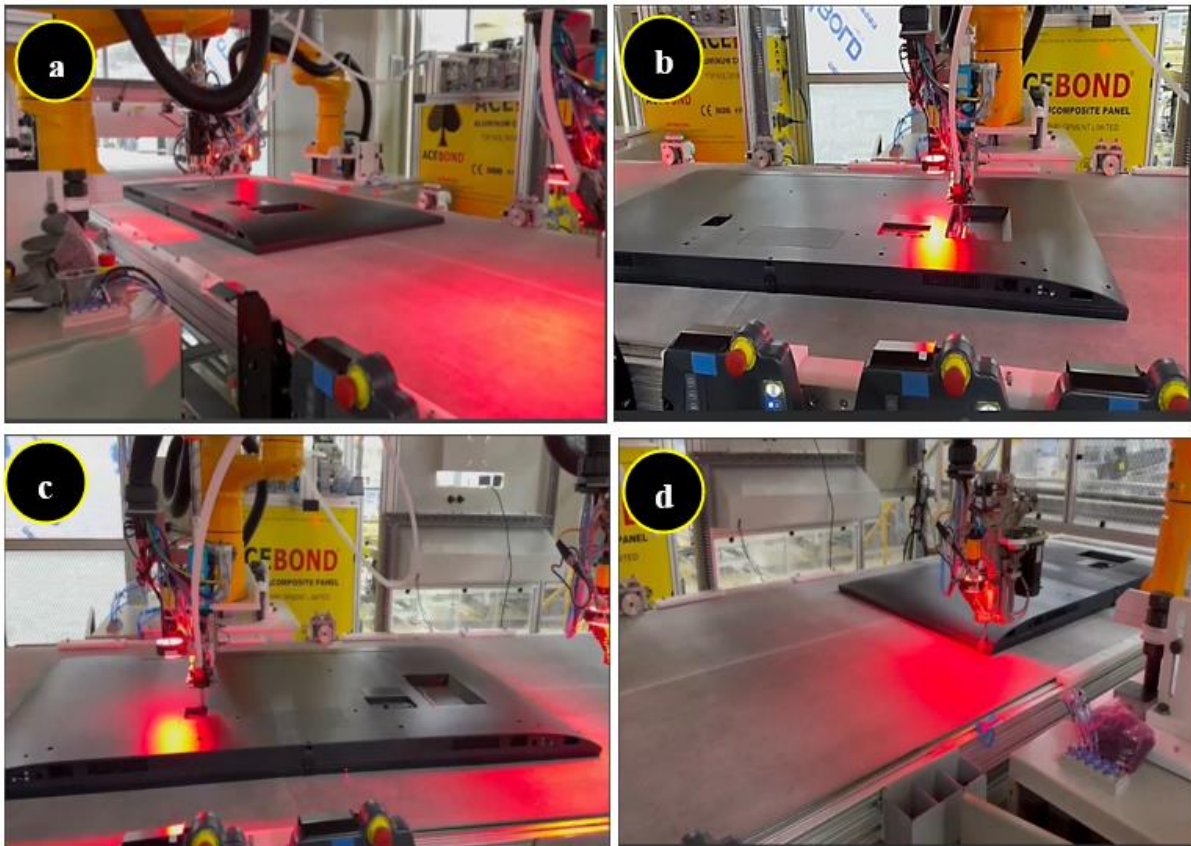
Source: Prepared by the authors (2024)

The test involved positioning the robot at different distances from the bolting point, evaluating its accuracy. The camera vision system was used to correctly locate and position the bolting point in real time.

The test of *tracking* with the camera was essential to verify the efficiency and reliability of the automated screwing system. Criteria such as success rate in locating the bolting point, response time, and accuracy in positioning the robot in relation to the target were considered. The results obtained as illustrated in the Figure 21 They ensure an efficient automated screwdriving process, even under changing conditions. In Figure 21 (a) the back cover passing through robot 1 to screw, in the Figure 21 (b) the back cover passing through robot 2 to screw, in the Figure 21 (c) the back

cover passing through robot 3 to screw and into the Figure 21 (d) the back cover passing through robot 4 to finish screwing.

Figure 21 – Screwing steps on the 65" TV



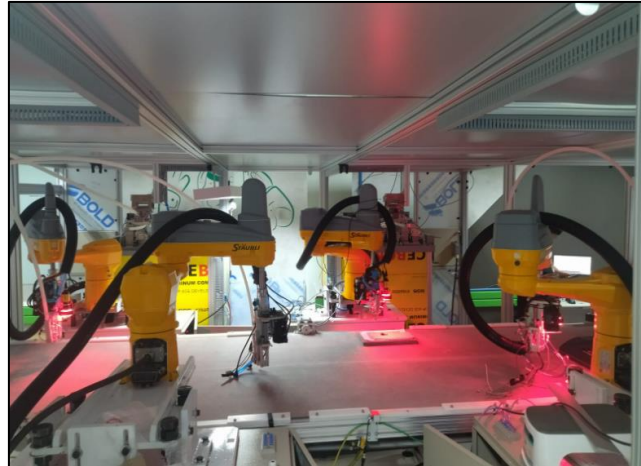
Source: Prepared by the authors (2024)

In summary, this project involved a series of carefully planned and executed steps, from concept design, technique study and testing, all with the aim of meeting the need for bolting. Each step was crucial to ensure that the bolting could be carried out correctly and effectively.

CONCLUSION

The project presents an important technological contribution by automating the screwing process of different models of televisions on the move, eliminating the need for human intervention. The key innovation is the synchronized combination of automation to select the proper screw and the optimal time to screw each product, ensuring production efficiency. The method of the *conveyor tracking* was used to integrate the vision system with the robots, as illustrated in the Figure 22, allowing you to follow the movement of the products on the conveyor belt during the automated screwing using different types of screws. This module works with programmable belts and sensors to ensure the correct positioning of moving products, maximizing time without interrupting production.

Figure 22 – Integration of robots



Source: Prepared by the authors (2024)

The combination of automated screwing, vision system, selector, dispenser and *conveyor tracking* is essential for the industry as it provides greater efficiency, accuracy and quality in assembly and automation processes. These elements work together to optimize production, ensuring the correct fixation of components and following the flow of products along the production line, the prototype is still in the implementation phase in the company and with that some adjustments must still be made.


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Recent student mobilizations and their contributions to educational purposes

 <https://doi.org/10.56238/sevened2024.010-066>

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ABSTRACT

This text was developed based on the research, readings and discussions carried out in the author's doctoral course, in the Graduate Program in Education of the Federal University of São Carlos (UFSCar), especially in the debates that took place at the Center for Studies and Research of the Vygotsky School (NEEVY), between the years 2017 and 2021 and in the discipline Critical Theory and Education of the aforementioned program, as well as through documentary research on the topic addressed. The concepts discussed here are based on Critical Theories and Historical-Cultural Theory and are part of the analyses presented in the resulting thesis, defended by the author in 2021. It carries out an analysis of the student mobilizations that have recently taken place in Brazil, drawing a comparison with other Brazilian historical contexts, in order to promote a discussion about the causes of the current struggles, their coping mechanisms and some of the main educational results obtained.

Keywords: Democratic education, Student mobilization, Political participation, Citizen emancipation, Social transformation.

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INTRODUCTION

Between 2013 and 2016, Brazil registered important and diversified student mobilizations in struggle for their rights, which were greatly threatened by changes in official public policies in the various spheres of power: local, state and federal. These mobilizations took place in several municipalities and states of the country, reaching a significant number of individuals.

Among the various episodes that marked these student mobilizations, a group of students occupied, in November 2015, the Diadema State School (SP) and, soon after, the Fernão Dias Paes State School, in an upscale area of the city of São Paulo (capital), to protest against the project of the governor at the time, Geraldo Alckmin, which, if it had advanced, It would lead to the closure of 94 schools in São Paulo. The project foresaw the implementation of the new cycle system and would imply the relocation of more than 300 thousand students. The student movement has spread and affected the classes of at least 26,000 students in 25 occupied schools, according to the Department of Education. Other states, such as Rio de Janeiro and Rio Grande do Sul, began to have the action of student movements similar to the one started in São Paulo.

More than schools, the students demonstrated that they wanted to occupy other spaces of representation, demanding more funds, positioning themselves against the reforms, fighting for more rights and to be effectively heard. These demonstrations, marked by an expressive capacity for organization and articulation, impressed and instigated: after all, what new form of student action would be presented in these occupations and what would be the objectives of these new fronts of struggle?

According to the statements of Pessoni and Libâneo (2018, p. 154): "Education, understood as a social practice, is situated in a dynamic and multifaceted context that requires a deep understanding of its purposes, since they give the direction of meaning to this practice".

Another relevant aspect of these episodes was the youth protagonism, since it was the students, organized in their school units, who elaborated and managed the various activities promoted, such as lectures, exhibitions, debates, artistic presentations, among others. The determination and effort to defend their positions engender what Petrovsky (1980) calls "volitional activity", pointing to necessary learning that involves autonomous thinking.

Many of these mobilizations had the support of teachers and the school administration. However, this was not the determining factor of success, since there were several cases in which students took control of the schools, closing them for the planned teaching activities, collectively creating a specific schedule for each unit.

It was said, especially of high school students in public schools, that they were politically apathetic and distant from the school institution. However, through participation in discussion activities on educational policies, in organized public demonstrations, in debates on social



networks on the internet, or in the face of the concrete experience of the precariousness of educational institutions, students became self-politicized. (GROPPO, 2018, p. 113)

Since the movements for "Diretas Já" in 1984 and "Fora Collor" in 1992, similar student mobilizations have not been registered in Brazil, suggesting a resumption of the strength of the struggle of the youth, thus opposing the idea of their apparent political apathy and disinterest. As stated by Piolli, Pereira and Mesko, cited by Groppo (2018):

[...] We are witnessing in Brazil a new cycle of collective actions or social struggles since the June Days of 2013. The occupations of schools by high school students in several states at the end of 2015 and beginning of 2016, as well as the occupations of schools and universities against MP 746 and PEC 55 at the end of 2016, have continued this cycle. (GROPPO, 2018, p. 89).

Cavalcanti (2011, p. 41) presents us with his view on student movements and their new forms of action:

Although it is no longer possible to clearly perceive organized and politicized youth movements to contest the current order, as was the case in past decades, when they played a relevant role in restructuring the current order in several countries, at any time it can be said that their different groupings have political, ideological, symbolic, implicit and explicit links. being, in any case, ways they find to interpret and manifest their own conceptions of the world, of life, of place, of space, ways of contesting the dominant culture.

The episodes that took place, marked by their evident strength of struggle and resistance, as well as the breadth achieved, fostered the analyses presented here. The aspects related to the important political-ideological clashes and the possibilities of transformation of the current order, as a result of the youth's position, assumed in the face of the official political-educational propositions, revealed themselves as possible and powerful forms of student action, contributing to the desired citizen emancipation.

EDUCATION AND POLITICAL PARTICIPATION IN BRAZIL

The analysis of the main and most discussed pedagogical currents, no matter how many variables they may present in terms of their content and method, shows that their main purposes are as follows: good theoretical foundation and technical/practical qualification, in the most diverse fields of professional activity.

Although they differ in many aspects, these pedagogical currents defend the need to ensure the appropriation of the content and its use as a tool, considering the particularities of the reality in which the students are inserted.

However, a more careful investigation allows us to highlight more specific elements, such as the need assumed by education to promote the autonomy of citizens, making them capable of



exercising their criticality on a daily basis. As Santos (2008) presented to us, a way of transforming the condition from mere consumers to citizens.

Also in this sense, Mészáros (2008, p. 47) warns us:

What needs to be confronted and fundamentally changed is the whole system of internalization, with all its dimensions, visible and hidden. Breaking with the logic of capital in the field of education is therefore equivalent to replacing the ubiquitous and deeply rooted forms of mystifying internalization with a comprehensive concrete alternative.

Educational institutions, guided by such precepts, must guarantee the right to education, not only as a form of qualification, but, above all, as a passport to definitive entry into citizenship.

As a process of knowledge, political formation, ethical manifestation, search for beauty, scientific and technical training, education is an indispensable practice for human beings and specific to them in History as a movement, as a struggle. History as a possibility does not dispense with controversy, with conflicts that, in themselves, would already engender the need for education. (FREIRE, p. 2014b, p. 10)

Corroborating this discussion, Adorno (1995) states:

[...] a democracy with the duty not only to function, but to operate according to its concept, demands emancipated people. An effective democracy can only be imagined as a society from which it is emancipated. (1995), p.140-141)

More broadly, education should provide men and women with multiple capacities for citizen action, which allows them to act in a way that fully enjoys what is offered, or what should be. The constant and effective participation of citizens in the elaboration of living conditions becomes a fundamental aspect for more successful and less exclusionary social constructions, allowing the overcoming of existing socioeconomic discrepancies.

In this sense, educational processes, when successful, can promote the expansion of community participation, establishing new and more elaborate criteria for the daily construction of citizenship.

Education is permanent not because a certain ideological line or a certain political position or a certain economic interest requires it. Education is permanent in reason, on the one hand, of the finitude of the human being, on the other, of the awareness he has of his finitude. Even more so, because of the fact that, throughout history, it has incorporated into its nature not only *to know that it lived*, but *to know that it knew* and thus to know that it could know more. Education and ongoing formation are based on this. (FREIRE, p. 2001, p. 14)

In the Brazilian case, due to the political opening carried out since the end of the Military Dictatorship in 1985, many and long steps have been taken in the construction of an educational model that promotes this citizenship. The implementation of the Law of Guidelines and Bases (LDB) in the 90s was a milestone in this process, establishing the general and fundamental parameters of education in the country. The movement of democratization of institutions, the inclusion of social



sciences in the curriculum and the expansion of popular participation in the daily life of the school, with emphasis on those living in the large peripheries, among other measures, allowed a reorientation of the school content, with emphasis on the problematization of the themes addressed. Gradually, a more critical educational process was outlined, supported by aspects of the Brazilian reality:

An education that would enable man to courageously discuss his problems. Their insertion in this problem. That he would warn him of the dangers of his time, so that, aware of them, he would gain the strength and courage to fight, instead of being led and dragged to the perdition of his own "I", submitted to the prescriptions of others. Education that would put him in constant dialogue with the other. That would predispose him to constant revisions. To the critical analysis of their "findings". To a certain rebelliousness, in the most human sense of the term. (FREIRE, 2014a, p.90)

In this sense, educators and students began to establish new forms of work relationship, more open and based on dialogue. The old and conservative paradigms imposed by the military regime were abandoned, and there were spaces for the propagation of liberating and libertarian pedagogies developed inside and outside Brazil, with emphasis on the works of Freinet (1978) and Freire (2001).

The last decades of the twentieth century were marked by pedagogical experiences in some Brazilian municipalities that had great relevance, such as the one carried out under the command of Paulo Freire in the Department of Education of the municipality of São Paulo, under the management of Luiza Erundina, in the early 90s. On the occasion, the project of democratization of the school institution began, with effective popular participation in its management. The dismissal of the old hierarchical forms of power (principal, teachers, employees, etc.) allowed for a reorganization of pedagogical practice.

It was therefore necessary to democratize the Secretariat. Decentralize decisions. It was necessary to inaugurate a collegial government that would limit the power of the Secretary. It was necessary to reorient the policy of teacher training, going beyond the traditional vacation courses in which the discourse on theory is insisted, thinking that the educators then put into practice the theory that was talked about in the course through the practice of discussing the practice. This is an effective way of living the dialectical unity between practice and theory. (FREIRE, p. 2014b, p. 38)

The results achieved in this period reinforce the thesis of the need for democratization of the school and pedagogical practices, aiming at its greater effectiveness. After all, it seems difficult to suppose today an effective educational practice that is carried out simply **for** someone, but between and with the people involved. "In the information society, the social and educational projects that mobilize the most motivation are those that contribute to the creation of meaning." (AUBERT et al, 2016, p.180).

Not only does the administrative machine gain from the greater division of functions, but the community also feels that it belongs to that place, due to the protagonism played by it. As the mother of a student from one of the schools in the municipal network of São Paulo pointed out at the time of



the aforementioned administration: "It's good because in part the community can know what the school is like from the inside. What is done with our children, the use of money. Before, the community was outside the gate. We only went to school to find out about our children's grades and complaints. That's all parents were called to do in the old days – or to bring a plate of delicacies to the parties." (FREIRE, p. 2014b, p. 38)

There have also been important changes in public educational policies in other Brazilian regions, such as those adopted by the government of Olívio Dutra, in Rio Grande do Sul, which created the "School Constituent Assembly" in 1999, being an important instrument for the construction of a more democratic school in that state and the new forms of choice of leaders by the community, adopted in states of the Northeast and Midwest. among many others.

In this way, gradually, the country was building a new education, guided by the need for a dialectical practice among all those involved, allowing a greater understanding of the educational process and its purposes, embarking on dialogical methodologies. The importance of the participation of the entire community in the educational process has become increasingly evident, contributing substantially to its elaboration and decision-making.

Brazilian society, after overcoming the difficult context of total lack of freedom experienced in the military regime, currently enjoys important pedagogical advances, such as the successful experience carried out by the Unified Education Centers (CEUs) in the city of São Paulo, which, installed in the most peripheral and needy areas of the city, carry out a great transformation in the communities. both within the schools and in their surroundings.

Another example to be considered is the Schools of Learning, developed in Spain and studied and applied in Brazil. They promote, through new methodological approaches, the breaking down of barriers between school, teachers, principals, students and the community. An example of this application in Brazil is the impressive transformation, both theoretical and practical, promoted by professor and manager Braz R. Nogueira at EMEF Pres. Campo Salles, in the community of Heliópolis, in São Paulo. With the valorization of popular actions and local social movements, it resignified the role of the school and the educational objectives in a slum area.

The examples cited here, as well as so many others, support the thesis of the need for democratization of education in order to achieve the desired success: an education that enables the human being to participate effectively in his own constitution as a social agent and in the society in which he lives, endorsing an important concept of the Historical-Cultural Theory. that of the "social situation of development" (BOZHOVICH, 1981).



STUDENT MOBILIZATION CREATING POSSIBILITIES FOR EMANCIPATION

The student classes have always played an important role in political and economic transformations around the world, from the Student Revolution of 1968 to the Arab Spring in 2011, they have been the protagonists of important conflicts and struggles for civil rights.

In Brazil, before, during and after the military dictatorship, young students have always been at the center of debates and actions. There are many historical episodes that have recorded the mobilization of this category. Much of the democratization experienced in the country in recent decades is due to the struggles waged by them.

However, many claim that in recent decades there has been a distancing of them in relation to political issues in the country. Whether due to frustration with the corruption installed at the various levels of power, or due to the fossilization of the forms of organization and action of politicians and parties, the fact is that there is widespread discontent with this segment of public life.

As the social scientist Marco Aurélio Nogueira analyzes: "They are less politicized in the sense that they are dedicated to entering the political system as it is there, with political parties, candidacies."² Such a group does not seem to find representativeness in the current entities of classes and acronyms.

However, contrary to the maxim of non-political involvement, they seek other mechanisms of action and transformation of society. They use new digital resources and the virtual communication of social networks and applications to establish action strategies. With so many modern communication tools available on the market, they reorganize their forms of struggle. In the words of Carina Vitral, who was in charge of the presidency of the National Union of Students (UNE), "[...] Politics is an instrument for the transformation of society and every occupation knows what politics is. Every movement knows that it is a political movement. They deny the political class, but not politics as a way of transforming society."³ Because of this disengagement from parties and politicians in general, they redraw the paths of the student struggle in the search for transformations, for whatever reasons.

With this new attitude, detached from the process of formal education and outside the planned pedagogical expedient, there seems to be a resignification of educational practice, often plastered in the old known forms. Subverting the established norm, these young people who took to the streets for a reduction in bus fares, for the cancellation of authoritarian government measures to close schools or for the end of corruption in the country, showed signs of political maturity and possible emancipation. As stated by Adorno (1995, p. 182), "[...] The only effective realization of

²Available:https://noticias.uol.com.br/Novo%20protagonismo%20estudantil%20_%20UOL%20Educa%C3%A7%C3%A3o.html

³Available:https://noticias.uol.com.br/Novo%20protagonismo%20estudantil%20_%20UOL%20Educa%C3%A7%C3%A3o.html

emancipation is that those few people interested in this direction direct all their energy to making education an education in contradiction and resistance."

These mobilizations are manifestations of the need for political positioning on the part of the student class, since democracy, contrary to what has been imagined, is not a permanent condition of a country, but a daily conquest. In many cases, and in the opinion of several analysts, Brazil is still rehearsing its democracy. "[...] In a truly democratic country, it is necessary to have institutions in society that are solid, and Brazil does not have this, or has this very embryonically." (FAUSTO, B. 2018)⁴

Thus, as Adorno warned, conformation generates an adaptation of the human, leading to its domestication (PUCCI, B; ZUIN, A. A.S.; LASTÓRIA, L. C. N., 2010). And, in a society where democracy is still so incipient, there is a permanent risk of collective control through the mechanisms strongly established by the culture industry (HORKEHEIMER, M. ADORNO, T. W., 1985), establishing semi-formation, making it impossible for subjects to achieve autonomy.

Thus, it remains for the resistance, be it from students or any other organized social segment, to devise new and necessary ways to minimize or eliminate this control.

If Brazilian education and its institutions, despite having recently been democratized to a certain extent, are still co-opted by the mechanisms of control, or by the sedimentation of ideas, perhaps the necessary strength to transform this situation lies in the youthful indignation.

FINAL THOUGHTS

As much as Brazil has registered a clear movement towards the democratization of institutions as a whole, old power structures are still active. There are many cases that show the incipient and often intermittent Brazilian democracy. In this sense, nothing is ready. There is always a lot to transform in social organization. Public policies, in general, tend to ignore the wishes of the population. They are based on isolated decisions of a questionable nature and do not meet social demands. Often they only reproduce the prevailing interests or, in an even more perverse way, create the false sense of meeting the needs of the various social groups. As Mészáros (2008, p. 35) points out:

Institutionalized education, especially in the last 150 years, has served – as a whole – the purpose of not only providing the knowledge and personnel necessary for the expanding productive machine of the capital system, but also generating and transmitting a framework of values that legitimizes and dominant interests, as if there could be no alternative to the management of society. either in the "internalized" form (i.e., by the properly "educated" and accepted individuals) or through a hierarchically and ruthlessly imposed structural domination and subordination.

⁴ Available in <https://noticias.uol.com.br/politica/ultimas-noticias/2018/01/27/impeachment-de-dilma-abriu-caixa-de-males-do-pais-diz-boris-fausto.htm?cmpid=copiaecola>



However, contrary to existing norms and opinions, young people have shown the strength to resist and transform the world as it has been presented to them. In a surprising way in the country, they present new and modern weapons for old battles, achieving very expressive results, such as confronting the measures proposed by the former governor of the State of São Paulo, Geraldo Alckmin, which were withdrawn after a few weeks by the governor himself, after the success and permanence of the school occupations. Or even, public transport fares were rediscussed in several municipalities, with reductions in several of them.

At the national political level, discussions on corruption in public management have gained strength. In this particular case, the power of the media and the impressive strength of the culture industry and its efficient means of mass communication played a preponderant role in the formation and, above all, in the deformation of opinions. Even so, the fact that the political discussion has conquered the streets and is able to echo among everyone, including young people, is an important element of analysis.

Another relevant fact that can be extracted from this context is the diversified character of these current mobilizations. Unlike the years when the enemy had a certain address, today there are many causes. The change in the profile of young students in the country also explains this diversification. Today's students are from diverse social backgrounds, as the quota policy has democratized university admission. In this way, the claims are also broad and of different natures, corroborating what Arthur Poerner, author of the book "O Poder Jovem" (Young Power), at the time a law student and reporter for the daily newspaper "Correio da Manhã", states. "When you put low-income students inside the university, you generate a demand that students in the 1960s didn't have, which is student assistance. The flag, permanence grant, housing, today all of this is vital", exemplifies the UNE leader. "The agendas are diversifying a lot."⁵

In the struggle for the most diverse causes, young people perform the important task of resisting anti-democratic forms of government and policies that ignore the capacity for analysis and critical positioning of citizens, underestimating their potential for political mobilization and emancipation.

Society has been transformed and it is necessary to understand its new and complex forms of organization and action. They have also changed their demands. You have to be aware of them! "High school students are an example that today there is more awareness of the need for good teaching, good structure, good teachers and that this should be demanded because it is their right," says the executive president of the Todos pela Educação movement, Priscila Cruz.⁶

⁵Available:https://noticias.uol.com.br/Novo%20protagonismo%20estudantil%20_%20UOL%20Educa%C3%A7%C3%A3o.html

⁶Available:https://noticias.uol.com.br/Novo%20protagonismo%20estudantil%20_%20UOL%20Educa%C3%A7%C3%A3o.html



However, while the occupations and mobilizations took place and the conquests became effective, new social arrangements were being established. The Brazilian political, economic and, above all, educational scenario has gained new and complex elements since the 2018 presidential elections and the rise of new policies for these sectors, demanding new positions and confrontations, thus evidencing the dialectic and continuous social construction of the best living conditions for citizens.




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Identity, professional identity and teacher identity: Theoretical-conceptual notes

 <https://doi.org/10.56238/sevened2024.010-067>

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ABSTRACT

The categories of identity, professional identity, and professional teaching identity have historically been conceptualized from the perspectives of scholars of different nationalities, in specific approaches, and in various areas of knowledge. In view of the polysemy of the term "identity", it is necessary to situate the concepts in their various theoretical approaches in order to obtain a real meaning of what is meant when using it in academic studies and research. In the same way, the terms "professional identity" and "professional teaching identity", because they derive and are composed of and with the former, deserve the same treatment because they acquire different approaches in different theoretical contexts. Taking as a theoretical basis the productions of several scholars, in their studies on identity, professional identity and teacher identity – although the three terms have not been addressed by all of them – this article aims, based on a bibliographic review, to briefly discuss theoretical-conceptual notes of such categories. It is expected to subsidize researchers and scholars of the themes, with clues and references of exponent authors from different areas of knowledge and to achieve a greater understanding of these terms.

Keywords: Identity, Professional identity, Teaching professional identity, Teacher identity.

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INTRODUCTION

The categories of identity, professional identity, and teacher identity have been historically conceptualized from the perspectives of scholars of different nationalities, in specific approaches, and in various areas of knowledge.

The studies of Claude Dubar (2005; 2006; 2012), a French sociologist, in the *Sociology of Professions*; Stuart Hall (2006), British-Jamaican sociologist, in *British Cultural Studies*; Anthony Giddens (2002), British sociologist, in *Structuration Theory*; Zygmunt Bauman (2001; 2005; 2007; 2009), Polish sociologist and philosopher, in the *Critique of Postmodernity*; Antônio da Costa Ciampa (1987), Brazilian psychologist in *Social Psychology*; António Sampaio da Nóvoa (1999; 2007; 2009; 2019), Portuguese educator in the *Science of Education*, among many others.

In view of the polysemy of the term identity, it is necessary to situate the concepts, in their various theoretical approaches, in order to obtain a real meaning of what is meant when using it in academic studies and research. In the same way, the terms professional identity and professional identity of teachers, because they derive and are composed of and with the former, deserve the same treatment, as they acquire different approaches in different theoretical contexts.

It is important to note that, although the terms "definition" and "concept" are often used as synonyms by common sense, there is a considerable difference in their meanings. While the definition represents a more objective and direct explanation, usually found in dictionaries, representing, therefore, the meaning of something, the concept is something conceived by someone's thought, and may vary from person to person, depending on the area of knowledge addressed and the historical, social and theoretical context employed.

Taking as a theoretical basis the productions of several scholars, in their studies on identity, professional identity and teacher identity – although the three terms have not been addressed by all of them – this article aims, based on a bibliographic review, to briefly discuss theoretical-conceptual notes of such categories. It is expected to subsidize researchers and scholars of the themes, with clues and references of exponent authors from different areas of knowledge and to achieve a greater understanding of these terms.

IDENTITY, PROFESSIONAL IDENTITY AND PROFESSIONAL IDENTITY OF TEACHERS: AS CONCEPTS IDENTITY

Few terms are more polysemic and broad than "identity." In 37 lines, the Houaiss dictionary presents such broad and diverse meanings, such as "state of what does not change, of what always stays the same", or "awareness of the persistence of one's own personality" or even "set of

characteristics or circumstances that distinguish a person or a thing" (Houaiss and Villar, 2019, p. 423).

According to Campos (2023, p.1),

To pinch from these senses the meanings more related to human relations also does not reduce their polysemy appreciably. Much of what we do in our lives – from the occupation we perform to the kind of habits we entertain, from our political views to our appearance – helps shape who we are, our identity, therefore. In short, "identity" is such a broad concept that, at the limit, it can encompass our entire existence, our personality, collective affinities, public image, etc.

In his study, Gomes (2018, p.44) presents several concepts of identity in different areas of knowledge. Starting from the etymology of the word to the most recent studies, the author points out that it does not make sense to speak of identity in the singular, but of identities in the plural and dynamic identities, "[...], because identity (s) is/are an element(s) of mediation between subjects and the contexts of their lives, revealing, therefore, their instability caused to a large extent by the rapid transformations in society in general".

Paixão (2009) clarifies that identity comes from the term of Latin origin, formed from "*iden*" (meaning "the same") and the suffix "*-tate*" (indicator of a state or quality). The etymology of this word places it as a qualifier of what is identical or the same being an identifier of something that remains. Thus, from the etymological point of view, from the Latin *identitate*, identity means the quality of that which is identical; a set of a person's own characteristics, which is considered exclusive to him and, consequently, taken into account when he needs to be recognized; a person's awareness of himself.

In philosophical terms, the same author defines identity as the quality through which one or more objects of thought possess equal properties, even if they are distinctly designated. Generalizing, philosophically for Paixão (2009), identity translates the coincidence of a substance with itself, and the first logical principle of thought is the principle of identity, which comprises the meaning of the supreme law of being (metaphysical principle) and that of the supreme law of thought (logical principle).

According to Hobold and André (2008, p.5),

The situations experienced throughout the personal trajectory, through social relations and personal meanings, constitute identity. These situations that permeate personal experiences construct a person's "subjective self" and, at the same time, their intrapsychological self. Identity can be exemplified as a personal framework, that is, the reservoir of experiences that, little by little, the human being constitutes through social relations.

Thinking from the Sociology of Professions, Dubar (2005, p. 136) understands identity as "[...] the result, at once stable and provisional, individual and collective, subjective and objective,



biographical and structural, of the various processes of socialization that, together, construct individuals and define institutions".

Thus, Dubar (2005) defines identity as a product of socialization, emphasizing relational and biographical processes and suggests that identity is constructed through social interactions and personal experiences throughout life. It introduces the idea of "identity for the other" and "identity for oneself", highlighting the tension between how we are perceived by others and how we perceive ourselves. This duality is crucial to understanding identity construction, since identity is constantly negotiated between these two perspectives.

Thus, a construct can be affirmed that there is no defined and static identity (or identities), whether social or professional identity.

This assertion is corroborated by Ciampa (1987) when he proposes that identity is a process of continuous metamorphosis, resulting from the interaction between personal history, social context and individual projects. Thus, for Social Psychology, in the studies of Ciampa (1987), identities are the result of a phenomenon, a dynamic and constantly changing construction that manifests itself through characters, cultural roles played by individuals.

In Ciampa's (2001) conception of identity, we actually have several identities that are used separately at different times. However, the person is a totality, and in those moments what happens is the manifestation of a part of unity. But it is important to consider that even with different identities and constant changes (metamorphosis), our identity is a totality (Albuquerque and Gonçalves, 2020, p. 4).

Based on the Structuration Theory and focusing on the reflexivity of modernity, Giddens (2002) enriches the concept of identity metamorphosis by suggesting that identity is a reflexive project, shaped by social interactions and cultural influences, in which individuals constantly reevaluate and construct their identities in response to social changes. Giddens (2002) also points out that as a continuous process, identity is constantly influenced by social institutions such as family, education and work and points to globalization as a factor that complicates identity construction by exposing individuals to multiple cultural influences.

Still in this vein, specifically in British Cultural Studies, Hall (2006) states that identities are formed and transformed by belonging to various cultures (ethnic, racial, linguistic, religious and national). It also evidences a structural and transformative change in modern society from the end of the twentieth century, in which "this change fragmented the cultural landscapes of class, gender, sexuality, ethnicity, race and nationality, which in the past had provided us with a solid location as social individuals" (Hall, 2006, p.11). The British-Jamaican sociologist emphasizes that globalization and cultural changes fragment identities, leading to an "identity crisis," describing the postmodern subject as multifaceted and ever-changing, with identities that are continually constructed and reconstructed in different contexts.

In this sense, for Hall (2006, p.12), identity,

It bridges the space between the "inside" and the "outside" – between the personal world and the public world. The fact that we project onto "ourselves" these cultural identities, while at the same time internalizing subjectives with the objective places we occupy in the social and cultural world.

Giddens (2002), in making an analysis of modernity and its relations with the construction of identity, also points out that currently the globalizing tendencies of modern institutions are accompanied by a transformation of daily social life, with profound implications for personal activities. In this way, the "I" becomes a "reflexive project", sustained by a narrative of identity that can be revised.

This time, Bauman (2005) approaches the concept of identity in contemporary society from the so-called "liquid modernity", a state in which identities are fluid and unstable, precarious and subject to even more constant changes. It highlights that identity in liquid modernity is a continuous invention, the result of the need to adapt to an environment in constant transformation. This view contrasts with more static conceptions of identity, suggesting that in liquid modernity, identity is an even more unfinished project. For Bauman (2001), as we are faced with the uncertainties and insecurities of liquid modernity, our social, cultural, professional, religious and sexual identities undergo a continuous process of transformation, ranging from the perennial to the transitory, with all the anxieties that such a situation raises. Being on the move is no longer a choice, but an indispensable requirement.

The "crisis of identities" is addressed by Dubar (2006) in a more in-depth analysis in his work "The Crisis of Identities: The Interpretation of a Mutation", in which he "proposes an analysis of the relations between the crisis of modernity and the crisis of identities, crises that are not separate and that devalue the communitarian forms of social insertion, without being able to impose new corporate forms" (Albuquerque and Gonçalves, 2020, p.7).

Albuquerque and Gonçalves (2020), when studying the work of Dubar (2006), state that,

[...] The crisis of modernity is also a crisis of personal identities, being a consequence of the transformations that have occurred in three important domains of social life: mutation of gender relations and profound changes in family relations; changes in the world of work and in jobs and, consequently, in training and schooling; mutation in the nation-state and its institutions, which led to changes in legitimacy and representative democracy (Albuquerque and Gonçalves, 2020, p.7).

Although each scholar presents the category of identity in specific perspectives dictated by the context and by different areas of knowledge, points of convergence are evident in their theories. There is an emphasis on the dynamic nature and construct process of identities as a result of social interactions and personal experiences. On the other hand, from modernity and postmodernity, there is



an identity crisis, a fluidity and fragmentation of identities, giving them an instability, based on the influences of social institutions and culture, bringing a need for constant renegotiation of identity in response to social changes.

Agreeing with Dubar (2005, p.13), in which "human identity is not given in the act of birth; it is built in childhood and must always be rebuilt throughout life" and that it is a socially constructed and simultaneously unfinished process, the ideas of the cited authors rest on the same assertion. The individual is socialized in his trajectory through the world, incorporating norms and values, principles and behaviors that ultimately allow him to be congruent with the inherited identity matrix (the result of the primary socialization process) and that simultaneously facilitate his social integration (Santos, p.128). "Thus, identity is a process of permanent change that occurs from birth to the end of life, being permeated by social and work relations" (Hobold and André, 2008, p.5).

PROFESSIONAL IDENTITY

In order to conceptualize "professional identity", it is first necessary to define what is meant by "profession". According to Dubar and Tripier (1998), the term profession can have four meanings or four points of view: (i) the profession as a declaration – professional identity; (ii) the profession as a job – professional classification; (iii) the profession as an occupation – professional specialization; and (iv) the profession as a function – professional position.

Based on the authors' sense or point of view of professional identity as a "declaration of a profession", in the Sociology of Work and in the Sociology of Professions, it is studied as a particular set of professional representation and is linked to professions and work situations (Hosson et. al., 2015).

Because it is a continuous and ascending process, it begins in childhood, when the child dreams of exercising a certain profession – whether by admiring it, being interested in it or by family influences – and it is a self-evolving process. "[...] This identity represents a consistent mechanism of personal reconstruction, resulting from autobiographical trajectories, professional aspirations, and continuous self-reflection on professional practice" (Silva, Machado, and Moreira, 2020, p. 2).

Thus, Silva, Machado and Moreira (2020), when studying the works of several sociologists dedicated to the theme, define professional identity as

the mechanism of professional self-perception that seeks to capture a collective sense at work. The concept can be explained in terms of a person's relationships with others, resulting from the processes of socialization and rhetoric in a given context. From the study of personal identities, the understanding of professional identity derives from the sociology of professions and implies the definition of the place that is occupied by an individual based on their relationships in the work environment (Silva; Axe; Moreira, 2020, p. 1).

For the authors, " professional identity is the concept that describes people within their respective occupational contexts, marking not only their engagement in the profession, but also their investment in the construction of their professional trajectories" (Silva, Machado and Moreira, 2020, p. 1).

Silva, Machado and Moreira, (2020, p.12) conclude that professional identity overcomes barriers and scenarios of action, involves motivation, social identification, socialization and the worker's own subjectivity, which is projected in the aspirations and interpretations that he develops throughout his professional career.

On the other hand, Dubar (2005) argues that identity forms are constituted and/or reconstituted by social relations in the family, school and work spheres. Thus, despite the numerous sociologists who focus on this concept (Dubar, 1997; 1998; 2005; 2012; Slay & Smith, 2011; Amiel, 2017; Best & Williams, 2019, among others), it was privileged within the limits of this article to address only Dubar's studies, in which for the constitution of personal and social identity, the professional dimension acquires singular importance.

Work conditions the construction of social identities. Because it undergoes changes, work forces subjects to make delicate identity transformations in order to keep up with the evolution of work and employment. Dubar studies the constitution of identity forms, derived from social and work relations, after agreements between subjectivity and objectivity (Dubar, 2005).

For the same author, professional identity goes through moments of deconstruction and reconstruction, in certain particular moments of the individual's life, through remarkable facts as well as through professional situations that directly affect the individual.

Instead of the term identity, Dubar (2005, p.156) preferentially uses the expression "identity forms" in order to indicate that these are forms assumed by language that we can find in other fields and that refer to visions of oneself and others, of oneself by others, and also of others for oneself. They are "assigned categories" (identities for the other) and "constructed identities" (identity for oneself).

In order to understand the movement of the identity constitution, in addition to the involvement of personal aspects arising from life history, as well as from the social relations produced in the work context, it is necessary to know some relevant aspects of the relationship between mode of production and capital.

His theory on the forms of constitution of professional identities is based on research carried out by him (Dubar, 1997) in six large French companies in the process of modernization, over a period of 20 years (1960 to 1980). The research showed that companies demanded from employees a new form of relationship and commitment to the professional activity they performed. Three areas were explored: the "world lived at work"; the socio-professional trajectory of workers, especially

employment movements; and the relationship of employees with training, in particular, the way they learned the work they did (Dubar, 2005).

In this study, Dubar showed the following forms of identity: "identity outside of work"; "mobilized identity"; "identity of the trade"; and "mobility/flexible identity", as pointed out by Hobold and André (2008).

Alves et al. (2007), when studying the same works of Dubar (1997; 2005) affirm that the identity structuring is formed from the articulation of the identity processes that unfold in the multiple relationships in life, which are heterogeneous, inseparable, complementary or contradictory.

In this dynamic, biographical processes are considered – identity for oneself (what the individual says about himself, what he thinks he is, or would like to be), and relational processes – identity for another (who the other says I am, the identity that the other attributes to me). In the articulation of these processes, there is the attribution of roles by the other, the internalization that is the acceptance and experience of the role and the incorporation, a process by which this role becomes part of the individual's social-professional identity (Alves et. al., 2007, p.273 – bold added).

The socially constructed identity undergoes alterations by the identity negotiations of the identity conferred by the other and the identity constructed for oneself. And, as Dubar (2005) points out, work constitutes a space for the occurrence of these identity negotiations, which will give rise to a structure of professional identity.

Thus,

Professional identity results from relationships and interactions at work, based on varied collective representations, building actors in the social, institutional or business system. Labor relations are based on the struggle for power in a context of unequal access, so we will have different typical identities in the exercise of the profession (Alves et. al., 2007, p.273).

For Dubar (2005, p. 135), "identity for oneself and identity for the other are at the same time inseparable and problematically linked. Inseparable, since identity for oneself is correlated to the Other and to its recognition: I never know who I am except through the eyes of the Other."

Professional identity constantly undergoes moments of construction and deconstruction, resulting from the social, political and economic context, "[...] in certain particular moments of the individual's life, through remarkable facts as well as through professional situations that directly affect his person" (Hobold and André, 2008, p.5).

Dubar (1997) highlights four identities constituted in action at work: (i) Identity of "distancing": combines individual preferences with oppositional strategies; (ii) "Fusional" identity: combines collective preferences with alliance strategies; (iii) "Negotiatory" identity: combines polarization in the group with opposition strategies; (iv) "Affinitarian" identity: combines individual preferences with alliance strategies.

Comparing the editions of the book published in 2005 and the first edition in 1997, Hobold and André (2008) claim that the names previously given by Dubar were minimally changed. These are conceptualizations that the sociological team has unfolded from Sainsaulieu's studies⁵ and that he enunciates them as follows:

- Stable identity threatened: work experiences and learning in the workplace are effectively valued by workers with stable identity threatened. They are individuals who assume the collective identity of the work group, and their discourse is always permeated by "we". The "subjective" self is greater than the "objective" self, that is, the inner will prevails to the detriment of the advances and innovations that surround the individual.
- Identity blocked: in this case there is a fusion of the individual with his or her profession. The repetitive and mechanical way of exercising the profession blocks him from innovations in the context of the labor market. He is an individual who is loyal to work standards, who considers his professional activity as unique and fundamental to the company. In the face of this fusion, there is the supremacy of objective transactions over subjective ones; The subject almost cancels itself out to the detriment of the profession and/or company.
- Identity responsible for their promotion: these are those people who are mobilized to progress professionally and perform their tasks with prominence and dedication. Everything they do is thinking about themselves and also about the company. The "I" is articulated with the "other", demonstrating a relationship of interdependence. "They know that if they invest in their work, they will reap the rewards of that commitment later on. They are the 'managers' who sometimes ignore each other, but who have in common an interest in management, leadership, and change in the organization" (DUBAR, 1997, p. 48).
- Autonomous and uncertain identity: this identity is also recognized as of the 'affinitarian' type. Affinities with other people and institutions are strongly valued as a way to maintain "networks" of contacts, aiming to facilitate entry into other jobs. This individual is significantly dedicated to their continuing education. In this case, the subjective transaction is what directs the objective transaction (Hobold and André, 2008, p. 7).

The authors conclude that the four forms of identity reconstructed by Dubar (1997, 1998, 2005), "[...] define the constitution of professional identity in labor relations. However, it should not be forgotten that biographical experiences, that is, life history, actively participate in these identity constitutions" (Hobold and André, 2008, p.7).

TEACHING PROFESSIONAL IDENTITY

In view of the concepts of identity and professional identity - as a continuous and dynamic phenomenon, the teacher's identity is not an immutable or external datum that can be acquired, but is a process of construction of the subject, historically.

The teaching profession has its own specificities and is the subject of numerous academic studies. Although the activity of the teacher is often understood or experienced as a missionary vocation (Nacarato; Varani; Carvalho, 2011), Nóvoa (2009) points out that the characteristic of being a teacher is defined by his teaching professionalism, which is involved with several personal, experiential, experiential and contextual factors, but also with his initial and continuing education.

According to Albuquerque and Gonçalves (2020, p. 14),

⁵ Renaud Sainsaulieu (4 November 1935 – 26 July 2002) was a French sociologist specialising in the sociology of organisations

The teacher's identity is a process of construction of the subject and of the social and historical group, that is, it is a way that the teacher has to understand himself in a given context, subject to definitions and redefinitions in relation to others and to his professional group. The teaching profession emerges and develops in historical contexts and moments as a response to the needs that are posed by educational policies, by the Departments of Education of the States and Municipalities of the country, by the schools where they work and by society and its social, economic, political and cultural conditions, and in the processes of valorization and devaluation to which they are subjected.

From the studies of Dubar (2005), in the Sociology of Professions, it can be inferred that teacher identity refers to a set of "identity forms", which result from a variety of processes of socialization of teachers, in which transactions occur between an "identity for oneself" (which the subject attributes to himself in a tension between the real and the ideal) and an "attributed identity" (the "mandates" that others and culture attribute to the subject) (Garcia, 2010, p.1).

According to Rossi, Monteiro and Silva (2024, p.159),

[...] The process of identity construction is based on individual values, that is, on the conditions in which each one constructs their life history, on their way of being and being in the world, as well as on their representations, knowledge, anxieties, dilemmas, challenges, potentialities – in the sense in which it has in "being a teacher".

In this context, the teacher's identity can be understood as unique and at the same time diverse, that is, constituted by personal identity and professional identity, based on the social meanings of the profession, the reaffirmation of practices, and develops and adapts to the socio-political-historical context in which it is inserted.

Identity is constructed from the social meaning of the profession; the constant revision of the social meanings of the profession; of the revision of traditions. But also the reaffirmation of culturally consecrated practices that remain significant. Practices that resist innovation because they are pregnant with knowledge that is valid for the needs of reality. From the confrontation between theories and practices, from the systematic analysis of practices in the light of existing theories, from the construction of new theories. (Pimenta, 1999, p. 19).

On the other hand, Silva (2000) shows that the teacher's identity depends on his professional training, on the appropriation of experiences in the historical dynamics of the school, on the sense of belonging to the social group "teachers", on his experiences of socializing interactions with his peers in a given historical and social moment. Therefore, "being a teacher" goes beyond "being a teacher" in isolated moments of teaching. Being a teacher is a becoming, a *gradual and contextual continuum* (Pimenta, 1996).

Nóvoa (2009) also defends a joint construction of the profession, in which one only becomes a teacher through praxis, applying, in transformative practice in the classroom, all the theory learned in academic environments.



Thus, for Burchard *et. al.* (2020, p.18) Regarding the problem of the teacher's professional identity, the paths and mishaps throughout personal and professional life contribute to this construction, configuring itself as a process in constant movement, being continuous, changeable and unfinished, considering that, over the course of the career, the teacher is built and identifies with his profession. Citing Huberman (2000), the authors warn that "[...] The development of teacher identity is a complex process and not a series of events, which may occur naturally for some, and for others may be accompanied by moments of regression".

According to Dubar (2006; 2011), the contemporary world is experiencing a crisis of identities, and Arroyo (2000) points out that the human being becomes "human" to the extent that he establishes relationships with other human beings, taking into account the material conditions in which he lives. Thus, considering the teaching profession as differentiated, with a role of hope for transformation and progress of society, favoring solidarity, community living and respect between people, Gatti (2010) reports that in the current working conditions, in the school day-to-day with its enormous needs, as well as the social devaluation of the teaching work, the identity constitution of the teacher goes through the same crisis. What is verified in the reality of pedagogical practices is a phase marked by difficulties, uncertainties and absence of humanistic values, enabling feelings of insecurity, devaluation, anger, fear and sadness in teachers, which directly impacts their professional identity.

In this sense, it can be understood that the identity constructed by the teachers presents itself with a multiplicity of elements/aspects that intersect and interpret each other, permanently developed in a given historical-political-social context. Thus, the discussion about the teaching professional identity process presents itself as a context full of comings and goings, reflections that permeate the various dimensions that make up the human, be they affective, social, personal and professional dimensions, which evidences a vast exercise of teacher resignification in a multidimensional, gradual and, more than that, contextualized in a time and space of its own (DUBAR, 2005; DEWEY, 2010) (Rossi; Martin; Silva, 2024, p. 161).

In the same vein, Santos and Rodrigues (2010, p.17) conclude that

It is necessary to understand that the teacher's identity can be thought of not as a given, a property, a product, but as a dynamic and conflicting process, a space for the construction of ways of being and of being in the profession. Teacher training should seek relationships between the personal identity and the professional identity of the teacher, in this process, which are established with the students, with the families, with the educational institution, with the people with whom they live on a daily basis; In these relationships, the teacher constructs knowledge that constitutes the ideology that underlies his actions.

The teacher's identity is defined by the balance between personal and professional characteristics and is constituted in the social relationships that are established with the students, with the families, with the educational institution, in short, with the people with whom they live in their daily lives and in some way influence this construction. In this process, throughout their student and



professional careers, teachers construct knowledge and constitute the theoretical framework that underlies their actions (Nóvoa, 2001).

In summary, Nóvoa (2001) warns that in the teaching profession the identity process is constructed in a complex and diachronic way, dynamically, by accommodating innovations and assimilating changes that enable a psychosocial reformulation of each teacher, which leads them to feel and say they are teachers.

To be a teacher is to feel personal and professional, to decide and act according to life and action options, choices that, according to Nóvoa (1992), each teacher has to make, which intersect their way of being, with their way of teaching and reveal, in their way of teaching, their way of being, making it impossible to separate the professional self from the personal self. Each teacher has to do, which intersect their way of being, with their way of teaching and reveal, in their way of teaching, their way of being, making it impossible to separate the professional self from the personal self (Saboya, 2015, p.3).

Nóvoa (2019) also highlights the collective dimension of identity construction, since teachers see themselves as part of a professional community, whose shared norms and values shape their identities. Professional autonomy and critical reflection on the pedagogical decisions they make, as well as the necessary adaptations to the needs of learners, are also intrinsically linked to their professional teaching identity.

Emphasizing the relevance of initial and continuing education in the construction of their teaching identity, for Nóvoa (1999), training should be seen as a continuous process of professional development integrating theory and practice, allowing teachers to develop a deep and contextualized understanding of their profession. Also, the context in which teachers work, including educational policies, available resources and school culture, have a significant impact on the construction of teachers' professional identity.

In short, teacher identity is fundamental to the quality of education and the professional development of teachers, as teachers with a well-developed professional identity are better prepared to face the challenges of the classroom and promote quality teaching. A strong identity contributes to cohesion and a sense of belonging within the school community, which is essential for collaboration and continuous improvement of pedagogical practice. Thus, the recognition and appreciation of teachers' professional identity are crucial for their motivation and job satisfaction, helping to prevent *burnout* and promote a positive and productive work environment (Nóvoa, 2019).

FINAL THOUGHTS

The concepts of identity addressed in this text, although they have been coined by several researchers, with different nationalities and backgrounds, in specific contexts and in different areas of knowledge, have in common their dynamics. It is an individual and at the same time collective construction; a dynamic and continuous process; They should be treated in the plural, "identities",



because they do not have a unique and immutable identity, given the concepts of professional identity, which are constructed at work, in the profession and in the exercise of work, in different contexts and by different influences.

Regarding the professional identity of teachers, it is evident that over time, several scholars have focused on the theme due to the relevance that teaching imposes on society. The teacher's actions and knowledge, their initial and continuing education, their interpersonal relationship with the entire school community, their pedagogical praxis - in which the theories learned are put into practice in the classroom, the social, economic, political context in which they live, all this influences their identity formation as a professional educator.

Studying the professional identity of teachers is crucial for several reasons that directly impact the quality of education and the professional development of educators, such as the improvement of pedagogical practice, stimulating innovation and creativity in teaching, the search for continuous training and professional development, adaptation to different educational contexts, whether curricular changes, technological or socio-cultural activities, professional engagement and the promotion of more inclusive and equitable educational practices, as well as their personal and professional well-being and satisfaction. Finally, studying and understanding the professional identity of teachers is fundamental for the improvement of education as a whole. By understanding and valuing this identity, it is possible to promote quality teaching, support the continuous development of teachers, and create a more inclusive and effective educational environment.

By way of conclusion, it is hoped that all the concepts discussed in this text can help researchers, educators, students and those interested in the subject with clues for a better understanding of the concepts of identity, professional identity and professional teacher identity, in addition to subsidizing them with various references to continue in the desired studies.



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Nurses' role in compulsory notification of domestic violence in a Basic Health Unit

 <https://doi.org/10.56238/sevned2024.010-068>

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ABSTRACT

In Brazil, in July 2022, 31,000 reports of domestic violence were registered, a problem that has serious consequences, such as psychological, physical, financial damage and even the death of the women involved. To address this reality, policies such as the Maria da Penha Law (Law 11,340) were implemented to protect victims. The need for health strategies then arose, resulting in the development of the Notifiable Diseases Information System (SINAN), driven by health professionals through Compulsory Notifications. This article, based on a literature review, used sources such as books, dissertations, scientific articles and online databases (Google Scholar, Scielo, VHL). The analysis covered the last five years (2018-2023), including laws prior to that period (2006-2015). Violence against women ranges from harassment to femicide, and access to health services is often intermediated by basic health units. Nursing care begins with welcoming, where nurses play a crucial role as health educators, contributing to the recovery, empowerment and well-being of patients, in addition to dealing with the alarming statistics of this type of violence. Despite the advances made by the Maria da Penha Law, domestic violence against women in Brazil persists as a serious problem, as shown by statistics from the Ministry of Human Rights and Citizenship. Addressing this phenomenon remains challenging, especially with regard to the proper identification and notification of cases.

Keywords: Types of Domestic Violence, Maria da Penha Law, Compulsory Notification, Primary Care.

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INTRODUCTION

Violence in Brazil is a reality that persists and worsens year after year, as evidenced by statistics from the Ministry of Human Rights and Citizenship July 2022. In this context, domestic violence emerges as one of the most alarming forms of aggression, with alarming numbers of complaints recorded. In the year alone, a total of 31,000 reports of domestic violence were received, with 31,398 of them directed to the call center, highlighting the seriousness and urgency of this problem.

Given the profound psychological, physical, and financial repercussions that domestic violence can entail, it is imperative to understand its magnitude and justify the implementation of effective measures to combat it. The enactment of the Maria da Penha Law represented a crucial legal milestone, offering protection and support to women who are victims of violence, in addition to establishing policies aimed at preventing and punishing aggressors.

However, despite legislative advances, addressing domestic violence still faces significant challenges, especially with regard to identifying and reporting cases. Thus, the research problem that guides this study arises: what is the role of the nurse in the compulsory notification of domestic violence? This question reveals the urgent need to understand the role of health professionals, especially nurses, in combating this social scourge.

In this context, the general objective of this study is to understand the role of nurses in compulsory notification of cases of domestic violence. To achieve this objective, we propose the following specific objectives: to present the types of domestic violence, to discuss the Maria da Penha Law and to analyze the role of nurses in compulsory notification. These objectives delimit the scope of research and direct investigations to specific areas of interest.

DEVELOPMENT

METHODOLOGY

This article was carried out through a literature review, and books, dissertations and scientific articles were searched in database sites: Google Scholar, Societific Electronic Libray Online (SciELO); Virtual Health Library (VHL). The period of the articles researched was the published in the last 5 years (2018-2023) and some laws drafted before this period (2006-2015) were used, however, they reinforce, match and support issues related to the theme. The keywords used in the search were: types of Domestic Violence, Maria da Penha Law, Compulsory Notification, Primary Care. With the descriptors, a total of 22 articles were found, where 12 were selected and articles in Portuguese, freely accessible and in their entirety were included.

RESULTS AND DISCUSSION

Violence is an act of aggression against women and has various types of violence ranging from harassment to femicide. Violence against women is the issue of culture, social and religious that manifests itself in different ways in parts of the world, violence usually starts with those close to them such as partners, the father and his children, for not doing what is asked. This does not only happen in the home environment, but in the work environment, and any conduct that women do is a reason for provocation, which promotes the act of discrimination, aggression, or coercion (INSTITUTO MARIA DA PENHA, 2023).

According to Law 11.340 of August 7, 2006, the definition of the types of violence are:

- I- Physical violence is defined as the act of harming the physical integrity of a person, an example of physical violence: aggression, strangulation or choke killing, injuries caused by bladed weapons or firearms, among others.
- II - Psychological violence is defined as any behavior that causes emotional harm and lowers self-esteem, or harms and disturbs your overall development, or that is intended to threaten, embarrass, humiliate, manipulate, degrade, or control your actions, actions, beliefs, and resolute behavior, isolation, constant surveillance, continued stalking, humiliation, blackmail, invasion of privacy, ridicule, exploitation, and restraint, or any other way that causes harm to the mental health and self-determination.
- III – Sexual violence is defined as any act of non-consensual participation or when force or threat is used, examples of sexual violence, rape, harassment, impeding the use of contraceptive methods among others.
- IV - Property violence is defined as any action that causes retention, subtraction, partial or total destruction of their objects, work instruments, personal documents, assets, values and rights or economic resources, including those intended to satisfy their needs;
- Moral violence is defined as any act leading to slander, defamation or injury (BRASIL, 2003).

Domestic violence is more common than we think or imagine, because it is not only characterized by physical and sexual violence, there is also psychological, patrimonial and moral violence. In this way, many women are unable to identify the violence caused by their partner, and those who do are afraid to report it because they suffer threats and consequently these women end up suffering femicide by their partners (INSTITUTO MARIA DA PENHA, 2023).

There are some laws aimed at protecting against violence against women. The following are the main laws, which are:

"Law No. 11,340/2006. Creates mechanisms to curb domestic and family violence against women, pursuant to Article 226(8) of the Federal Constitution, the Convention on the Elimination of All Forms of Discrimination against Women, and the Inter-American Convention on the Prevention, Punishment, and Eradication of Violence against Women; provides for the creation of Courts for Domestic and Family Violence against Women; amends the Code of Criminal Procedure, the Criminal Code and the Criminal Enforcement Act; and makes other arrangements" (BRASIL, 2006).

"Law No. 13,104/2015. Amends article 121 of Decree-Law No. 2,848, of December 7, 1940 - Penal Code, to provide for femicide as a qualifying circumstance for the crime of homicide, and article 1 of Law No. 8,072, of July 25, 1990, to include femicide in the list of heinous crimes" (BRASIL, 2015).

"Law No. 12,845/2013. It provides for the mandatory and comprehensive care of people in situations of sexual violence" (BRASIL, 2013).



"Law No. 10,778/2003. It establishes the compulsory notification, in the national territory, of the case of violence against women who are treated in public or private health services" (BRASIL, 2003).

"Law No. 12,737/2012. Provides for the criminal classification of computer crimes; amends Decree-Law No. 2,848, of December 7, 1940 - Penal Code; and makes other arrangements" (BRASIL, 2012).

The initial point of access to health services is through basic health units. In cases where there are suspicions or confirmation of violence against women, it is essential that any health professional report it. The Notifiable Diseases Information System (SINAN) is a resource of great value in this regard (SINAN, 2016).

According to Law No. 10,778, approved on November 24, 2003, in Brazil, both public and private health facilities have a legal obligation to report incidents of violence against women. This means that if any healthcare provider comes across a suspicious situation or evidence of violence, they must fill out a notification form and Provide compassionate care and necessary referrals to the affected woman. It is essential to emphasize that the act of notification does not imply consent and is intended exclusively for epidemiological analysis, occasionally as a primary source of data. Primary health facilities play a crucial role as a starting point for access to health services, including in cases where suspicions or threats of violence arise. In case of suspicion, primary health units are the first portal for the provision of health services. In the recognition of violence against women, notification is mandatory and can be made by any health professional.

"With the use of this system, it allows a dynamic diagnosis of the events that happen to the population, being able to offer explanations for the causes of compulsorily notifiable diseases, in addition to indicating the risks to which people are susceptible, contributing to the epidemiological identification of the geographical area" (PORTAL SINAN, 2023).

"On the other hand, the systematic use, in a decentralized way, contributes to the democratization of information, allowing all health professionals to have access to information and make it available to the community. It is, therefore, a relevant instrument to assist health planning, define intervention priorities, in addition to allowing the impact of interventions to be assessed" (PORTAL SINAN, n. p, 2023).

With data from the epidemiological system, they can facilitate decision-making and solutions to reduce the prevalence of diseases and conditions.

In fact, it shows the importance of Compulsory Notification, and how important it is to report suspected and confirmed cases of domestic violence. The Compulsory Notification can be made by any health professional, it is important to emphasize that the Notification is not intended to denounce but to indicate epidemiological data.

Agreeing with SILVA; RIBEIRO (2020), in the basic health unit, listening and bonding trust with women in the area described is developed. With this, reception, guidance, referrals to protection services and notification can be carried out.

Health professionals need to understand the feelings of victims of violence, such as fear and



submission, to help them recover. Reflecting on your own experiences is crucial to encouraging victims to grow stronger. The consumption of alcohol by the aggressor poses a danger to women, and the Healthcare professionals should address this in preventive activities. Submission may be associated with the financial dependence of the victims. Community health workers play a vital role in communicating with nurses, as they are closer to families and can identify situations of violence. Nursing care for women who suffer violence begins with the Embrace, but ends when the victim is referred, going against the conception of health services acting in a network. The nurses, in their practice, emphasize that the victim's silence is something that makes it difficult to identify cases. From this perspective, the importance of Community Agents in the accompaniment, and even in the assumption of violence, is affirmed. (SILVA; RIBEIRO, p. 5, 2020).

Agreeing with the author BOGUCHEWSKI, C *et. al* (2022), health professionals have difficulties in identifying psychological, verbal, or moral violence. Professionals are usually able to identify violence that is physical and/or sexual.

Nurses have an important responsibility in the care and detection of violence against women, preparing the professionals who are under their responsibility to identify cases of violence and assist in the solution of the problem. (SILVA; RIBEIRO, 2020). According to Silva and Ribeiro (2020), it is understood that nurses, as health educators, play an important role in sharing information about the management of women victims of domestic violence and in carrying out compulsory notification. Researchers highlight its relevance in detecting and supporting victims, but some face difficulties in identifying or reporting it for fear of the aggressor. It is essential that nurses and community workers work together and are trained to identify cases of domestic violence.

CONCLUSION

The persistence of domestic violence against women in Brazil is an alarming phenomenon that not only challenges legal and social frameworks, but also reflects issues deeply rooted in culture and gender perception. Despite the advances provided by legislation, such as the Maria da Penha, and the protection policies implemented, the statistics of the Ministry of Human Rights and Citizenship still reveal an alarming incidence of these cases. In this context, this study aimed to examine in detail the crucial role of nurses in the compulsory notification of domestic violence, recognizing their fundamental importance in early detection and support for victims.

The in-depth analysis of the different types of violence and the relevant legislation highlighted the complexity and seriousness of this social problem. Violence against women goes beyond physical aggression, but also encompasses emotional, psychological and financial aspects, reflecting unequal patterns of power and a culture of devaluation of women.

The results emphasized the urgency of close collaboration between health professionals and



community agents to identify and intervene early in cases of violence. The nurse, as an integral part of the healthcare team, plays a crucial role in providing emotional support, guidance, and appropriate referral to victims. In addition, the continuous training of health professionals is essential to ensure a sensitive and effective approach to this delicate and complex issue.

The compulsory notification of domestic violence, combined with the use of the Notifiable Diseases Information System (SINAN), emerges as a valuable tool to collect epidemiological data that are essential for the planning and implementation of prevention policies and programs. However, it is essential that this process is conducted in an ethical and respectful manner, ensuring the privacy and autonomy of victims.

Addressing violence against women requires not only targeted interventions, but also broader cultural and structural change. This entails promoting gender equality, empowering women, and educating them about healthy and respectful relationships. Additionally, it is crucial that victims are adequately resourced and supported so that they can overcome trauma and rebuild their lives with dignity.

Addressing domestic violence against women requires a collective effort from all of society. From the health professionals who are on the front lines of victim care to the legislators responsible for creating effective public policies, everyone has a role to play in this process. Only through a comprehensive and coordinated approach can we hope to create an environment where violence against women is truly intolerable.


This study, by providing valuable insights into the role of nurses in the compulsory reporting of domestic violence, contributes to this collective effort. It highlights the importance of an integrated and sensitive response to this complex and multifaceted issue, reaffirming its commitment to the protection of women's rights and dignity throughout the country. The persistence of domestic violence against women in Brazil is an alarming phenomenon that not only challenges legal and social frameworks, but also reflects issues deeply rooted in culture and gender perception. Despite the advances provided by legislation, such as the Maria da Penha Law, and the protection policies implemented, statistics from the Ministry of Human Rights and Citizenship still reveal an alarming incidence of these cases. In this context, this study aimed to examine in detail the crucial role of nurses in the compulsory notification of domestic violence, recognizing their fundamental importance in early detection and support for victims.



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Ethnopedology: Popular and scientific classification of a soil profile in the quilombola community Os Rufinos, Pombal-Paraíba

 <https://doi.org/10.56238/sevened2024.010-069>

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ABSTRACT

The culture of a people is measured by what it produces as a manifestation, material or immaterial, of its daily expressions, whether symbolic, discursive or in the spectrum of a domestic economy that has its essence founded as a mold of expression of the culture and identity of the place. Thus, in this work we seek to understand the form of soil classification according to the use and destination of this soil for the production of ceramics in the Quilombola Community the Rufinos in the municipality of Pombal-PB. The study of local soil names can contribute to the advancement of formal knowledge, as well as to the development of socially appropriate management strategies. If a quilombola names some soils based on the characteristics of the arable layer, this does not mean that he or she is necessarily unaware of what is below this layer. Ethnopedology enables the dialogue between popular knowledge and technical scientific knowledge, debating the connection of knowledge between what we already know and what we can still learn. Popular knowledge originates from the personal experience of each individual, transmitted from one generation to another, through facts, stories and arguments, through daily contact with variations in climate, vegetation and soil. Seeking to understand natural resources from a less technical point of view, but sufficient for the development of its activities. Thus, in this work, it was possible to describe a soil profile according to the conditions of use of the community and also according to the scientific society.

Keywords: Clay, Artisanal production, Quilombola.

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INTRODUCTION

The culture of a people is measured by what it produces as a manifestation, material or immaterial, of its daily expressions, whether symbolic, discursive or in the spectrum of a domestic economy that has its essence founded as a mold of expression of the culture and identity of the place. Thus, the place of orality gains prominence when the community becomes an object of study and is given the prerogative to speak of itself through its residents (Rufino, 2018).

Popular knowledge originates from the personal experience of everyone, transmitted from one generation to another, through facts, stories and arguments, through daily contact with variations in climate, vegetation and soil. Seeking to understand natural resources from a less technical point of view, but sufficient for the development of its activities, ethnopedology emerges, which enables the dialogue between popular knowledge and technical scientific knowledge, debating the connection of knowledge of what we already know with what we can still learn, awakening an essential dialogue between farmers and soil science researchers (Araújo *et al.*, 2013).

Ethnopedological studies have been predominantly discussed regarding its agricultural use, giving little attention to other fields of activity. Soils are not only natural substrates, but a way of representing the cultural identity of a given place, carrying the history and trajectory of the place, from analyses made in the physical, chemical and biological components, we can thoroughly understand in a broader and contextualized way their relationship in the social and environmental context (Ferreira; Falcon, 2023).

Small farmers and/or local artisans select their working material called "earthenware clay" used as a ceramic resource based on the hard resistance it presents cracks in the soil, such characteristics are defined by the manifestation of the physical forces of cohesion and adhesion between soil particles and other materials. These cracks are caused by the activity of the high-activity clay fraction, which presents more accentuated expansion and contraction due to the effect of pedogenetic processes (Alves *et al.*, 2005; Santos *et al.*, 2015).

To a large extent, the soils that fall into the classes of Planosols are used for the production of pottery, as they have specific characteristics that are valued by local artisans. This portion is extracted from the 2Bt horizon affected by Na, which is characterized by a high activity of the clay fraction (Alves *et al.*, 2005).

In this way, this research aimed to study the relationship of man with the knowledge of the soil under the popular perspective of artisanal production, correlating with the classification of soils in the scientific environment, evidencing the values of the local culture and tradition regarding the use of "earthenware clay" permeated in the experiences lived with the place and with nature. In the search to identify the ethnopedological view of the remaining quilombo community called "Os Rufinos".



MATERIAL AND METHODS

The research was developed with the remaining quilombola community called "Os Rufinos", located on the São João I site, in the rural area of the municipality of Pombal-PB, high hinterland of Paraíba, with geographic coordinates 6°42'37" S and 37°45'35" W, with an elevation of 170 m.

A field visit was made to the place used by the artisans to remove the "earthenware clay", called by them "hole", which is actually a trench opened manually and used for years for the extraction of the raw material, which was used to describe the soil profile. In sequence, the artisans described the soil profile according to their popular knowledge, explaining each layer of the soil according to the use and purpose given by them. Then, the description of the soil profile was carried out, in a scientific way, using the recommendations of the Manual of Soil Description and Collection in the Field of Santos *et al.* (2015).

With the horizons defined in the soil profile, each one was collected, forming the samples that were separated into bags, identified and sent to the Soil and Plant Nutrition Laboratory of the Center for Agrifood Sciences and Technology of the Federal University of Campina Grande, Pombal Campus, for physical and chemical analyses.

In the field, morphological analyses of each horizon were performed, where the color according to the Munsell® Chart, the structure, porosity and roots, consistency, transition between the horizons and the presence of nodules and concretions were verified, following the guidelines given by Santos *et al.* (2015). Throughout the field classification process, the popular knowledge explained by the artisans and the scientific explanations made by the team were discussed.

Laboratory analyses consist of physical characterization and chemical characterization. The samples were air-dried, undisturbed and passed through a 2.00 mm mesh sieve, obtaining air-dried fine earth (TFSA) for physical and chemical characterization. The particle size analysis (sand, silt and clay) of each horizon was performed using the ASTM n° 1 - Type 152H hydrometer method (with Bouyoucos scale in $g L^{-1}$), of each horizon of the profiles described according to the Manual of Soil Analysis Methods of Embrapa (Teixeira *et al.*, 2017).

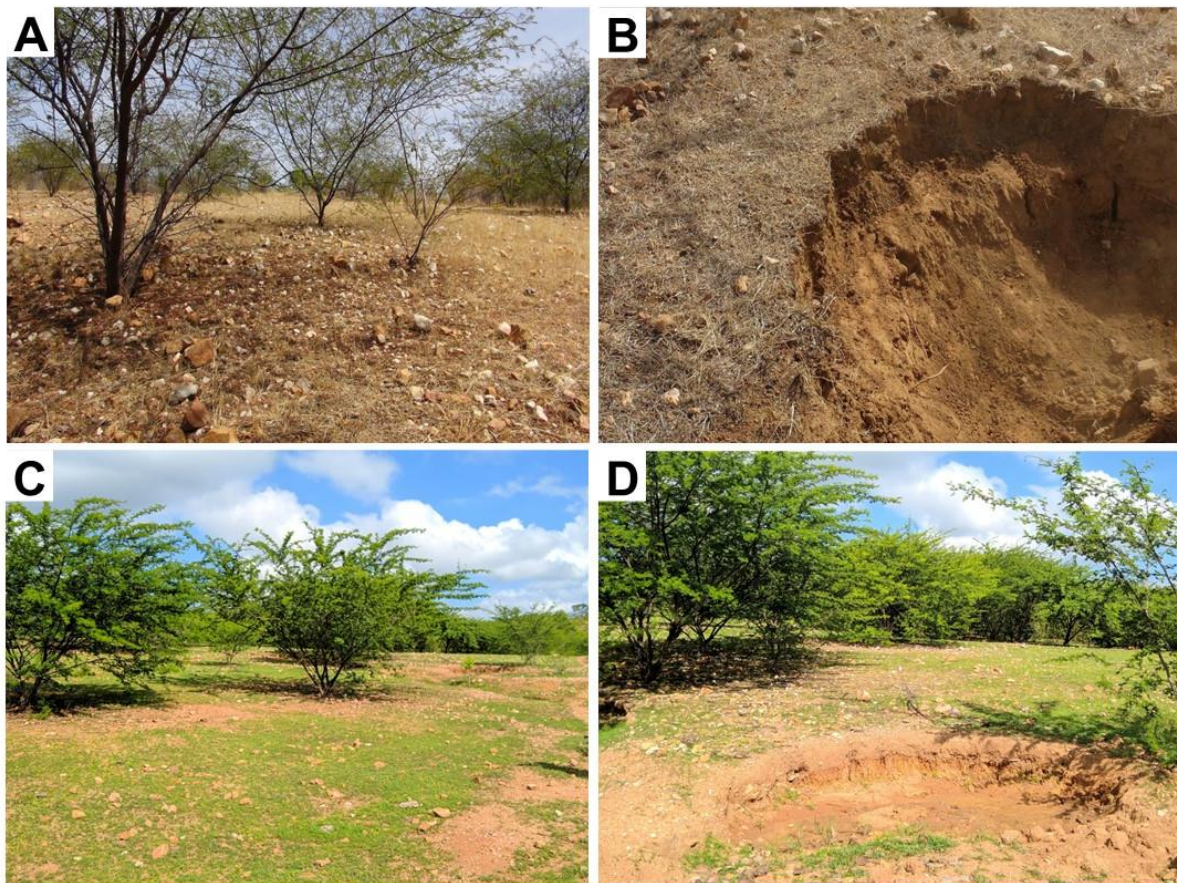
Regarding the chemical analysis of the soil, the following were as follows: pH in $CaCl_2$ 0.01 $mol L^{-1}$, in the ratio 1:2.5 (soil:solution); exchangeable calcium, magnesium and aluminum, extracted with 1 $mol L^{-1}$ KCl solution, quantified by titration with 0.0125 $mol L^{-1}$ EDTA standard (Ca and Mg); Al by titration with 0.025 $mol L^{-1}$ NaOH solution; exchangeable potassium and sodium extracted with 0.05 $mol L^{-1}$ solution and 0.0125 $mol L^{-1}$ H_2SO_4 were quantified by flame photometry; available phosphorus extracted and determined by colorimetry (Teixeira *et al.*, 2017).

The classification of the soil profile was carried out using the 5th edition of the Brazilian Soil Classification System – SiBCS (Embrapa, 2018), being classified at the level of subgroups, that is, up to the fourth categorical level.

RESULTS AND DISCUSSION

The landscape presented in figure 1 is characterized by a semi-arid environment in which we have the environment in the dry and rainy season, making it possible to observe the low vegetation cover around the soil profile or "hole" also called by the residents of the quilombola community. In the area, the black jurema (*Mimosa tenuiflora*) is the dominant species, which according to Azevêdo *et al.* (2012) is a pioneer, native to the semi-arid region, presenting a deep root system that allows its development in degraded soils, notably in the initial and secondary occupation of degraded areas or in the process of degradation. In addition, the soil surface presents stony material indices of varying classifications and sizes.

Figure 1. Presentation of the landscape where the clay extraction "hole" is located and the soil profile described, where A and B correspond to the dry season and C and D to the rainy season.



Source: personal archive.

The popular description made by the artisans is presented in table 1, which consists of the community's perception of dividing the soil into layers according to its usefulness for the production purposes for which this soil is intended. In the discourse of the artisans, materials were recognized in horizontal layers, as relatively independent parts, and not as units of a three-dimensional body.

Table 1. Popular description of the soil profile according to the craftsmen.

1st layer	0-22 cm, SURFACE SOIL, loose soil and good for planting swiddens with corn and beans.
2nd layer	22-69 cm, EARTHENWARE, hardened earth, difficult to break, very good for the production of clay pieces.
3rd layer	69-81 cm, EARTHENWARE CLAY + ARMADILLO DOUGH, is an earth that has the clay of crockery mixed with another kind of earth, which is not good for producing clay pieces.
4th layer	81-87 cm+, ARMADILLO DOUGH, is the pure earth that does not have good clay to produce the clay pieces.

The first layer was called surface soil, in view of the characteristics of a looser and darker soil, which in their perception, is an ideal soil for the cultivation of annual crops in the swidden system, such as corn and beans. In the extraction of the soil for the manufacture of ceramics, this layer is discarded and thrown around the "hole".

The second layer of soil, the thickest with 47.0 cm, constitutes the clay of crockery, a material that is extracted for artisanal production, which according to the artisans is a hardened earth, being evident the concentration of clay, which they call clay, with a structure that is difficult to dismantle, requiring the use of tools such as the pickaxe to carry out the extraction.

The third layer of the "hole", they call the mixture of the previous layer (earthenware clay) with the next layer (armadillo mass), what differs from this material is the presence of material that mixes, and according to one of the artisans, experience is required to carry out the separation of these layers, in case of confusion, at the time of collection, If this material is used in the manufacture of ceramic pieces, the finish will not be of good quality, and the pieces may crack, making them useless for commercialization.

The fourth and final layer of soil is the armadillo mass itself. This name was given because it is a layer without any use in the artisan activities of the community, referring to the armadillo, a local species of the Caatinga fauna, which usually uses burrows dug deep in the soil to shelter, in this way, in the perception of the community, in this depth of the soil, there is no need to extract material, leaving it available for the armadillo to make its home.

Figure 2 shows the soil profile, in the perception of a "hole" for the extraction of the material and its division into layers, according to the use attributed by the artisans.

Figure 2. Presentation of the soil profile with the popular classification.



Source: personal archive.

The general description of the profile under study is presented in Table 2. Located in a BSh climate area of the Köppen-Geiger classification, gentle undulating relief and elevation of 170 m in relation to sea level. Having the lithology of gneisses and migmatites, with geological formation in Super Suite I - calcialcaline granite suite of medium to high potassium and Neoproterozoic chronology. The original material is due to reworked materials from coarse granite and granodiorite alteration products to porphyritics associated with diorite and intermediate mixing phases.



Table 2. General description of a soil profile in the quilombola community "Os Rufinos", Pombal – PB.

<p style="text-align: center;">GENERAL DESCRIPTION</p> <p style="text-align: center;">PROFILE 01</p> <p style="text-align: center;">DATE - 04.08.2018</p> <p style="text-align: center;">PREVIOUS CLASSIFICATION - BRUNO NON-CALCICO (Embrapa, 1979).</p> <p>SiBCS CLASSIFICATION - NATRIC PLANOSOL Typical carbonate, medium texture little gravel, eroded phase, smooth undulating relief.</p> <p style="text-align: center;">MAPPING UNIT - SNk</p> <p>LOCATION, MUNICIPALITY, STATE AND COORDINATES - Quilombola Rural Community "Os Rufinos", Sítio São João I, 22 km from the Center of the Municipality of Pombal, Paraíba, coordinates 6°42'37" S and 37°45'35" W Gr.</p> <p>SITUATION, SLOPE AND VEGETATION COVER ON THE PROFILE - Described and collected in a manually opened trench, in a clay extraction barrier for the manufacture of handmade pottery, with soft undulating relief and native vegetation cover.</p> <p style="text-align: center;">ELEVATION - 170 m.</p> <p>GEOLOGICAL FORMATION - Super Suite I - Medium to high potassium calcialcalin granite suite</p> <p style="text-align: center;">CHRONOLOGY - Neoproterozóico</p> <p>SOURCE MATERIAL - Granite and granodiorite coarse to porphyritic associated with diorite and intermediate mixing phases.</p> <p style="text-align: center;">STONY - Not stony.</p> <p style="text-align: center;">ROCKY - Not rocky.</p> <p style="text-align: center;">LOCAL RELIEF - Soft wavy.</p> <p style="text-align: center;">REGIONAL RELAY - Soft wavy.</p> <p style="text-align: center;">EROSION - Slight.</p> <p style="text-align: center;">DRAINAGE - Moderately drained.</p> <p style="text-align: center;">PRIMARY VEGETATION - Hyperxerophilic Caatinga.</p> <p style="text-align: center;">CURRENT USE - Extraction of clay for making ceramic material.</p> <p style="text-align: center;">CLIMATE - BSh according to Köppen-Geiger.</p> <p>DESCRIBED AND COLLECTED BY - Jussara Silva Dantas, Rodolfo Trigueiro de Almeida, Jefferson Luan de Araújo Regis, Leonardo José Silva da Costa, Tiago da Silva Santos, Rosy Carina de Araújo Ventura and Francisco Alves da Silva.</p>

Table 3 shows the morphological characteristics of the soil according to the scientific aspect. It is possible to observe that there is no homogeneous pattern in the behavior of texture, structure and consistency (Table 2). The Bt1 horizon, used for the extraction of soil for use in the manufacture of ceramic pieces, has a columnar structure, characteristic of soils with a high concentration of clay, also evidenced in the consistency when wet, being very plastic and very sticky, which explains its favorable condition for the artisanal work carried out in the quilombola community.

Table 3. Morphological description of a soil profile in the quilombola community "Os Rufinos", Pombal – PB.

And	0-22 cm, dark brown (7.5YR 3/3, wet), dark yellowish brown (10YR 4/4, dry); sandy loam little gravelly; moderate very small to large, subangular blocks; soft, crumbly, non-plastic and non-sticky; Smooth and clear transition.
Bt1	22-69 cm, bruno-forte (7.5YR 5/8 wet); loamy loam, little gravel; small to very large, columnar strong; too hard, too firm, too plastic, and too sticky; Smooth and clear transition.
Bt2	69-81 cm, yellowish-brown (10YR 5/4, wet); sandy loam loam; small to large strong, angular blocks; very hard, firm, slightly plastic and slightly sticky; Smooth and clear transition.
BT3	81-87 cm+, dark yellowish-brown (10YR 4/4, moist); little gravel france; small to large strong, angular blocks; abundant and strong waxiness; slightly hard, crumbly, slightly plastic and non-sticky; Smooth and clear transition.
<p>Observations:</p> <ol style="list-style-type: none"> 1. Soil with absence of A horizon, A was eroded; 2. Manganese effervescence at Bt1 horizon; 3. Effervescence for calcium carbonate in the Bt3 horizon. 	

Vertical cracking was observed, with cracks of 2 to 5 mm wide in the Bt1 horizon. No cracking was observed on the soil surface. Dark manganese punctuations were also observed in the Bt1 horizon and whitish calcium carbonate punctuations in the Bt3 horizon. With characteristics of abundant and strong waxiness in the Bt3 horizon, and no mottling was identified during the profile.

The texture analysis reveals a predominance of the sand fraction in all horizons of the profile, with higher levels of coarse sand in the superficial horizons, with the exception of the Bt1 horizon in which the clay fraction predominates, (Table 4). The fine sand fraction was the one with the highest amounts in the Bt2 and Bt3 horizons and the coarse sand fraction was higher in the E and Bt1 horizons.

Table 4. Physical attributes of a soil profile in the quilombola community "Os Rufinos", Pombal – PB.

Hor.	Prof.	SAND GROSS	SAND FINE	AT	ARG	SIL	S/A	GD	GF
	cm	----- g.Kg ⁻¹ -----						-----%-----	
E	0-22	273	374	647	130	223	1,7	35	65
Bt1	22-69	171	211	382	396	222	0,5	74	26
Bt2	69-81	100	438	538	199	263	1,3	70	30
Bt3	81-87	89	427	516	198	286	1,4	59	41

Hor.: Horizon; Prof.: Depth; TA: Total Sand; ARG: Clay; SIL: Silt; ADA: Clay Dispersed in Water; S/A: Silt-Clay Ratio; GD: Degree of Dispersion, GF: Degree of Flocculation.

The E and Bt1 horizons showed acidic pH, while the Bt2 horizon showed neutral pH and Bt3 alkaline pH analyzed the pH in water. The organic matter contents were in relation to the soil texture. Regarding the bases found in the horizons, it can be seen that the contents of Ca⁺² and Mg⁺² were much higher in the Bt3 horizon. Na⁺ increases in depth, and was very expressive in the Bt3 horizon, characterizing the soil under study with nautical character (Table 5).

Table 5. Chemical attributes of a soil profile in the quilombola community "Os Rufinos", Pombal – PB.

Hor.	Prof.	pH		M.O.	Na+	Towards	P	Mg+2	Ca+2	Al+3	H+Al
	cm	H2O	CaCl2	g kg ⁻¹	-----mg/dm ³ -----			----- cmolc dm ⁻³ -----			
E	0-22	6,1	-	6,73	0,17	43,01	4	2,1	3,4	0,0	3,1
Bt1	22-69	5,6	-	7,34	1,96	66,47	0,8	14,1	11,2	0,0	4,5
Bt2	69-81	7,0	-	3,26	3,97	35,19	792	13,3	11,0	0,0	0,0
Bt3	81-87	7,8	-	2,04	6,46	46,92	506	17,2	14,7	0,0	0,0

Hor.: Horizon; Prof.: Depth; M.O.: Organic Matter; Na+: Sodium; K: Potassium; P: Phosphorus; mg+2: magnesium; Ca+2: Calcium; Al+3: Aluminum; H+Al: Hydrogen+Aluminum.

The horizons of the profile under study show nutrient availability, with high values of sum of bases (SB), high cation exchange capacity (CEC), with zero levels of exchangeable aluminum (Al³⁺) and consequently of saturation by Al³⁺ (m) (Tables 5 and 6). Analyzing the profile under study, there were high concentrations of exchangeable bases (K⁺, Na⁺, Ca²⁺, Mg²⁺) (Table 5), and base saturation (V) (Table 6). The Bt3 horizon showed whitish punctuations that effervesced in the presence of HCl, being characterized with carbonate character, and the Bt1 horizon showed dark punctuations that effervesced in the presence of hydrogen peroxide (hydrogen peroxide volume 10).

Table 6. Chemical attributes of a soil profile in the quilombola community "Os Rufinos", Pombal – PB.

Hor.	Prof.	SB	t	CTC	V	m	PST
	cm	----- cmolc dm ⁻³ -----			----- % -----		
E	0-22	5,8	5,8	8,9	65	0	1
Bt1	22-69	27,4	27,4	31,9	86	0	7
Bt2	69-81	28,4	28,4	29,4	100	0	14
Bt3	81-87	38,5	38,5	38,5	100	0	15

Hor.: Horizon; Prof.: Depth; SB: Sum of Exchangeable Bases; T: Effective Cation Exchange Capacity; CTC: Cation Exchange Capacity at pH 7.0; V: Base Saturation Percentage; m: Percentage of Saturation by Aluminum; PST: Percentage of Sodium Exchangeable.

The study profile showed a flat and clear textural change, columnar structure (figure 3) in the Bt1 horizon, being classified as Planosol in the first categorical level, being classified as Nátric in the second categorical level. Carbonate at the third categorical level and at the fourth categorical level was classified as typical.

Figure 3. Columnar structure of the Bt1 horizon.



Figure 4. Presentation of the soil profile.





CONCLUSION


1. The studied profile was appropriately classified in the Brazilian Classification System up to the fourth categorical level, being classified as a typical Carbonate NATIC PLANOSOL.
2. The craftsmen were able to distinguish, identify and name, in their own way, the following soil materials along the profiles: "surface earth", "earthenware", "armadillo clay + pottery clay", "armadillo clay". These materials were distributed in strata along the soil profile, in a manner comparable to the arrangement of the pedogenetic horizons.
3. The color, consistency, and amount of cracks were used by the artisans and researchers to distinguish soil samples, although they were used in different ways by these two groups.
4. The ceramic material most used by local craftsmen was "earthenware" with a high concentration of clay, which was evaluated mainly using sight and touch. In the area studied, the clay corresponded to a specific layer of soil, belonging to the Bt1 horizon of Planosols affected by Na.
5. It is recommended that ethnopedological research be constant and address the knowledge of artisans about soil variations, both on the surface (arable layer) and indicated by them as good soil to produce, and in depth, considering that such studies in specific contexts contribute to the advancement of pedology and to a better understanding and appreciation of the knowledge of these important authors of Brazilian culture.



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Palliative care in dentistry: Literature review

 <https://doi.org/10.56238/sevened2024.010-070>

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ABSTRACT

Palliative care seeks to provide quality of life through an interdisciplinary team capable of providing effective and comprehensive assistance to the patient in their final moments, and their family. In this sense, this work aims to address palliative care in dentistry. Several conditions act as a supporting or main factor in the development of oral problems in palliative patients. Among the main causes are nutritional deficiency, difficulty in oral hygiene, pharmacological and collateral therapies and dehydration, with xerostomia being the most frequent problem, followed by oral candidiasis, dysphagia, mucositis, orofacial pain, changes in taste and ulcers. However, the initiation of dental intervention is difficult, as many patients believe that oral manifestations are typical and inherent to diseases or because they lose the ability to communicate about their

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discomforts. Thus, the importance of including the dentist in the care of the palliative patient is verified to alleviate pain and the occurrence of complications, as well as to guarantee care for this individual.

Keywords: Palliative care, Dentistry, Oral health, Quality of life.

INTRODUCTION

Brazil has faced a process of changes in the demographic and epidemiological profile over the years, resulting in the formation of a population with specific health conditions mainly linked to aging (Pereira, Alves-Souza, Vale, 2015). In addition, there is also a change in the profile of illness, which estimates that a large part of the population may contract oncological or chronic-degenerative diseases that lead to long periods of suffering, and some of these conditions are often little benefited by existing scientific and technological resources (Gomes, Othero, 2016; Pineli *et al.*, 2016). In this sense, patients who do not have the possibility of cure are considered fragile and limited physically, psychologically, socially and spiritually, which motivates the need for a new form of care.

As a result of the changes imposed by the disease, palliative care emerged with the objective of providing quality of life through an interdisciplinary team able to provide effective and comprehensive care to the patient and his family in their final moments (Hermes, Lamarca, 2013; Silva, Sudigursky, 2008). The term palliative care was used with the beginning of the modern *hospice movement*, an action created with the objective of changing the strategy to deal with these patients, bringing the focus to care, instead of the traditional emphasis on the disease, in addition to bringing innovative proposals for the approach and care of patients, as well as their surroundings. during the phase of illness and mourning (Floriani, 2009). In this sense, the structure of the movement was established in 1967, with the inauguration of the *Saint Christopher's Hospice Foundation*, being the first service to offer care for patients with advanced disease, under the direction of Dame Cicely Saunders, a nurse who dedicated her efforts to carrying out such care (Pineli *et al.*, 2016).

Over the years, the concept of palliative care has been consolidated, being defined, in 2002, according to the World Health Organization (WHO), as an approach that aims to improve the quality of life of adults and children facing life-threatening diseases and their families (Oliva, Miranda, 2015). The WHO also reports that this intervention is done with the prevention and relief of suffering, through early identification, correct assessment, treatment of pain and physical, psychosocial or spiritual problems. In 2014, the *Worldwide Palliative Care Alliance* (WPCA) added to the concept of palliative care the information that there is no life span or prognosis that determines the indication of this conduct, but rather the patient's need (Pineli *et al.*, 2016).

In effective palliative care, the understanding of the individual goes beyond the disease, and it is essential to consider them in their totality, preserving their right to autonomy in decision-making and access to information about their treatment (Oliva, Miranda, 2015). Palliative medicine is based on some principles, which aims to ensure the quality of life of patients in a humanized way, in addition to emphasizing the importance of a team able to help the patient and his family understand that death is a natural process, and although painful, it can happen in an environment of peace and

serenity. However, before the moment of mourning occurs, professionals should assist in valuing and affirming life, and offer support so that the patient is able to live as actively as possible until the moment of death (Silva, Sudigursky, 2008; Pineli *et al.*, 2016).

Palliative care is not related to the length of life, the hastening or anticipation of death, but rather focusing on ensuring a higher quality of life that can have a positive impact on the treatment of the disease (Oliva, Miranda, 2015). Therefore, it is possible to affirm that each case is individualized and the conducts are appropriate according to the therapy and the needs of the patient and his family (Silva, Sudigursky, 2008; Pineli *et al.*, 2016).

Hospitalized patients are usually dependent on care and often unable to maintain satisfactory oral hygiene, thus requiring the support of professionals who perform this and other interventions (Rabelo, De Queiroz, Santos, 2018; Oliveira, Montenegro, Lima, 2019). In this sense, Dentistry should be included in the palliative care team, in the care of individuals with active, progressive or advanced diseases, which may present oral manifestations, due to direct or not involvement of the oral cavity, caused by the disease or from its treatment (Sarri, Augusco, 2020), since the oral cavity can host numerous microorganisms, in addition to presenting side effects from drug therapy of the underlying disease (Rabelo, De Queiroz, Santos, 2018; Oliveira, Montenegro, Lima, 2019).

Because it is related to nutrition and speech functions, care for the oral cavity is even more necessary, since the impairment of these functions causes a decrease in quality of life (Rabelo, De Queiroz, Santos, 2018; Oliveira, Montenegro, Lima, 2019). In this sense, care for terminally ill patients must be based on respect for their integrality, in order to meet their needs and guarantee the right to a dignified death (Sarri, Augusco, 2020).

Based on the above, this study was developed with the objective of discussing palliative care in Dentistry, analyzing the importance of including the dental surgeon in the multidisciplinary team, as well as the appropriate approach in the treatment of these patients and the associated factors, with the main oral manifestations Presented.

METHODOLOGY

The theme of this narrative literature review is the practice of palliative care in the field of Dentistry. The search for scientific articles was carried out from August to November 2023, in the bibliographic databases Pubmed and Google Scholar (Scholar Google), using the following descriptors: palliative care and dentistry. The inclusion criteria were: original works, written in Portuguese or English. The exclusion criteria were incomplete articles or articles that did not adequately address the study theme. After the data collection stage, the references were analyzed by reading the title and the abstract, taking into account the defined inclusion and exclusion criteria.

Subsequently, the selected articles were read in full. In total, 29 articles met the inclusion criteria for this literature review.

LITERATURE REVIEW

Palliative care encompasses active and comprehensive care for the sick patient and also for their family, in order to assess, prevent, and alleviate physical, psychosocial, or religious suffering, aiming at a higher quality of life (Soares *et al.*, 2022). In this sense, some essential components of this care were identified, namely, the need for teamwork, management of pain and physical symptoms, holistic care, the existence of qualified, compassionate and responsive professionals, and the preparation of the patient and family. In addition, in order to carry out an efficient approach, it is important to identify the need for care early and have adequate dialogue with patients and their families (Singh *et al.*, 2021).

Considering that the need for care is concentrated in patients who have progressive and incurable diseases, or highly complex problems that do not have adequate treatment options, it is essential to work with a multidisciplinary team, one of which is the dental surgeon. As for palliative care in Dentistry, patients are submitted to procedures for the oral cavity directly compromised by the disease, or indirectly due to the treatments received. The approach dedicated to these patients should be based on respect, integrity, and ethics, paying attention to the uniqueness of each individual, with the objective of allowing them to carry out their daily activities and obtain quality of life (Soares *et al.*, 2022; Serra *et al.*, 2023; Yadav *et al.*, 2020).

Several conditions act as an adjuvant or main factor in the development of oral problems in patients with minimum survival expectancy. Among the main causes are nutritional deficiency, difficulty in oral hygiene, pharmacological and collateral therapies and dehydration (Magnani *et al.*, 2019). It is customary that dental care should pay attention to the maintenance of all soft tissues, collaborating with pain relief, prevention, and treatment, thus providing comprehensive quality of life or minimizing the clinical manifestations and symptoms of the disease (Dias *et al.*, 2021).

The bacterial plaque in the oral cavity can interfere with the systemic status of the patient due to the virulence of these microorganisms, in addition to the presence of other conditions can intensify the damage caused by these bacteria (Rabelo, De Queiroz, Santos, 2018). Thus, the stomatognathic system can be impacted by the presence of oral manifestations, such as ulcers, xerostomia, halitosis, dental caries, endodontic or periodontal abscess, with implications that affect people's physical, as well as emotional and social health. From this perspective, the lack of oral health care associated with difficulty in swallowing can result in a pulmonary infection due to aspiration or even death. In addition, compromised periodontal health can increase the chance of osteoradionecrosis in patients undergoing radiotherapy who have oral cancer (Yadav *et al.*, 2020).

In view of the severity of the other complaints, oral discomfort is usually less important to patients and consequently left aside, so that physicians are not informed about it (Dhaliwal *et al.*, 2022). In this sense, it is necessary for a dental surgeon to remain in the hospital environment in order to contribute to the diagnosis of oral alterations and assist in medical therapy. This professional will perform emergency, restorative and oral environment adaptation procedures, in order to prevent the worsening of the systemic disease and the appearance of hospital infection, in addition to ensuring comfort for the patient (Rabelo, De Queiroz, Santos, 2018).

Early diagnosis and treatment minimize pain and suffering, however, the beginning of the intervention is difficult, because patients in this situation lose the ability to communicate about the discomforts related to the oral cavity, or believe that these problems are not possible.

Demonstrations are inevitable. In addition, the appearance of oral abnormalities is variable, as well as the moment of the patient's admission to palliative care units.

Thus, treatable oral problems can occur for a long period of time, contributing to underreporting, failure of health professionals to intervene in these complications, and lack of knowledge about the ideal time to perform these interventions. Thus, it is essential that patients are asked about oral problems and that they are examined periodically to maximize the treatment of signs of oral pathologies (Venkatasalu *et al.*, 2020; Matsuo *et al.*, 2016).

Therefore, the extraoral inspection examination should be followed, which will investigate skin lesions, edema, lymphatic chains and their possible alterations, temporomandibular joint, masticatory muscles, asymmetries and other signs that characterize pathologies. Therefore, the follow-up for the intraoral examination will highlight the conditions of the soft tissues, salivary glands and aspects associated with saliva (Soares *et al.*, 2022).

The presence of oral problems can cause an emotional burden in palliative patients, reflecting on their coexistence. As a result, he tends to withdraw due to discomfort when coming into contact with other people, which generates anxiety, embarrassment, and worries. In addition, it has functional impacts by compromising their communication and contributing to the development of eating disorders (Venkatasalu *et al.*, 2020). Thus, in order to cope with the fear and anxiety of this patient, the dental surgeon's care should be based on humanization, seeking to demonstrate interest in their speech and allowing them to share their experiences and feelings. From this dialogue, it is possible to carry out a detailed anamnesis that enables a discussion about the causes of suffering and the search for ways to alleviate it (Soares *et al.*, 2022).

Palliative treatment consists of oral health care, clinical examinations, complementary exams, diagnosis and intervention. Thus, it is active in the treatment of glandular diseases present in the oral cavity, head and neck cancer, temporomandibular disorders, myofascial pain, mucocutaneous diseases, autoimmune diseases, odontogenic infections, manifestations associated with systemic

conditions and drugs, edentulism and problems of periodontal or cariogenic origin. Concomitant with aging, the difficulty of ingestion, radiotherapy or interventional chemotherapy treatments, in addition to the association of drugs for systemic treatment causes a reduction in quality of life, thus reducing eating, fluid intake, and communication due to the discomfort generated in the oral cavity (Majeed *et al.*, 2021).

The study by Venkatasalu *et al.* (2020) pointed out the main oral conditions most present in palliative patients. These conditions were classified in descending order, according to the evidence of greater appearance, with xerostomia being the most frequent problem, followed by oral candidiasis, dysphagia, mucositis, orofacial pain, changes in taste and ulcers. In this bias, professional care and oral hygiene become important for a better quality of life (Funahara *et al.*, 2022), therefore, the dentist is essential for symptom relief (Tacianel *et al.*, 2020).

The dentist should collaborate responsibly in the treatment of clinical manifestations, improving nutritional quality and contributing to the reduction of the risk of infection. Oral hygiene instructions should be given in detail to avoid aggression to the periodontium and reduce bacterial plaque in order to keep the mouth healthy and disease-free (Tacianel *et al.*, 2020). In addition, the professional in his care should be concerned with welcoming the patient and family members, paying attention to their doubts and anxieties, since their unresolved complaints can trigger other complications, such as longer time in the hospital and a greater risk of infections, thus increasing the vulnerability of this patient (Ghazali *et al.*, 2011).

DISCUSSION

Currently, studies on preventive and therapeutic care in patients at the end of life, provided by dentists, are still few. According to the World Health Organization (WHO) manual, Medicine, Nursing, and Physical Therapy courses have a greater role in this area. However, dental professionals' knowledge and understanding of oral health care for terminal patients are also of paramount importance in ensuring improvements in the quality of life of people with this condition, and multidisciplinary work is fundamental in the development of a treatment action plan (Silva *et al.*, 2023).

Oral diseases such as xerostomia, caries and stomatitis are prevalent in adults who have severe systemic alterations, which can cause fatal complications, thus interfering with the individual's quality of life. Xerostomia is the most common oral condition, being responsible for impairing speech, taste, chewing and swallowing, worsening at each stage of death, due to kidney failure, dehydration and the use of anticholinergic medications. In this sense, caries disease can also prevent the intake of nutrients in an adequate way, due to odontogenic pain, as well as the presence of ill-fitting prostheses, which can also interfere with the well-being of patients. Other conditions that

can affect palliative patients are related to candidiasis, cold sores, tongue coating and inflammation, halitosis, mucositis, periodontitis, mucosal erythema, and orofacial pain (Santana, 2020; Venkatasalu *et al.*, 2020).

In the initial dental consultation of patients in palliative care, such as the oncological examinations, priority should be given to the creation of a professional bond, the realization of a complete anamnesis and extra and intraoral examinations, so that the best approach can be determined to act on the necessary oral conditions. Although dental treatment is elementary in the patient's well-being, there is still a blockage on the part of some individuals who cannot understand the value of this care, because they believe that oral manifestations are typical and inherent to diseases. In this sense, the professional can act by informing the risks resulting from the therapies and explaining the treatment options to the patient, in order to provide a better reaction to complications. From then on, the dentist will be able to perform procedures according to the patient's needs, such as extractions, restorations, scaling and prophylaxis (Soares *et al.*, 2022).

In palliative patients, oral care should be performed in a focused on the patient's real needs, as opposed to standard procedures. In the hygiene of the oral mucosa, attention should be paid to the removal of coatings, adoption of preventive measures against infections, consequently to the reduction of pain (Kvalheim, Strand, 2022). Thus, another function of the oral health team is related to helping patients with tracheostomy or intubated patients. The dentist should intervene by brushing the teeth and tongue, and applying 0.12% chlorhexidine gluconate in the oral cavity, since this care, when well performed, reduces the appearance of pneumonia due to acting on the primary focus of the infection (Santana, 2020).

Xerostomia was a nuisance perceived by most of the participants. interfering socially and functionally. The reduction of salivary flow brings with it a decrease in the capacity for self-cleaning, tamponade and antimicrobial effects, providing the oral cavity with microbial demineralization processes. This patient, in turn, is more predisposed to potentially aggressive infections and complications, such as pneumonia and septicemia. However, the study points out that the participants tend to accept xerostomia once they understand it to be a manifestation of their pathological process, making it a worrying issue regarding the health of the oral cavity, systemic and the search for it (Chen *et al.*, 2021).

Among the management options available for the treatment of xerostomia in palliative patients, the use of lubricants for lips and mucous membranes, acupuncture, oral care, as well as medications and medical treatments improved in 80% or more of the patients. In the case of candidiasis, another frequent manifestation of these patients, fluconazole 150mg, oral in a single dose, showed a significant reduction in symptoms in 78.1% of the patients, with $p < 0.001$. Other alterations, such as dysphagia, improved after the fifth acupuncture treatment, however, it is worth

noting the worsening of swallowing and pain in the mouth when the pharmacological approach of topical action was chosen. Regarding mucositis, improvement results were observed when indomethacin oral spray was used, with pain relief after 25 minutes, with no improvement through the association of topical drugs (Venkatasalu *et al.*, 2020).

The study by Hong *et al.*, 2019 evaluates the efficiency of laser therapy for patients with oral mucositis, and it is notorious that laser has shown evident efficacy in minimizing oral mucositis in cancer patients, since, based on photophysical and biochemical effects, they act as an analgesic, anti-inflammatory, and scarring agent for lesions in the oral mucosa. Its mechanism of action acts on the photostimulation of chromophores, which compels to increase adenosine in mucosal cells, potentiating cellular metabolism, and consequently, maximizing fibroblast production and reducing healing time (Florentino *et al.*, 2015). Therefore, it is essential to evaluate laser therapy treatment as an important option, since it has a low cost and does not have side effects.

The oral cavity holds significant importance in personal well-being, due to the connection with nutritional health, guaranteed through the preservation of patients' ability to feed by mouth and the pleasure generated by tasting a food of their choice. In addition, it is possible to observe the impact of oral alterations on communication, since hyposalivation, presence of lesions, infections or poor adaptation of prostheses makes pronunciation impossible (Oliva, Miranda, 2015). Finally, systemic complications resulting from microorganisms in the oral cavity are well described in the literature. Therefore, it is essential to carry out procedures that promote the improvement of oral hygiene and follow-up of patients undergoing palliative care, thus reducing the development or progression of complications (Santana, 2020).

CONCLUSION

The end of life may be associated with specific challenges in relation to increased illness, physical limitations, and psychological distress. These difficulties overwhelm the patient and their families, causing oral care to be often neglected. Therefore, the palliative care performed by the dentist is of fundamental importance to alleviate pain and the occurrence of complications, as well as to welcome and transmit confidence to the patient dominated by emotions.

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Trajectories of construction and training of a natural sciences teacher

 <https://doi.org/10.56238/sevened2024.010-071>

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ABSTRACT

It is a text built under the aegis of the autobiographical perspective, with formative memorial clippings of a Professor of Natural Sciences, whose trajectory was crossed by the passion for Sciences, since her childhood. Throughout the construct, we narrate facts that rescue these memories and show how the Teacher in question was built and formed into a Teacher of Natural Sciences, who works at the higher level.

Keywords: Teaching, Sciences, Autobiography.

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INTRODUCTION

"[...] Our search for discovery fuels our creativity in all fields, not just science. If we reached the goal, the human spirit would wither and die."
(Stephen Hawking – The Universe in a Nutshell).

It's not news to people who know me how much I love Stephen Hawking. His intelligence, perspicacity and good humor are contagious! Reading his books has always led me to make reflections that intrigue me, even for the types of questions he uses in his works. I consider the excerpt alluded to above pertinent and I chose it to be the initial words of this text, because I believe that I am still in a process of "discovery" and at the same time of construction and training as a teacher of Natural Sciences. I agree with your assertion, because I also believe that we have the constant need to always undertake something new, otherwise our existence would not make sense.

Thus, taking the autobiographical perspective as a theoretical construct, I launched myself for the first time in my academic trajectory to outline some traces of my schooling memories. In this way, the present text aims to rescue the formative memories of my construction and training as a teacher of Natural Sciences. In this sense, I made some retrievals of memories before the atypical motherhood, because what needs to be written for after the atypical motherhood is something that requires more time and space than we will have at this moment.

The present text was "shelved" for 10 years. And "rummaging through" old texts on an old hard drive, I found it... And I decided to "finish it". In quotation marks because it is a text that, even with the updates of atypical motherhood, will not be finished, and not even close. As long as I live, I will continue to dedicate myself to science, at least a little, since now there is a beautiful child in my life, who communicates without expressing words, like other children, which requires a lot of my time. My little mermaid broke all the paradigms of my existence. So today I understand why this text was kept. It's because my life wasn't complete without the mermaid in it.

For this, I use a qualitative research, in the terms of Minayo (2012), taking the case study as a methodological construct, in the terms of Yin (2011).

REMEMBERING MY SCHOOLING HISTORY

My explanation in this text will be by means of recollections. I agree with Gadamer's thought (2005, p. 216), when he states that "[...] Remembrance only has the value of remembrance for those who still have a link with their own past. Memories lose their value when the past they remind us of no longer has any meaning." And precisely because I consider it to be an important part of my life trajectory, I bring these first formative memories of my childhood, which take me back to a time that was once permeated by experiences already related to education, even if I did not realize it at the time.



Thus, I bring my memories, my memories, which are stored in a very special place in my subconscious, in a time situated in my past and in my present, because "Time is memory; time is installed in experiences circumscribed in moments; Time is situating oneself in the past and in the present. Time, memory and oblivion. A trilogy to think about the art of remembering, to structure a look at oneself, to reveal oneself" (SOUZA; FORNARI, 2008, p. 114).

And in rescuing these memories, I am able to search for memories of the times of my literacy, still in Gurupá, a municipality in the interior of Pará, where I was born. The person responsible for this feat was the late educator Rosa Bahia. I can remember a little of her, she was a kind and patient person, who noticed my interest in wanting to "learn the letters", when she was about three or four years old. One time I went to do something at her house, at my mother's request, and it was then that I saw a book on her couch. I was delighted! It's colorful, full of beautiful illustrations... and lyrics! While waiting for the teacher to get out of the shower, I sat down on the couch (even though I wasn't invited!) and started flipping through that book, all the while wondering what those letters meant. And I stood there talking to myself and naming the characters. It was then that I was startled when she came into the room with a smile on her face, asking what my mother wanted. I ran the errand and returned the book to the couch. The next day, my mother told me that I could go to Rosa's house in the late afternoon, that she would teach me to read. I was so excited, that I left the house wearing only a "venom",² as my late grandmother used to say. At the same time I was running with a pencil and a notebook in my hand! I remember that well! But I can't remember in detail the literacy process itself, I can only say that at the end of 1989 (at the age of five) I was already literate.

That same year, due to health problems in the family, we went to live in the state of Amapá, precisely in the city of Santana, since the resources there were a little better than in Gurupá. I can remember long before my first day of school. I remember the selection test I took to enter the school I would study for all my Basic Education, that is: Janary Gentil Nunes School - Bradesco Foundation. The Principal of the school was a blonde and nice lady, Professor Francisca, affectionately called "Aunt Beautiful" by the students. She applied the test herself. I remember I thought it was easy. It should identify colors, geometric shapes, and letters. She would read the command of the questions and I would answer, however, it was interesting when I started to read the instructions for taking the test. It was then that, with a smile on her face, she said to my mother: "But you didn't tell me that she was already literate." I had no idea what she meant by that at the time. I only know that I got the place to study at what is considered the best school in Amapá.

My first day at the so-called "Kindergarten" is something that is also burning in my memories. It was February 1990, I was 5 years old. He was a slight, quiet child who liked music a lot and often listened to Raul Seixas, Legião Urbana, Maria Betânia, Pink Floyd and the Beatles. I

² It was what my maternal grandmother called her underwear.



remember waking up early, before the clock woke up. My mother bathed me, we had breakfast and walked to school, which was close to my house. That space was immense, enchanting and paradoxically frightening, and it managed to be beautiful and smelled good at the same time. The school was always flowery, clean, had lots of grass and a playground. The dining hall was immense, as was the sports court; The hallways were spacious, the classrooms were large and it was very ventilated. And there was also something that I consider very important... The snack was (always) excellent! I sat right in front of me (and so it was for my entire academic life) and that skinny person with chanel hair and brown skin introduced himself: "Good morning kids. I am Professor Lúcia Bezerra"... It was "Aunt Lucia" who would be my teacher for the whole year and the following year, in the so-called "Preschool"! He liked her very much, she was a serious person and at the same time, patient and attentive.

It was a very fruitful two years. I learned a lot from her, her classes were fun, and she constantly asked me for help with small tasks, "guiding" other classmates who were not understanding what should be done in a certain activity. I was always able to finish the activities well before the rest of my classmates.

By the end of 1991, I was worried about whether "next year's aunt," my 1st grade teacher, would be nice. And she was, yes, "Aunt Goreth." But the funny thing is even though she was a good teacher and I liked her a lot, I can't even remember her face the same way I remember "Aunt Lucy". I just remember that she was skinny, fair skinned, with light brown hair and "chanel". I think it was fashionable at the time!

Thus, the year 1992 passed, and the following year (1993), my 2nd grade teacher was a beautiful lady, with the same name as my maternal grandmother, "aunt" Maria Gomes. She always wore a skirt, with her black hair, long and wavy, and an intriguing red mark on her face near her right eye. He is a person for whom I have a lot of affection and who represented a lot in my formation. She was the great encourager of the development (at least in me) of the habit of reading. "Aunt" Maria Gomes, delegated to the class an interesting activity, still on the first day of class and warned us that it was not worth a point! All students were expected to read one book a month. The book we wanted, the choice would be ours, every Friday we went to the library to read it (and what a wonderful library ours was!), and at the end of each month, three students would be "drawn" to explain the book to the class, while the others had to write an essay about the book they had read... The activity lasted the whole year and I am very grateful to the teacher for that, because from then on, I continued throughout my school life reading a book a month.

I tell this story to all my friends, that the book I chose to read in the first month was "A Midsummer Night's Dream" by William Shakespeare. To tell you the truth, it was the first book I read in my life, and I found the book difficult, full of new words, and every Monday, I would go to



the teacher's desk to ask the meaning of the words in the book that I didn't understand. Until I got a dictionary from her. I think she was tired of so many questions! But the whole year went by and I was never "drawn" to talk about the books I read, but I wrote about them every month.

A YEAR OF TRAMPLING!

The following year (1994), with great difficulty, I attended my 3rd grade, with Professor Kátia. She wouldn't let us call her "auntie," and explained to us that she wasn't our blood relative, so we shouldn't call her that. I speak of the difficulty because this has been a particularly traumatic and difficult year in my life. The story begins in the year before this one (1993). My mother had developed a serious health problem. It was an undifferentiated carcinoma of the cells of his right upper eyelid (it was a malignant tumor, a rare type of cancer). She had already performed three surgeries in Macapá and the problem that had started as a simple cyst had taken on serious proportions. Then, in 1993, she began her treatment, which culminated in a series of 12 surgeries, a corneal ulcer from exposure, and the loss of her vision, which was later recovered, by what doctors called "spontaneous remission." But for my family, the name is different: miracle, since she was already scheduled for surgery to amputate her eye, due to the fact that she did not respond to the treatment of the ulcer, and her cornea recovered from the injury literally "from one day to the next".

Thus, in the midst of a troubled end of the year due to the illness that had struck my mother, our beginning of the year of 1994 had become even more complicated, because in February of this year, me, my brothers and my father suffered a serious traffic accident. We were run over at a bus stop by a man who was driving under the influence of alcohol. As a result, my father had serious cranial concussions, was a victim of amnesia for more than a month, and needed care because he couldn't remember his children, his wife, or himself! My sister was so brutally injured that you could see the exposure of her muscles all over her left lateral region, her breast tissue was exposed and she needed a lot of care so that the wounds did not become infected.

In turn, I had a perforated lung, fractures in my right collarbone and arm, countless bruises and needed the help of a ventilator in an Intensive Care Unit to be able to breathe for 15 days. The only one who came out "unscathed" physically, with only scratches was my 6-year-old brother. In the midst of all this chaos, it was a difficult year at school. Due to the events that occurred, I was very sad and could not understand very well what was happening to us and especially to my mother, who was far from us at this very difficult time. I cried a lot, not so much because of the physical pain, but because of the fact that I knew she could die, and that was the worst thing that could happen in my life, because for a 9-year-old child, who was away from his father (who didn't recognize me), his mother (hospitalized in Belém for treatment) and his siblings.



I may be sounding "melodramatic" in recounting such events, but they were in fact very important in my life. Thus, I decided to bring these memories because I consider that "[...] the self-report, mobilizing the density of our experiences as protagonists, takes place in a complex fabric of alterity that articulates the privacy of a narrative subject and its socio-historical space" (SOUZA; FORNARI, 2008, p. 130).

Thus, in this socio-historical space of school formation, I (re)inserted myself into school even with a fractured right arm and several other health problems that I also faced. It was very difficult for me to (re)adapt, because I felt that people looked at me with pity. "It's that girl who was run over with the whole family and her mother has cancer" – I heard it once! I had to write with my left hand. My teacher was understanding, she didn't force me to do anything, but I pushed myself, because I had already missed a lot of classes. And even with pain in my arm and lungs, I went to school.

My mother, burdened with worries, requested a leave of absence of less than a month from her treatment and went to Santana to see us. When faced with the situation I was in, crying in pain because of my arm, he took me to the Emergency Room. It was then that a month after the accident, we discovered the fractures of the arm and clavicle. Because the doctors paid more attention to the lung problem, they didn't perform any imaging tests, and I was in an induced coma in the ICU, they didn't know about the fractures. So, I had to operate. I was very afraid, especially because when I had the surgery, my mother had returned to Bethlehem to proceed with the treatment. Again I walked away from school. I was "in recovery" in all subjects because I missed the exam period, but at the end of the year, I was approved in everything, I passed with good grades throughout this process, I was very afraid of death. Not mine's, but my mother's. Thus, I refer to the words of Hawking and Mlodinow (2011, p. 7)

Each of us exists only for a brief lapse of time, during which time we explore only a tiny portion of the universe. But the human being is a curious species. We question, we seek answers. Living in this vast world, sometimes generous, sometimes cruel, and contemplating the infinite sky above us, we always ask ourselves countless questions [...] (HAWKING; MLODINOW, 2011, p. 7).

And sometimes I found myself looking up at the infinite sky and questioning various things. Why was all this happening to me and my family? Would things be okay after all that? Would my mother come back to us "for good"? There were many thoughts that were going on in my mind... And another year passed.

The following year (1995), I attended the 4th grade, with the "other" Teacher Lucia (we talked like that at the beginning of the year), who won our affection very easily. We were very demanded, because next year we would do the 5th grade, there would be many teachers and we would have several schedules, we did a lot of readings and she gave "dictation" practically every day. We had been hearing about it from the beginning of the year, from the 5th grade teachers. Would that



be scary?! For me, I would say challenging, because I was no longer that "fearful" girl from the first day of kindergarten... But that's another story. My mother was already back home. But very fragile, due to the disease and all the suffering she had gone through, she didn't need to say anything, but her eyes were sad and she was no longer that cheerful person. Things weren't going well. I was always worried about her and I lived a childhood at home, because I had asthma, 'rheumatism', migraines and insomnia. That year, due to reasons I couldn't understand at the time, my father left home. Their separation was difficult for us. He never abandoned us financially speaking, but we missed a father, mainly because after my mother had cancer, she became very debilitated and the next few years for her were not easy, I remember that she contracted leptospirosis, then malaria, and dengue. Not to mention the serious spinal problems she developed due to successive hospitalizations.

THE MOMENT I REALIZED I FELL IN LOVE WITH THE SCIENCES!

Another year passed, and I believe it was at this time that I realized how much I enjoyed life-related issues. I don't know if it was because I wanted to understand my mother's health problems, or my own problems, or if it was already a 'vocation'. My "awakening" to Biology... I can't even describe how it happened. I think it's been forever. I remember that around the 2nd, 3rd grade, I was already in love with the functioning of the human body. I didn't even know the name, but I found the physiology fascinating! I thought it was amazing how this perfect system worked, and I was very happy to go to school when I knew I was going to have a science class. I liked all subjects (I just didn't have much sympathy with Mathematics, and look how funny it is, no teacher explained to me that the language of the universe is mathematics, but when I discovered that, I started to have a lot of respect and admiration for Mathematics).

I remember that my curiosity led me to kill a poor frog because I wanted to know what his blood and heart were like (I had seen the picture in a book). Although I had no knowledge of Bioethics, I later felt sorry for the frog for having done that in a painful way for him, but I didn't regret it, because I saw that the figure in the book was not as cool as seeing it for real. And I have a cousin, whom I deeply admire to this day. To Rôane. Wow, I idolized that girl, because of her knowledge of science. I went to my godmother's house not only because I liked it there, but also because "Rô" (I still call her that to this day) kept telling me about the things she studied in Science... I can't hear about magmatic and sedimentary rocks without being reminded of her. I wanted to be a doctor! And I believe that this became a desire in my life, because I believed that I could help other children not to have to go through everything I went through in my childhood because of my mother's health problems. Thus, I believe that the love for Science has always been in my life, but I realized that I was deeply in love with it, just before I started attending the 5th grade.



FROM 5TH TO 8TH GRADES: OUTSTANDING TEACHERS' CONTRIBUTIONS IN MY TRAINING TRAJECTORY

And so, the year 1996 arrived. The long-awaited 5th grade. Lots of different schedules, a teacher for each subject... Many school discoveries were to come, and of course I sought to know from the science teacher. Thus, on the second day of school, I came across an illustrious figure named Jerome, a man of about 45 or 50 years old; It reminded me of those "windsock" scientists, of whom we see the stereotyped representation by common sense. He was a bit stressed, sometimes throwing chalk at the restless boys who didn't pay attention to class, but he had incredible knowledge. Our "mental chemistry" had been immediate. He was my teacher for 2 years and for sure, he was one of my "unforgettable teachers". And I emphasize here that this year was also a difficult year for me. For the first time I came across the death of a family member. It was Rory (Rô's brother), my cousin-brother, who at the age of 16, had suffered a tragic car accident that took his life. That shook me to my core, the impact was so much that I can hardly remember what the rest of the year was like. Be indescribably sad. And I didn't want to go to school. Even so, I went, because I had a conviction since I was a child, that I should study to become "someone in life". And with that thought I went through 6th, 7th, and 8th grades (and I still think that way to this day).

My 7th grade science teacher was a person who marked me a lot, Mara Zampar (who years later, became my co-worker at the José do Patrocínio State School, in Fazendinha, district of Macapá, as well as Geography teacher Luzinaldo Roberto, who was also one of my "unforgettable teachers" and who became a colleague). Professor Mara made me love science more than I already did. I have no doubt in saying that she was the most creative, captivating and special teacher I had in all my Basic Education. Always developing different, interesting activities, I managed to transform one's classroom into such a pleasant and relaxed environment, that there is no way not to want to be such a special Teacher, as she is! Too bad it was only for a year.

Already in my 8th grade (1999) it was particularly interesting with regard to Science. I discovered that Physics and Chemistry would certainly be new passions in my life, along with Biology. I loved studying science in the 8th grade, and I was already looking forward to studying the subjects in isolation in high school. Even though I wasn't my best friend with Mathematics, I knew I would need it as a tool for Physics and Chemistry subjects, so I started to pay more attention to Professor Joenyr's Math classes (who worked Mathematics, Financial Mathematics, Statistics and Physics throughout High School). We had a lot of classes with him, so I had to get used to numbers, even though they were never my passion!



HIGH SCHOOL: NEW PASSIONS AND DISCOVERIES FOR THE SCIENCES

With great expectations about Science, in the year 2000 I started my High School, with the consolidation of my affinity for Biology, Physics and Chemistry. Although I didn't feel very comfortable when at one time or another of the disciplines alluded to, we needed Mathematics, this did not become an obstacle for me to dislike them. I was especially attracted to Physics, because I had loved Biology since childhood. In high school, I had my first contacts with the theories of Albert Einstein and the readings of Stephen Hawking. Despite all the complexity of the topics dealt with by these authors, Cosmology at one extreme and Particle Physics at the other, have always fascinated me.

In the same way that I fell in love with Chemistry, especially the study of Radioactivity. I remember reading a book by Oliver Sacks, titled "Uncle Tungsten: Memoirs of a Chemical Childhood," released in 2001. I was delighted to learn that a woman, Madame Currie, had developed remarkable research in the area of radioactivity and this motivated me even more, to want to seek more knowledge. Thus, I have to emphasize that the knowledge gathered during this period was essential in my training. As well as the Professors of these disciplines who inspired me a lot: my dear Professor Ana Bitencourt (Chemistry), Professor Marília (Biology) and Professor Joenyr (Physics), who were essential to the construction of what I am today as a teacher!

In the last year of high school (2002), life played another trick on me. My boyfriend (by the way, my first boyfriend) passed away. Again I experienced the grieving process and had depression for two years. Even so, I continued to study hard. My professors bet that I would choose a career as a biologist. But when I signed up for the entrance exam at the Federal University of Amapá (UNIFAP), I opted for the Nursing course, I believe motivated by the proximity I have always had with the constant health problems experienced in my family context.

BRIEF APPROACH THE TRAJECTORY OF MY UNDERGRADUATE DEGREE AND BACHELOR'S DEGREE IN NURSING PARALLEL TO THE BEGINNING OF MY TEACHING CAREER

In 2003 I started my undergraduate course in Nursing at UNIFAP, very happy for the pride I gave to my family, especially to my father, who once heard from a cousin "*Don't be fooled that a poor man's son doesn't graduate!*". I heard this when I was seven years old, and I grew up wanting to prove my uncle wrong, because despite his humble origins, my father always worked hard so that his children would not lack anything, especially education. And I would be the first poor person in my family to enroll in a higher education course, notably at a Federal University.

I believe that I had a great undergraduate course, I took advantage of it as much as I could, I studied a lot, at the same time that I suffered from the suffering of the people, because the conditions



offered by the public authorities were (and continue to be) precarious. I have seen people die due to the negligence, incompetence and recklessness of various professionals, and I could not remain silent in the face of these situations, because I already had and still have the conception that life is the greatest good, and that it is valid to fight for patients until all available resources are exhausted.

In this training trajectory, I had disagreements with teachers, doctors, nurses and nursing technicians during the internships I did, because I could see with great clarity the disregard of many professionals with life and the profession, thus, I could not understand the reason for so much individuality and what led people to aim only at the financial side. But not everything is reflected in bad things, because at the same time that I had to face many challenges, I found incredible, dedicated professionals who had great respect for people's lives. They were few, but they were people who inspired me to grow as a future professional and as a human being: Professor Francineide Pena, Professor Liudmila Miyar (my dear TCC advisor, for me, an example to be followed), Professor Joelma Pereira, Professor Olinda Consuelo, Professor Rinaldo, Professor Ronaldo, Professor Florianaldo Carreteiro... They have always been examples for me.

Throughout my five-year undergraduate course (2003-2008), I continued to treat Nursing with great respect, but I was much more of a "lover" of Education. During this period, I worked for two years with the disciplines of Chemistry and Biology in the state school system, but in 2006, after completing my Teaching course and completing a Training Course offered by the State Department of Education, I started working with Special Education, in the area of multiple disabilities. At the same time that I was studying, doing internships and mourning the loss of my patients, I saw my hopes renewed when I saw the small but important steps that my students with specific needs took on a daily basis! This made me hope and see Education as a profession in which I would contribute much more and suffer much less. Thus, I believe that "[...] education must start from dialogue with oneself and with the world in the search for authenticity in our experiences" (SOUZA; FORNARI, 2008, p. 110). And for me, education has always been authentic.

In this way, my experiences during my undergraduate degree in Nursing made me think about another professional path. Thus, I corroborate the thinking of Souza and Fornari (2008, p. 112), who mention the following: "[...] In walking, in the experiential flow, we are in the world of life, that is, we are living as historical beings who, in transformation, are transformed." So, due to all the difficult things I had already been through, and that I knew that other people were also going through, including with much bigger problems than mine, I was focusing more and more on my studies (something I always liked) and I was really transformed. And this process of (trans)formation continues to the present day.



BECOMING, BUILDING ME UP AS A TEACHER

In the midst of a context full of challenges, I started my teaching career at the age of 19. In March 2004 (still in the second year of my undergraduate degree in Nursing), I started teaching Chemistry and Biology. It seems to be very strange for a student of the Bachelor's and Bachelor's Degree in Nursing to work with this discipline, but in the state of Amapá there was no higher education institution that offered the Bachelor's Degree in Chemistry at the time, so undergraduate students in Nursing and Biology who had the opportunity, taught these subjects in schools. Because the teachers who existed in the state with training in these areas did not cover the enormous lack that existed (and still exists) in the schools.

The teaching job "*fit like a glove*", both in terms of personal and financial reasons. I fell in love with teaching and, unlike many colleagues, I became intensely involved with Education, and I did not see it as a "*quick-fix*" with regard to financial terms, on the contrary, I intensified the search for knowledge in the area, by taking the Teacher Training course for the initial grades (the so-called Teaching) parallel to the undergraduate course in Nursing. I completed the Teaching course in December 2005 and found myself completely immersed in Education, much more than in Nursing, because due to my suffering with the various problems that involved my patients, I deeply identified with teaching and seriously thought, while I was studying for graduation, that I would follow after graduating from the Teaching career. And this career, as a Teacher, for me, will always be a construction, a process in which I transform myself every day.

NURSE, BIOLOGIST, PEDAGOGUE, MASTER AND DOCTOR IN SCIENCE AND MATHEMATICS EDUCATION

It is evident that since the beginning of my teaching career, I realized that this is an area that has a lot to improve, full of challenges and, like health, suffers from the lack of honesty of political representatives, in addition to being little valued in financial terms. Education is seen by many people as a profession in which "*it is not worth investing*", I even heard it from some classmates in comments such as: "*But it is very brave to want to be a Teacher! Teacher earns poorly. As a Nurse you will earn double, triple, you will earn much more.*" But although money is no longer important to me, I decided to enroll in August 2008 in an Intensive Care Unit Specialization course, because in the entire state of Amapá there were only two nurses with this specialization and I thought it would be a differential. I completed the course in June 2009, and it was important for me to know DEFINITELY that my career would follow the paths of Education.

It was then that in 2009 I came to live in Belém do Pará. Away from my family and without a job, accustomed to a work routine and always full of tasks, I could not "*sit still*", I went to UFPA, directly at the Institute of Education Sciences (ICED) to look for information about the Graduate



courses, because since graduation, I had the dream of entering the Master's Degree; it was then that I was informed that the public notice for the *lato sensu* Postgraduate course in Education Management and Financing Policies was open. I applied, presented a project, resume and was approved. It was an excellent course, which contributed enormously to my training as an educator, as it broadened my understanding of the public educational policies that govern our country, as well as the issue of budget planning in this sector. I was able to understand what a public policy is about, how the State enables and executes its educational planning. It was of great value to have taken this course.

Immersed in the academic environment, I was informed about the Master's course offered by the former Pedagogical Center for Scientific Development Support (NPADC), currently the Institute of Mathematics and Scientific Education (IEMCI), which was aimed at teachers with training in the areas of Mathematics, Biology, Physics or Chemistry and people with proven experience in one of these areas. So, in 2009, while I was taking the course offered by ICED, I started reading to make the IEMCI selection.

Thus, in the first half of 2010, I started a new stage in my life. I was anxious, full of expectations, because I was going to launch myself into the long-awaited challenge of taking a Master's course. It was in this context that I started in 2010 the first discipline to be offered in the course: Epistemological Bases of Science. The prospects for it were great. We heard a lot about how challenging it would be to get in touch with all the authors we would have to meet, and at the same time be able to prepare our texts, and at the end of the course, we would have to deliver an article! Many had no idea how to start doing this, including me!

It was really a new, challenging experience. When I saw the syllabus of the course and the list of theorists we would have to read, I almost fainted! I already imagined that it would not be easy, but I threw myself into the unknown and formed a duo with the master's student Lêda Valéria to do a seminar together on the book "The Mutation Point" by Fritjof Capra, because this was the only author on the list that I already had any knowledge of, since I came from an extremely positivist background. I didn't know the theorists of the discipline and I had already watched the movie "The Turning Point" in 2009 in the Specialization course I took at ICED. So, I started reading Capra's book and became deeply enchanted by the theme, which was new to me. I was so excited that I even bought several other books by the author when I received my first Master's scholarship. I even attended some seminar presentations by my colleagues, and I was very happy.

But, that's when my trajectory was interrupted! My father (again) was in a terrible automobile accident and was left in a coma due to a traumatic brain injury. In addition, my ex-father-in-law was diagnosed with a terrible clear cell renal carcinoma, with brain, lung, and bone metastases. I did not have the emotional structure to face the situation, because with the possibility of losing my father and following the daily suffering of such a dear person, who no longer had a chance to recover, I saw my



life completely affected and was no longer in a position to continue the course. It was then that I abandoned the discipline of Bases and the other activities of the Program to be with my father, in Macapá, where he had been run over. I was going to be disconnected from the Master's Degree, but thanks to the understanding of the PPGECEM Coordination, I was able to continue the course and rejoin the Program's activities in August 2010. Unfortunately, my ex-father-in-law did not resist the ills caused by renal carcinoma and died, but my father, exceeding all expectations, managed to get out alive from all the problems he faced, even with some sequelae. After all the suffering of the loss and all the joy of seeing my father gradually recover, I returned to Belém and faced the challenges of the Master's Degree again, only this time, demanding much more, especially for the vote of confidence that was given to me by the Program Coordination, especially by professors Dr. Isabel Lucena and Dr. Nádia Freitas, who took the case to the collegiate meeting and asked for my non-dismissal from the Program with the readmission in the next semester.

Thus, in the second semester of 2010, I took five courses offered by the Program, namely: Trends in Science Education; History of Science in Science Teaching; Environment and Teacher Training; Affectivity and Construction of Scientific Knowledge: A historical-cultural approach; Cinema, Writing, Experience and Formation and Epistemological Bases of Science. Two of these disciplines culminated in the publication of four articles in national and international events in the area.

In 2011, feeling an immense need to expand my knowledge concerning the Sciences, I started my Bachelor's Degree in Biological Sciences, parallel to the activities of the Master's Degree. A new challenge for me! That added a lot to my specific training in science teaching. The present degree was completed in August 2013, one year after I completed my Master's degree.

I consider all the activities carried out during the Master's Degree to be very important to my (trans)formation, and I give special emphasis to the discipline Epistemological Bases of Science, as well as the participation in the "Research Group on Education in Science, Technology, Society and Environment" and in the "Research Group on Education, Science and Sustainability in the Amazon". These activities were essential to my training, since they provided me with the outline of theoretical reflections, which provided the theoretical, methodological and epistemological basis necessary for the development of my dissertation text. In this way, "[...] Producing meanings based on theoretical reflections was a challenge based on dialogue [...]" (SOUZA; FORNARI, 2008, p. 109), something, in my opinion, very present and valued in the present Master's course.

My focus of studies in the Master's Degree was the appropriation of scientific knowledge about Transgenic Foods (TA) under the STS focus. This, in turn, deals with the relations between Science, Technology, and Society, a widely spoken and widespread perspective in the teaching of Science, which aims, among other aspects, at the formation of critical citizens and decision-making,



based on scientific assumptions. However, for this to be possible, "[...] There is also a need to highlight that the exercise of teaching involves specific knowledge, pedagogical knowledge and knowledge constructed in the spaces of experience" (VEIGA, 2008, p. 19). Knowledge that I had the opportunity to share with the professors who participated in my training in this Graduate course.

My dissertation entitled "Appropriation of scientific knowledge: an approach to transgenic foods" was defended on May 30, 2012. A book was published in May of this year, at the invitation of a German publisher who was interested in the research topic. We also have to highlight that the empirical data collected during the Master's course enabled me to enter the PhD course in 2013. In my thesis, the possibilities and limitations of the use of socio-scientific controversies in science teaching were studied, in which "the simulated case of transgenic açaí in the Amazon" was developed. But the adventures of the doctorate and atypical motherhood will appear in another moment of writing in a new text. It is important to emphasize that it took a while, but I did it!

NOT TO CLOSE...

I consider that education in my life was first and foremost a choice, something I fell in love with, from the first day I walked into a classroom. The emotion I felt that first time, in March 2004, endures, because even today, almost 20 years later... And so I believe it will continue! Every time I enter a classroom and see the faces of my students, full of previous knowledge, apprehensions, doubts, and other feelings that we have as students... I have a good feeling, the famous "butterflies in my stomach". Then I see the reflection of my choice reverberated in the sense of apprehension of liking what I do. Being a teacher for me is the materialized fulfillment of my desires concerning one of the most important choices I have made in my life: to build myself, to become a teacher. A choice I will always believe in! Which I think can always be renewed by the meaning I will give to my choice, every time I teach and feel happy for it, for the simple fact of learning "new things" every time I enter this space, sacred to me, the classroom.

Thus, I recognize as essential for the teaching profession the growing and constant need for improvement. I make my own the words of the great educator Freire (1998, p. 25) "[...] those who form form and re-form by forming and those who are formed form themselves and form the formed being." In this way, I very much want to continue in my life "adventure", which is to be a Science Teacher, in the hope that I should contribute in some way to the improvements of Science teaching, since I believe that a transformative Science teaching is capable of promoting in students a qualified argumentation based on the knowledge of scientific contents and with consequences for decision making, This can certainly make them endowed with the ability to reflect on their thoughts, learning to reformulate them from classroom experiences and readings of scientific material. Thus, these subjects will be able to mediate conflicts through dialogue and decision-making based on qualified



arguments, based on their scientific knowledge, which will be built through training, provided by qualified and critical teachers.

I believe that only through the renewal of science teaching will it be possible to form more critical citizens. In this sense, I return to the thought of Hawking, who started this text, emphasizing that my search for discoveries is incessant! But what would those discoveries be? Not only those that will concern my teaching practice, but, notably, those concerning the person, the renewed and transformed human being that I become (or think I become every day) with the experiences and experiences of my profession, which I love so much.

What about the future? I don't know if it will be good! I hope to help build something better, in this society that so urgently needs teachers who love what they do, but who also expect recognition and appreciation for the importance they play in society.



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