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LIFE HABITS, MENTAL HEALTH, DIVERSITY AND ACADEMIC PERFORMANCE: A NEUROPSYCHOPEDAGOGICAL VIEW

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ABSTRACT

This article explores the interrelationship between lifestyle habits, mental health, diversity, and academic performance from a neuropsychopedagogical perspective. Based on a theoretical analysis based on the interdisciplinary literature in neurosciences, psychology and education, it is discussed how neuroplasticity, as a key concept, connects biological, social and cultural factors that influence human development and learning. The impacts of healthy habits, such as a balanced diet, adequate sleep, and physical activity, as well as the negative implications of chronic stress and harmful lifestyles on quality of life and academic performance, are highlighted. The article concludes that the adoption of pedagogical practices based on neuropsychopedagogical evidence can promote more inclusive educational environments adapted to cognitive diversity, favoring well-being and academic success.

Keywords: Neuropsychopedagogy, Lifestyle habits, Mental health, Neuroplasticity, Diversity, Academic performance.

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NEUROPSYCHOPEDAGOGY AND THE SCIENCES OF THE MIND, BRAIN AND EDUCATION: IMPORTANCE FOR SOCIETY AND ACADEMIA

Contemporary education is constantly evolving, reflecting the necessary dialogue between different fields of knowledge, with emphasis on the Sciences of Mind, Brain and Education (CMCE). This interdisciplinary field, which unites neurosciences, psychology and pedagogy, seeks to understand the processes that influence learning. The interrelationship of these areas, in addition to expanding knowledge about human development, promotes more effective and inclusive pedagogical methodologies and practices (SCHENKA-RIBEIRO & SHOLL-FRANCO, 2018, 2021; SHOLL-FRANCO; ASSIS & MARRA, 2012; TOKUHAMA-ESPINOSA, 2000, 2010, 2018).

The growth of CMCE has enabled the emergence of several careers and professional areas, whose professionals are dedicated to applying knowledge about the mind and nervous system in educational contexts (Figure 1). Among these areas, neuroeducation, specialized neuropsychological and psychopedagogical consulting, cognitive therapy, and teacher training based on neuroscientific principles stand out (TOKUHAMA-ESPINOSA, 2000, 2010, 2018; TOKUHAMA-ESPINOSA & NOURI, 2020; AVELINO, 2019; CHUPIL et al., 2018; SHOLL-FRANCO; ASSIS & MARRA, 2012; CARVALHO, 2010; HOWARD-JONES, 2010). These emerging areas are deeply rooted in the practical application of common principles to Neuropsychopedagogy (NPp), which use knowledge about neuroplasticity to develop pedagogical materials adapted to different cognitive profiles and promote teaching practices that respect diversity (FONSECA, 2021; SIMON; CORRÊA & FERRANDINI, 2020; AVELINO, 2019; RUSSO, 2015). Thus, NPp emerges as a transdisciplinary field of application of CMCE in an Institutional, Clinical or Hospital way capable of integrating neurosciences, psychology and pedagogy with the purpose of understanding and optimizing the cognitive processes related to the teaching-learning process. This field of knowledge focuses on the pursuit of a more inclusive and effective education, particularly at a time when academic success is increasingly related to students' emotional well-being and mental health. With the advancement of CMCE, this field has proposed to address new perspectives on how learning processes can be improved, incorporating both the biological aspects of the nervous system and the emotional, social, and cultural factors that affect cognitive development (SANTOS & SHOLL-FRANCO, 2017, 2022; SCHENKA-RIBEIRO & SHOLL-FRANCO, 2021).

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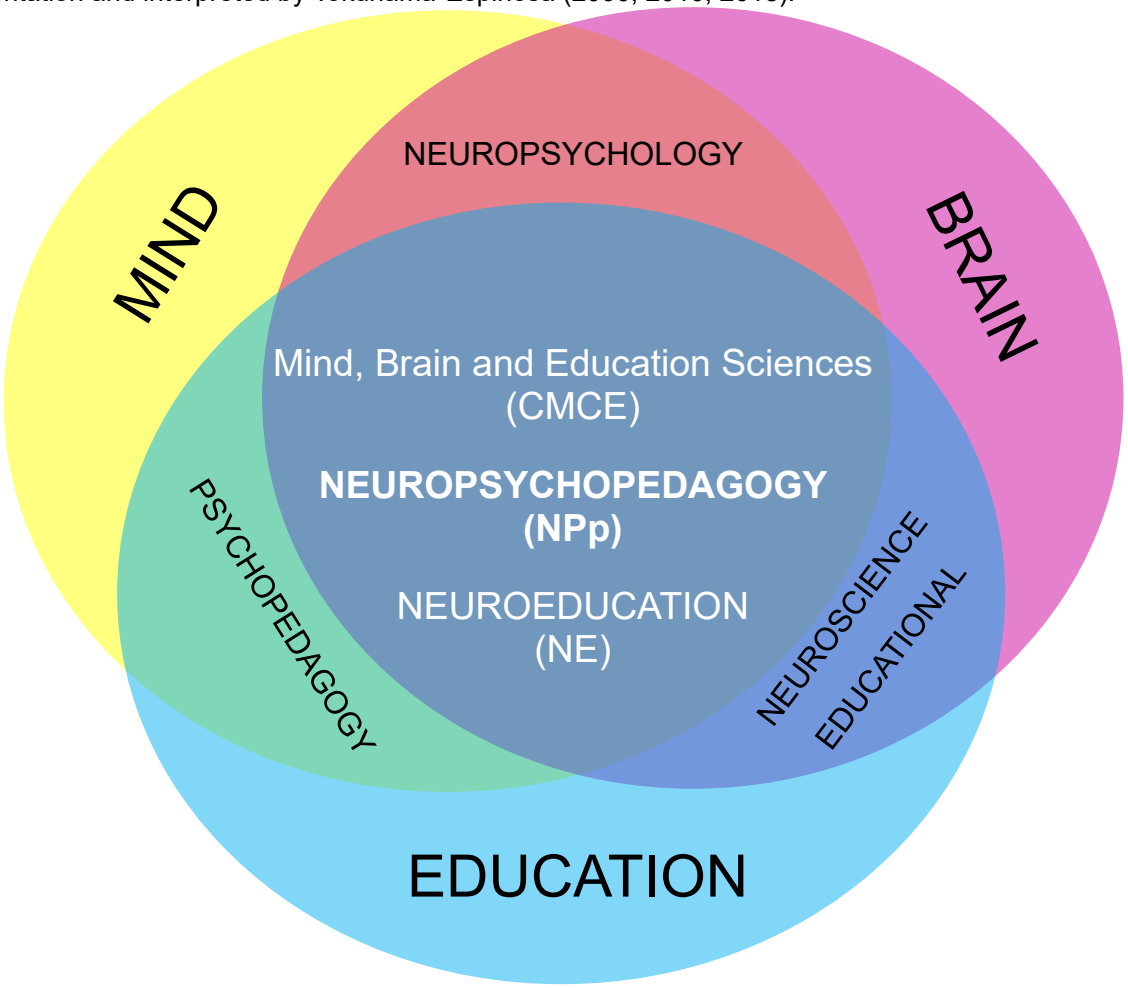
Figure 1 - Scheme showing intersections between the sciences of Mind, Brain and Education, with emphasis on the area of Neuropsychopedagogy (NPp), which can take Institutional, Clinical or Hospital approaches. Adapted from Santos & Sholl-Franco (2022), discussed by Schenka-Ribeiro & Sholl-Franco (2021), Schenka-Ribeiro & Sholl-Franco (2018) and Sholl-Franco, Assis & Marra (2012), based on the remodelled representation and interpreted by Tokuhama-Espinosa (2000, 2010, 2018).



NPp stands out, for example, by articulating neurodevelopmental disorders, such as Autism Spectrum Disorder (ASD), Attention Deficit Hyperactivity Disorder (ADHD) and others, with neurodiversity as a whole. This is because it seeks to understand the multiple causes that can lead to learning difficulties, going beyond specific diagnoses and valuing the complexity of the factors involved. This approach considers the different ways of processing information and developing cognitively, adopting methodologies that respect and value the diversity present in the classroom. In addition, it offers practical tools that help build inclusive and equitable educational environments. Its main objective is to promote conditions that favor neuroplasticity — the process by which the nervous system adapts and modifies in response to environmental stimuli and learning experiences. With trained and equipped mediators, neuropsychopedagogical performance enhances the development of students' cognitive and emotional capacities, contributing to a more optimized and

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personalized education (FONSECA, 2021; SIMON; CORRÊA & FERRANDINI, 2020; AVELINO, 2019; TOKUHAMA-ESPINOSA, 2018; RUSSO, 2015; FEUERSTEIN; FEUERSTEIN & FALIK, 2014; HOWARD-JONES, 2010).

The importance of NPp is particularly evident in the post-pandemic context, when early childhood education began to be widely discussed as a fundamental space for the integral development of children, and the losses generated by the pandemic scenario demanded ways to deal with the minimization of these losses. Recent public policies aimed at early childhood education and inclusion, as highlighted by Santos and Sholl-Franco (2017, 2022), reinforce the inseparability between educating and caring, a principle that is at the heart of NPp. In addition, it contributes to the formulation of strategies that favor both cognitive development and emotional well-being, offering an education that considers mental health and inclusion as central pillars. According to Cardoso et al. (2024), neuropsychopedagogical practices today play an important role in improving executive functions and language skills in elementary school students. A neuropsychopedagogical motor intervention program applied by Cardoso et al. resulted in significant advances, with an increase of 19% in inhibitory control, 29% in working memory and 23% in phonological skills, in addition to a significant reduction of 52% in reading and writing difficulties in the experimental group. These results highlight the positive impact of neuropsychopedagogical interventions in promoting cognitive and academic development, suggesting that the integration of these practices into the school environment can contribute to a more inclusive, equitable, and adapted teaching to the needs of students.

Thus, by emphasizing the relevance of neuropsychopedagogical practices based on scientific evidence, NPp seeks to identify effective strategies to optimize learning and respond to the contemporary challenges of a globalized society. Its transdisciplinary approach allows the integration of cultural, social and economic dimensions in educational practices, recognizing that cognitive development is profoundly influenced by interactions with the environment (SIMÃO; CORRÊA & FERRANDINI, 2020; SHOLL-FRANCO; ASSIS & MARRA, 2012). In this sense, it is possible to say that NPp adopts a holistic perspective of the teaching-learning process, considering external factors, such as the family and school environment, and its interaction with neuroplasticity, directly impacting the academic performance of students at different levels.

In relation to teacher training and the development of inclusive educational policies, pedagogical practices, based on neuroscientific principles, can provide more tangible

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(scientifically tested) bases for the proposition of actions, articulations and environments focused on learning models that favor the development of cognitive and emotional skills, improving academic performance. Bringing these new perspectives to the discussion can represent an incentive to continuous reflection on how to integrate this knowledge from different fields to find solutions to local realities, specific cultural and social contexts, stimulating quality education throughout life (SCHENKA-RIBEIRO & SHOLL-FRANCO, 2021). This interdisciplinary approach is expanding its frontiers, providing evidence-based bases for the development of pedagogical practices that respect the diversity and individual needs of learners, producing new reflections both in academia and in society by offering support for the understanding and resizing of the teaching-learning process in relation to the notions of life habits and quality of life.

PHYLOGENY AND ONTOGENY: RELATIONSHIP BETWEEN NEUROPLASTICITY, CONSTRUCTION OF LIFESTYLE HABITS AND QUALITY OF LIFE

Neuroplasticity is one of the central concepts for understanding human development, as it refers to the nervous system's ability to modify its synaptic structures and functions in response to everyday experiences, environmental stimuli, and lifelong learning processes (MARZOLA et al, 2023; HARLEY & WANG, 2014; HANNAN, 2007; FREITAS, 2006). This process is fundamental both at the phylogenetic level (MARIAN & HAYAKAWA, 2019; SHANER & HUTCHINSON, 1990), which concerns the continuous process of evolution of species, as well as at the ontogenetic level (RAKESH et al., 2024; KRÄGELOH-MANN et al., 2017), which refers to the different phases/stages that comprise the development of an individual in relation to its species (Figure 2). Both levels of development interact to enable cognitive and behavioral adaptations essential for survival and quality of life. Throughout phylogeny, the nervous system evolves in order to maximize the ability to adapt to different environments, while in ontogeny, neurobiological development shapes the individual's adaptive response, influencing decisions and behaviors that affect lifestyle habits (SHOLL-FRANCO, 2019; ROSEN et al. 2019; HANNAN, 2007).

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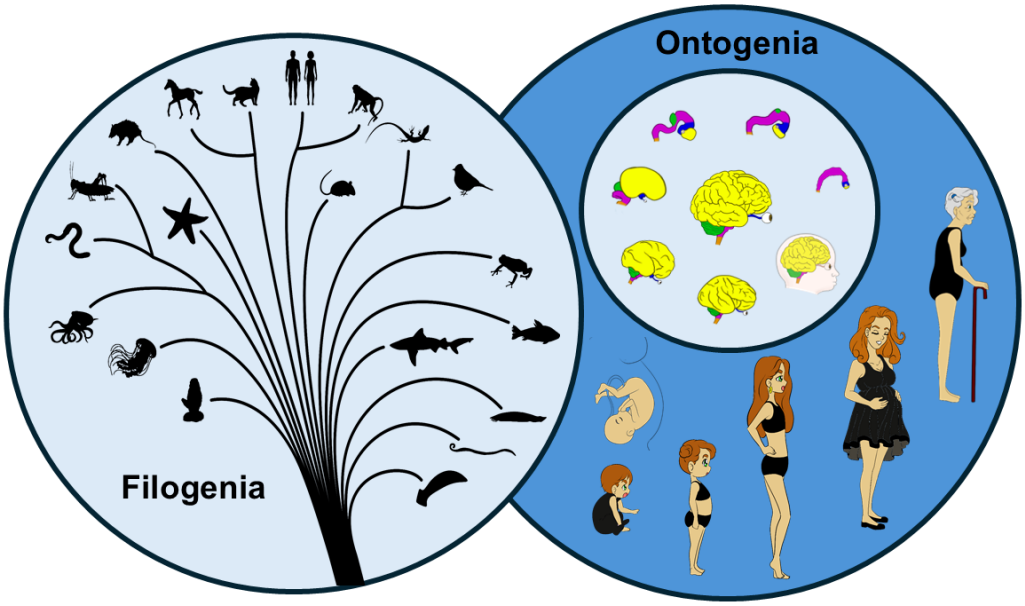
Figure 2 - Schemes relating the processes of phylogeny and ontogeny for development. In phylogeny, evolution of species is illustrated from a cladogram of the evolutionary sequence of animal species starting from a primordial axis (base), with the evolutionary outputs of different phyla and divisions that include porifera (sponges) to mammals, especially humans. B, In ontogeny, different phases of the development of an individual in relation to their species (human) and, in particular, the nervous system, schematized prominently in the smaller circle, are represented by the illustration. Source: Authors.



In the evolutionary context, life habits initially emerge as mechanisms for the survival of species. In primitive organisms, behavioral choices were strongly linked to feeding, defense, and reproduction, essential elements for the continuity of the species (DOBSON, 2007). As phylogeny advanced, especially with the development of vertebrates (including humans), these behaviors evolved into more complex choices, related to and influenced by the social, cultural, and economic organization of the groups (VYGOTSKY, 2007; KISILEVSKY et al., 2003). Human beings, social and cultural animals, make decisions about their lifestyle habits and lifestyles influenced by their historical-cultural and socioeconomic matrix, which shape learning opportunities and, consequently, influence academic performance and quality of life (HUNT et al., 2024; CAAMAÑO-NAVARRETE et al., 2024; SILVA; ARANHA & SHOLL-FRANCO, 2019; SHOLL-FRANCO & ARANHA, 2015; CASTRO-CALDAS et al., 1998).

Ontogeny is marked by critical periods of neuroplasticity, in which the brain is particularly sensitive to experiences and stimuli from the external environment. These critical periods are characterized by the formation, maintenance, and elimination of synaptic connections, which occur intensely mainly during childhood, but continue to influence development throughout life (KRÄGELOH-MANN et al., 2017; MIGUEL; CARDOSO &

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SHOLL-FRANCO, 2016; HARLEY & WANG, 2014). During these periods, the experiences lived profoundly shape the cognitive and emotional development of the individual, influencing the construction of life habits, which will have a direct impact on quality of life and academic performance. From childhood, healthy lifestyle habits, such as a balanced diet, regular physical activity, and adequate sleep, promote the strengthening of neural networks; while harmful habits, such as sedentary lifestyle and sleep deprivation, compromise the adaptive capacity of the nervous system, negatively affecting quality of life and learning (YADAV, 2022; OSHER et al, 2018; TAKSIAN & HENSCH, 2013; HENSCH, 2005). In this process, neuroplaticity acts by allowing the nervous system to respond to immediate stimuli, but also to integrate cultural and social influences in the long term, shaping behaviors and decisions (CAAMAÑO-NAVARRETE et al., 2024; FEUERSTEIN; FEUERSTEIN & FALIK, 2014; HARLEY & WANG, 2014).

Throughout ontogeny, the nervous system develops according to the progression of different non-linear phases (temporally or spatially speaking), from embryogenesis; and follows, after birth, through stages such as sensorimotor, in the first months of the newborn's life, to the formal operative stage, present in the adolescence period (SANTOS & SHOLL-FRANCO, 2022; PIAGET, 1986). During these stages, neuroplasticity allows the child to acquire and reorganize information, strengthening synaptic connections related to cognitive, emotional, and social skills (CAAMAÑO-NAVARRETE et al., 2024; SANTOS & SHOLL-FRANCO, 2022; KRÄGELOH-MANN et al., 2017). These critical phases of development are characterized by intense synaptic remodeling resulting from new stimuli and learning, which result in a significant increase in dendritic spicules and new synapses, laying the foundations for the formation of more sophisticated cognitive schemes (JAKOBOVICH et al., 2023; SHOLL-FRANCO, 2015; PIAGET, 1986).

Thus, it is possible to observe that the lifestyle habits that influence neuroplasticity and cognitive development are deeply rooted in the evolution of the human being. The environmental pressures that have shaped the brain throughout the evolution of species have given rise to an adaptable organism capable of modifying its behavior in response to new challenges. However, as human society has developed, these habits have become more complex and have been shaped by cultural and social factors, which, in turn, directly influence the individual's quality of life and academic performance (ARAUJO et al., 2 MARTIKAINEN; LINNAVALLI & KALLAND, 2024;, 2024; KRÄGELOH-MANN et al., 2017).

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The formation of habits that promote mental and physical health, from the early years, is vital for good academic performance in the long term. Habits that favor neuroplasticity will also contribute to greater emotional and mental resilience, helping the individual to face everyday challenges. On the other hand, when lifestyle is compromised by factors such as sleep deprivation, inadequate diet, and chronic stress, there is an increase in mental illness rates and a significant reduction in learning capacity (ALROUSAN et al., 2022; MAJEWSKA & MRIGANKA, 2003; NEVILLE & BAVELIER, 2001). Thus, the relationship between phylogeny and ontogeny in the construction of life habits, lifestyles and quality of life reveals a continuous process of evolution and adaptation. In human beings, choices about life habits are influenced by many factors, both by evolutionary pressures and by the cultural and social context. Neuroplasticity, as an underlying mechanism, allows the nervous system to integrate these influences throughout life, shaping how the individual learns, interacts with the world, and adapts to changes around them. The impact of this interaction between biology and culture is manifested in quality of life and academic performance, highlighting the importance of promoting healthy habits from childhood and throughout life (MANIACI et al, 2023).

INFLUENCE OF FAMILY, SCHOOL AND SOCIETY ON COGNITIVE DEVELOPMENT: INFORMAL, FORMAL AND NON-FORMAL TEACHING ENVIRONMENTS

The influence of family, school, and cultural spaces on human cognitive development is another aspect that cannot be disregarded in a holistic approach, being widely recognized in the CMCE literature (SANTOS & SHOLL-FRANCO, 2022; DUGAROWA et al., 2017; ESHACH, 2007). In the same sense, the NPp highlights the essential role of each of these dimensions in formal, informal, and non-formal teaching-learning environments, especially in childhood and adolescence, periods of high neuroplasticity (CARDOSO et al, 2021).

In the informal environment, the family acts as the first nucleus of socialization and teaching, since it will be in this spatial and sociocultural representation that the first emotional and cognitive interactions will occur, and where habits that influence the formation of neural circuits and cognitive development are shaped. From the beginning of life, the family builds a space that favors the stimulation of learning processes through care and social interaction (SHOLL-FRANCO; ASSIS & MARRA, 2012; BURGER, 2010; VYGOTSKY, 1989, 2007). This informal environment offers the foundations that, in

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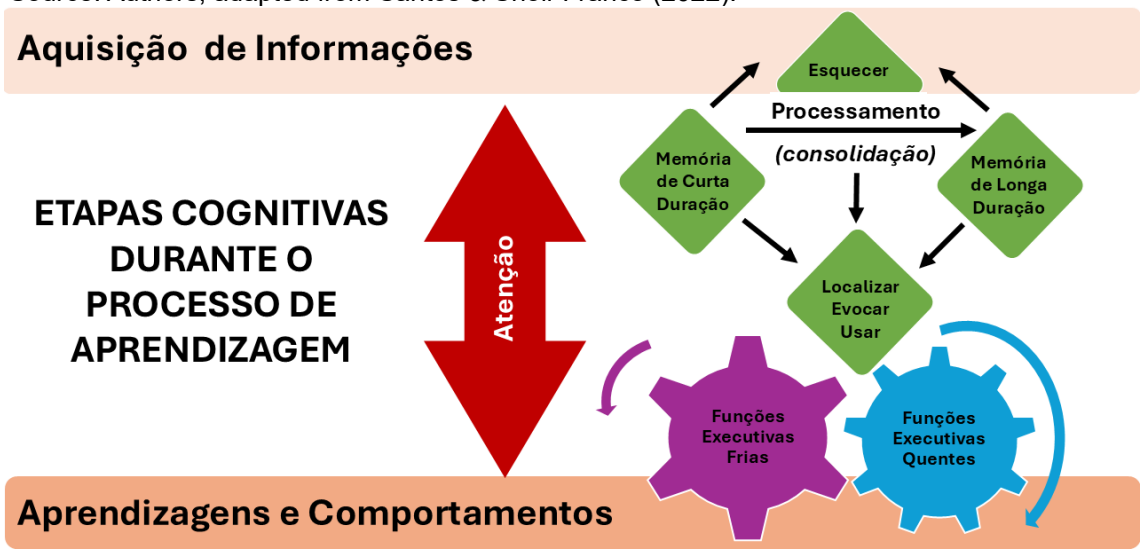
conjunction with neurobiological development, promote the consolidation of cognitive skills essential for the school phase (SANTOS & SHOLL-FRANCO, 2022).

The school, in turn, is configured as a formal environment, where the systematization (formalization) of the construction of knowledge occurs. It is here that cognitive and affective experiences gain structure and pedagogical intentionality, promoting the development of hot and cold executive functions (FONSECA, 2014; DIAMOND, 2013; ZELAZO & CARLSON, 2012). As illustrated in Figure 3, the process of acquiring information is mediated by cognitive stages ranging from attention to the consolidation of short- and long-term memories, which can result in the internalization of learning and the expression of behaviors, as well as in the establishment of lifestyle habits (SANTOS & SHOLL-FRANCO, 2022; BUENO & BATISTELA, 2016; LIMA, 2005; AUSUBEL, 2000). In the school context, these stages are mediated by formal processes that involve inhibitory control, working memory, and cognitive flexibility, all strongly influenced by mediation, the result of interaction with teachers, caregivers, and peers in an environment carefully planned for cognitive development (SHOLL-FRANCO, 2019; BUENO & BATISTELA, 2016; FEUERSTEIN; FEUERSTEIN & FALIK, 2014).

Figure 3 - Scheme illustrating the processes related to the transformation of acquired information into learning and behaviors, going through the action of different cognitive stages/processes such as attention, cold executive functions (e.g., working memory, action planning and organization, inhibitory control and cognitive flexibility) and hot executive functions (e.g., motivational and emotional processes, modulation of affect and emotional responses, social cognition, affective perception and the recognition of emotional expressions in faces). Source: Authors, adapted from Santos & Sholl-Franco (2022).



In addition to the family and school environments, non-formal teaching spaces, such as museums, theaters, and cultural and science centers, play an important role in mediating

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cognitive development throughout life (DUGAROWA et al., 2017; DAWSON, 2014). These spaces offer experiences that go beyond traditional curricula, providing an environment rich in sensory and intellectual stimuli that favor neuroplasticity and learning at different stages of development, and can also act as facilitators of the process of consolidation of academic concepts, in addition to fostering the construction of reflective and critical thinking. Visits to museums, for example, allow children and adults to explore knowledge in an interactive and relational way, developing their capacities for observation, analysis, and understanding of the world, highlighting the role of mediation (GIGERL et al., 2022; SANTOS & SHOLL-FRANCO, 2017, 2022; FEUERSTEIN; FEUERSTEIN & FALIK, 2014). The promotion of autonomous and motivated learning, which often has a deeper impact on cognitive structures, strengthens information retention capacity and cognitive flexibility (SANTOS & SHOLL-FRANCO, 2022). These spaces complement formal learning while broadening the repertoire of experiences that promote continuous cognitive development and emotional skills.

These non-formal environments are also essential for NPp, as they provide learning opportunities that respect cognitive diversity. Children and adolescents with different cognitive profiles, such as those diagnosed with ASD or ADHD, find in these spaces ways of learning that meet their specific needs, offering an opportunity for education that is more open and adapted to their capabilities and interests. The sensory richness and flexibility present in these environments allow each individual to interact with the content in a unique way, respecting their own learning rhythms (SANTOS & SHOLL-FRANCO, 2022).

During the COVID-19 pandemic, non-formal environments took a significant hit with temporary closures, limiting opportunities for cognitive exploration. However, the gradual return to these spaces has highlighted their importance as essential complements to formal and informal learning, offering experiences that expand the cognitive and emotional repertoire of individuals (INEP, 2021). Such environments provide valuable experiences that strengthen lifelong learning, demonstrating that education is not limited to the school space, but is a continuous construction influenced by diverse environments (SANTOS & SHOLL-FRANCO, 2022). Thus, the interaction between the three environments — informal, formal and non-formal — is essential for the integral development of the individual, enhancing lifelong learning. Educational programs that integrate these environments and consider the cognitive, emotional, and social dimensions of the student are more likely to promote effective and inclusive cognitive development. By aligning family and school expectations

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and offering access to cultural, artistic, and educational experiences in non-formal spaces, it is possible to create an environment conducive to continuous cognitive growth and academic and personal success (CNE, 2020a, 2020b).

The integration of school programs that promote mental and physical health is essential to align expectations between school and family, creating a more favorable environment for students' cognitive and emotional development. Actions that promote constant dialogue between these two environments are valuable in the sense of building paths for students to be accompanied holistically, allowing the continuity of healthy habits and the strengthening of neural connections necessary for academic success (VASUNDHARA & NAGARAJU, 2024; SANTOS & SHOLL-FRANCO, 2022). However, the engagement of society, especially in terms of supporting diversity and inclusion, is equally important, directly influencing the development of children and adolescents, both in cognitive and emotional terms. This understanding is reinforced by the CMCE model, which integrates the biological, cognitive, and cultural bases of learning, offering a holistic and inclusive approach. Environments that promote the diversity of experiences — family, school, and artistic-scientific-cultural — contribute to the flourishing of cognitive abilities throughout life (ELLYATT, 2022; SANTOS & SHOLL-FRANCO, 2022; SHOLL-FRANCO; ASSIS & MARRA, 2012).

QUALITY OF LIFE: THE INTERDEPENDENCE BETWEEN LIFESTYLE HABITS, LIFESTYLE AND WELL-BEING

Quality of life is a multidimensional concept that reflects an individual's subjective perception of general well-being, encompassing physical, emotional, social, and cognitive aspects (ESTOQUE et al., 2019). To fully understand it, it is essential to distinguish between lifestyle habits and lifestyle, as both have profound impacts on the formation of quality of life and, consequently, on academic performance throughout life. Lifestyle habits refer to daily actions such as eating, sleeping, physical activity, and social interactions, while lifestyle is a broader concept, which includes the way an individual organizes their life in social, cultural, and economic terms (DANIELS et al, 2023). These two elements continuously interact and shape an individual's perception of well-being and mental health.

Healthy lifestyle habits, such as a balanced diet, adequate sleep, and regular physical exercise, favor neuroplasticity, which is essential for the maintenance of cognitive and emotional functions. Building healthy habits from childhood has a direct impact on

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neurobiological development and the formation of a positive quality of life (MARZOLA et al., 2023; WICKHAM et al., 2020). On the other hand, harmful habits, such as poor diet, sedentary lifestyle, and sleep deprivation, can generate a series of negative consequences, such as increased stress, physical health problems, and decline in cognitive abilities, compromising the individual's well-being (MENEZES-JÚNIOR et al., 2023).

It should be noted that stress is one of the main factors that negatively impact quality of life, as it affects the immune system, impairs sleep, and decreases the ability to concentrate and solve problems (BOTTENHEFT et al., 2023). In the educational context, stress plays an even more critical role, directly contributing to the increase in learning difficulties. It interferes with the functioning of executive functions, such as working memory, inhibitory control, and cognitive flexibility, which are essential for processing information and solving school tasks (ALMARZOUKI, 2024; BAHRI-ROUDPOSHTI & AL ABDWANI, 2024; GIROTTI et al., 2018). In addition, prolonged exposure to stress can make it difficult for students to engage, decrease their motivation, and lead to behavioral problems, creating a vicious cycle that exacerbates academic challenges (CÓRDOVA et al., 2023). Therefore, it is essential to implement strategies that promote stress management in the school environment, such as the use of neuropsychopedagogical practices and the encouragement of healthy lifestyle habits, aiming to improve both emotional well-being and academic performance (GKINTONI et al., 2024).

It should also be noted that the way habits and lifestyle influence quality of life can vary between individuals, particularly in the context of neurodiversity. People with conditions such as ASD, ADHD, or dyslexia, for example, may have specific challenges and needs that affect their routines and lifestyle habits. In this sense, the recognition of neurodiversity and neurodivergence in education and in the planning of daily routines is essential to ensure that individuals with different cognitive profiles can achieve a quality of life that favors their well-being and development (ALCORN et al., 2024; SANTOS & SHOLL-FRANCO, 2017, 2022). In this sense, neuropsychopedagogical approaches, by focusing on the intersection between neurosciences, psychology and education, offer opportunities for the promotion of quality of life, by recognizing that each individual may have different ways of processing information, interacting with the environment and adapting their lifestyle habits. The adoption of personalized pedagogical strategies that respect this diversity would contribute to the creation of an educational and social environment that could support healthy development and, consequently, a better quality of life for all.

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FACTORS INFLUENCING QUALITY OF LIFE

Since quality of life is the result of a dynamic process, influenced by multiple factors over time, including genetic, epigenetic, social and environmental conditions, it is necessary to reflect on the fact that its relationship with academic performance assumes a great prominence in NPp, as habits and living conditions have a direct impact on neuroplasticity, mental health and cognitive development. Thus, promoting healthy lifestyle habits throughout life is essential for individuals, whether neurotypical or neurodivergent, to try to reach their maximum potential for learning and well-being (ESTOQUE et al., 2019).

The factors that influence quality of life are diverse and multifaceted, as illustrated in Table 1. These factors include sociability, affectivity and emotional management, food, leisure and cognition, physical activity and arts, and sleep and rest. Each of these elements contributes to overall well-being, but also directly impacts academic performance, promoting or hindering learning and intellectual development (KILIC & YAMAN, 2023).

Table 1 - Factors influencing quality of life and their impacts on cognitive development and academic performance.

Influencing Factors of Quality of Life	
Sociability	Social interaction activates neural networks related to empathy and communication, reducing stress and promoting well-being, which results in a better quality of life and more consistent academic performance.
Affectivity and Emotional Management	Cultivating positive affective relationships and managing emotions in a healthy way improves emotional resilience and reduces anxiety, directly impacting quality of life and optimizing focus and motivation in studies.
Feeding	Balanced nutrition and adequate hydration provide the nutrients and energy necessary for the functioning of the nervous system, improving the quality of life and the ability to concentrate and reason during studies.
Leisure, Cognition and Studies	Balancing studies with pleasurable cognitive activities and leisure is essential to strengthen executive functions and memory, improving quality of life and maximizing academic learning.
Physical Activity and Arts	The regular practice of physical exercise and artistic activities promotes the release of neurotransmitters beneficial to mood and neuroplasticity, increasing quality of life and enhancing the cognitive functions necessary for academic performance.
Sono and Descanso	Quality sleep and adequate rest are essential for memory consolidation and information processing, contributing to a better quality of life and more effective academic performance.

SOCIABILITY AND SOCIAL INTERACTIONS

Sociability, understood here as the ability to interact effectively with others, is fundamental for the activation of neural networks related to empathy, communication, and cooperation (MALEKI et al., 2019). As described in Table 1, healthy social interactions reduce stress and promote emotional well-being, which in turn is reflected in a better quality

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of life. The NPp highlights that positive social interactions, both in the family and school environments, promote the formation of neural networks that facilitate learning and social adaptation, while reducing levels of anxiety and isolation, both of which are harmful to academic performance (SIMÃO; CORRÊA & FERRANDINI, 2020). When these networks are activated consistently, the nervous system becomes more efficient at dealing with complex and challenging situations, strengthening both executive and emotional functions, which are essential for cognitive resilience. In school settings, the promotion of sociability through collaborative activities and study groups favors both academic performance and psychological well-being (LIU et al., 2022; FONSECA, 2014, 2016).

AFFECTIVITY AND EMOTIONAL MANAGEMENT

Emotional management and affectivity also play an important role in emotional well-being and quality of life. Cultivating positive affective relationships and managing emotions in a healthy way contributes to emotional resilience, which is the ability to face adversity with greater balance and less mental exhaustion (SÁNCHEZ & SEBASTIÁN, 2024; SAMIMI et al., 2019; FONSECA, 2016). The NPp considers that the ability to recognize and regulate one's emotions is essential for academic success, as it reduces anxiety, improves focus, and increases motivation for studies (MIGUEL & SHOLL-FRANCO, 2019). The development of these emotional skills would begin in the family environment, but it could also be enhanced in the school environment and in cultural spaces, such as museums and theaters, which offer experiences rich in emotional and cognitive stimulation. Cultivating these skills tends to directly impact quality of life, as it promotes overall well-being and the ability to cope with stress.

POWER

Diet influences both cognitive performance and quality of life. A balanced diet, rich in nutrients, and adequate hydration provide the necessary energy and conditions for the functioning of the nervous system, improving concentration and reasoning ability (MATHUNJWA et al., 2024). Studies show that inadequate nutrition can lead to cognitive deficits, which negatively impact learning and academic performance (BRYANT et al., 2023). In this sense, it is important that schools and families encourage healthy eating habits from childhood. In addition, formal and non-formal teaching spaces can serve as mediators of this process, promoting activities that associate nutrition and cognitive

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performance, increasing students' awareness of the importance of a balanced diet for academic success. In this sense, obesity can be seen as a detrimental factor for school performance (CARDOSO et al, 2023).

LEISURE, COGNITION AND STUDIES

The balance between studies and leisure activities is essential for the development of cognitive functions and for maintaining quality of life. Living in nature, in natural environments or with adequate stimulation, can be decisive for the construction of a perceptual and consequently cognitive repertoire throughout life (SHOLL-FRANCO, 2019). Pleasurable cognitive activities and leisure time strengthen executive functions and memory, facilitating learning and promoting intellectual development (UMENNUIHE et al., 2022; ISHII et al., 2020; GONZALEZ-SICILIA; BRIÈRE & PAGANIHANNAN, 2019; FONSECA, 2014). Thus, it is important to balance the time dedicated to studies with moments of rest and leisure, which are fundamental for memory consolidation and recovery from stress. Non-formal environments, such as museums, cultural spaces, and artistic activities, act in this process, offering cognitive stimuli that go beyond academic content, promoting neuroplasticity and emotional well-being (LACOE et al., 2020).

PHYSICAL ACTIVITY AND ARTS

The regular practice of physical and artistic activities is also a decisive factor in promoting quality of life and academic performance. Physical exercise can trigger the production of beneficial chemical messengers, such as endorphins, which improve mood, reduce stress, and increase neuroplasticity (VORKAPIC et al., 2021). The practice of physical activities also positively impacts cognitive functions, promoting better organization and planning, skills necessary for academic success (ZHOU et al., 2024; DIAMOND, 2013). In addition, the arts play an important role in stimulating creativity and strengthening emotional functions, promoting a more holistic and integrative education, whether from the process of artistic enjoyment or appreciation (ISHIGURO; ISHIHARA & MORITA, 2023). By incorporating physical and artistic activities into the school curriculum, or even into extracurricular activities, educators can contribute to improving students' quality of life and academic performance (SHOLL-FRANCO; BARRETO & ASSIS, 2014).

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SLEEPING AND RESTING

Sleep, rest or relaxation are fundamental pillars of quality of life and cognitive performance. Quality sleep is essential for memory consolidation and the processing of information acquired during learning (BUENO & BATISTELA, 2015). Sleep deprivation, on the other hand, compromises cognitive functions and can lead to a decline in academic performance (LIN et al., 2021). Thus, promoting adequate sleep routines from childhood can represent a decisive factor for adequate neurological development. Families and schools play a key role in creating routines that respect the importance of sleep for mental health and overall well-being.

Table 2 illustrates the relationship between quality of life and academic performance, reinforcing the importance of integration between school and family in the educational process. The partnership between these two environments can ensure that students are monitored in a more comprehensive and integrative way, promoting healthy habits that directly impact physical and emotional health, and, therefore, school success. In addition, practices such as regular sleep and physical activity, combined with a healthy diet, form the basis of a lifestyle that favors neuroplasticity, facilitating the lifelong learning process.

Table 2 - Main factors that influence quality of life and their impact on students' academic performance.

Influencing Factors of Quality of Life	
Family-School Partnership	Essential to promote healthy habits that directly impact health and the quality of learning. Healthy practices from childhood are important for cognitive development and success in academic life.
Balanced Diet	Healthy diets and adequate hydration are essential for the general functioning of the body and academic performance, improving attention, concentration and learning, acting as a support for a more efficient study routine.
Regular Physical Activity	It promotes the release of neuroplasticity modulating factors, which elevate mood and improve attention, helping to consolidate information and improve executive skills, such as organization and planning.
Adequate Sleep and Rest	Sleep is a pillar of development, being fundamental for the consolidation of memory and the recovery of cognitive functions, as well as the body as a whole. Thus, a healthy sleep routine contributes to better academic performance and greater emotional balance.
Sociability and Emotional Management	Stimulating sociability and managing emotions is essential for socio-emotional development, strengthening resilience in academic contexts. In this way, healthy practices expand the ability to deal with school challenges, creating an environment conducive to success in studies.
Integration of Healthy Habits into Routine	Incorporating healthy habits from an early age promotes not only physical and mental well-being, but also strengthens cognitive and emotional capacity, essential for academic performance and for a full and productive life
Role of the Family in Building Habits	Families that incorporate healthy habits by creating practical and pleasurable routines contribute to the strengthening of functions such as memory and attention. Joyful and interactive moments during these activities strengthen affective bonds and stimulate areas related to learning.

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CONCLUSIONS

The relationship between quality of life and academic performance is deep and multifaceted. Students who adopt healthy lifestyle habits tend to have a higher academic performance when compared to those who cultivate harmful practices. The main factors that influence quality of life, such as sociability, emotional management, balanced diet, leisure, physical activity, the arts, and adequate sleep are essential for academic success and for maintaining a state of continuous well-being. In this sense, emotional management, for example, which is a vital skill, directly influences focus, emotional resilience, and motivation, all critical factors for effective learning. Likewise, the balance between study and leisure is essential for memory consolidation and energy recovery, allowing for better cognitive and emotional performance. Proper nutrition also has a direct impact on brain function, offering the necessary nutrients to maintain concentration and logical reasoning.

In conclusion, cognitive diversity must be recognized and integrated into pedagogical practices, considering the natural variation between individuals, as in the case of neurodivergent students. Thus, ensuring an educational environment that respects cognitive differences is essential to promote academic success for all students. In this sense, NPp plays a key role in providing an interdisciplinary approach, based on CMCE, which values the interaction between healthy habits and quality of life in the cognitive, emotional, and academic development of individuals.

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ISSN: 2358-2472

REFERENCES

1. Alcorn, A. M., McGeown, S., Mandy, W., Aitken, D., & Fletcher-Watson, S. (2024). Learning about neurodiversity at school: A feasibility study of a new classroom programme for mainstream primary schools. Neurodiversity, 2. https://doi.org/10.1177/27546330241272186

2. Almarzouki, A. F. (2024). Stress, working memory, and academic performance: A neuroscience perspective. Stress, 27(1). https://doi.org/10.1080/10253890.2024.2364333

3. Alrousan, G., Hassan, A., Pillai, A., Atrooz, F., & Salim, S. (2022). Early life sleep deprivation and brain development: Insights from human and animal studies. Frontiers in Neuroscience, 16, 1–9. https://doi.org/10.3389/fnins.2022.833786

4. Araujo, C. P., Piva, J., Nicoladeli, A. V., Hartwig, J. P., Vieira, A. P. R., Rocha, N. S., & Rocha, T. S. (2024). Lifestyle and quality of life in children and adolescents during the COVID-19 social distancing period. Jornal de Pediatria, 100(1), 53–59. https://doi.org/10.1016/j.jped.2023.07.006

5. Ausubel, D. P. (2000). Aquisição e retenção de conhecimentos: Uma perspectiva cognitiva. Lisboa: Plátano Edições Técnicas.

6. Avelino, W. F. (2019). Neuropsicopedagogia no cotidiano escolar da educação básica. Revista Educação em Foco, 11, 33–44. https://doi.org/10.5281/zenodo.4116446

7. Bahri-Roudposhti, R., & Al Abdwani, T. (2024). Executive function and learning outcomes: A systematic review. Journal of Cognition, Emotion & Education, 2(2), 39–50. https://doi.org/10.22034/cee.2024.191024

8. Bottenheft, C., Hogenelst, K., Stuldreher, I., Kleemann, R., Groen, E., van Erp, J., & Brouwer, A.-M. (2023). Understanding the combined effects of sleep deprivation and acute social stress on cognitive performance using a comprehensive approach. Brain, Behavior, & Immunity - Health, 34, Article 100706. https://doi.org/10.1016/j.bbih.2023.100706

9. Bryant, M., Burton, W., O'Kane, N., Woodside, J. V., Ahern, S., Garnett, P., Spence, S., Sharif, A., Rutter, H., Baker, T., & Evans, C. E. L. (2023). Understanding school food systems to support the development and implementation of food-based policies and interventions. International Journal of Behavioral Nutrition and Physical Activity, 20, Article 29. https://doi.org/10.1186/s12966-023-

10. Bueno, O. F. A., & Batistela, S. (2015). Sistemas e tipos de memória. In F. H. Santos, V. M. Andrade, & O. F. A. Bueno (Eds.), Neuropsicologia hoje (pp. 76–82). Porto Alegre: Artmed.

11. Burger, K. (2010). How does early childhood care and education affect cognitive development? An international review of the effects of early interventions for children from different social backgrounds. Early Childhood Research Quarterly, 25(2), 140–165. https://doi.org/10.1016/j.ecresq.2009.11.001

Revista ARACÊ
ISSN: 2358-2472

12. Caamaño-Navarrete, F., Arriagada-Hernández, C., Fuentes-Vilugrón, G., Jara-Tomckowiack, L., Levin-Catrilao, A., del Val Martín, P., Muñoz-Troncoso, F., & Delgado-Floody, P. (2024). Healthy lifestyle related to executive functions in Chilean university students: A pilot study. Healthcare, 12(10), 1022. https://doi.org/10.3390/healthcare12101022

13. Cardoso, F. B., Bonone, F. M., Loureiro, V. da S., & Sholl-Franco, A. (2024). Neuropsychopedagogical perspective: Relationships between working memory and motor, inhibitory control, and linguistic development in elementary school. European Journal of Education Studies, 11(11), 46–62. http://dx.doi.org/10.46827/ejes.v11i11.5577

14. Cardoso, F. B., Loureiro, V. da S., Batista, W. A., Bonone, F. M., Carvalho, A. dos S., Lima, A. P. de, Esteves, J. V. G., & Sholl-Franco, A. (2023). Possible effects of obesity on motor development, executive functioning, and academic performance of schoolchildren from a neuropsychopedagogical perspective. Nurture, 17(3), 455–462. https://doi.org/10.55951/nurture.v17i3.369

15. Cardoso, F. B., Loureiro, V. da S., Souza, S., Pinehrio, J., Fulle, A., Russo, R. M. T., & Sholl-Franco, A. (2021). The effects of neuropsychopedagogical intervention on children with learning difficulties. American Journal of Educational Research, 9(11), 673–677. Available at: https://pubs.sciepub.com/education/9/11/3/

16. Carvalho, F. A. H. (2010). Neurociências e educação: Uma articulação necessária na formação docente. Trabalho, Educação e Saúde, 8(3), 537–550. https://doi.org/10.1590/S1981-77462010000300012

17. Castro-Caldas, A., Petersson, A., Reis, S., Stone-Elander, S., & Ingvar, M. (1998). The illiterate brain: Learning to read and write during childhood influences the functional organization of the adult brain. Brain, 121(6), 1053–1063. https://doi.org/10.1093/brain/121.6.1053

18. Chupil, P., Souza, K. P. O., & Schneider, C. (2018). A neuropsicopedagogia e o processo de aprendizagem. Curitiba, PR: IESDE Brasil.

19. CNE (Conselho Nacional de Educação). (2020a). Parecer CNE/CP nº 5/2020, de 28 de abril de 2020. Reorganização do calendário escolar e da possibilidade de cômputo de atividades não presenciais para fins de cumprimento da carga horária mínima anual, em razão da pandemia da Covid-19. Available at: http://portal.mec.gov.br/index.php?option=com_docman&view=download&alias=145011-pcp005-20&category_slug=marco-2020-pdf&Itemid=30192. Accessed on: May 30, 2021.

20. CNE (Conselho Nacional de Educação). (2020b). Parecer CNE/CP nº 9/2020, de 8 de junho de 2020. Reexame do Parecer CNE/CP nº 5/2020, que tratou da reorganização do calendário escolar e da possibilidade de cômputo de atividades não presenciais para fins de cumprimento da carga horária mínima anual, em razão da pandemia da Covid-19. Available at: http://portal.mec.gov.br/index.php?option=com_docman&view=download&alias=147041-pcp009-20&category_slug=junho2020-pdf&Itemid=30192. Accessed on: May 30, 2021.

Revista ARACÊ
ISSN: 2358-2472

21. Córdova, A., Caballero-García, A., Drobnic, F., Roche, E., & Noriega, D. C. (2023). Influence of stress and emotions in the learning process: The example of COVID-19 on university students: A narrative review. Healthcare, 11(12), 1787. https://doi.org/10.3390/healthcare11121787

22. Daniels, K., Lemmens, R., Knippenberg, E., Marinus, N., Vonck, S., Baerts, J., Bergs, J., Spooren, A., Hansen, D., & Bonnechère, B. (2023). Promoting physical activity and a healthy active lifestyle in community-dwelling older adults: A design thinking approach for the development of a mobile health application. Frontiers in Public Health, 11, Article 1280941. https://doi.org/10.3389/fpubh.2023.1280941

23. Dawson, E. (2014). Equity in informal science education: Developing an access and equity framework for science museums and science centres. Studies in Science Education, 50(2), 209–247. https://doi.org/10.1080/03057267.2014.957558

24. Diamond, A. (2013). Executive functions. Annual Review of Psychology, 64, 135–168. https://doi.org/10.1146/annurev-psych-113011-143750

25. Dobson, F. S. (2007). A lifestyle view of life-history evolution. Proceedings of the National Academy of Sciences, 104(45), 17565–17566. https://doi.org/10.1073/pnas.0708868104

26. Dugarova, D. T., Starostina, S. E., Namsarayev, S. D., Dagbaeva, N. Z., & Malanov, I. A. (2016). Non-formal education as a factor in civilizational development of educational space subject in the cross-border region. International Journal of Environmental and Science Education, 11(18), 11097–11117. Available at: http://www.ijese.net/makale/1490.html

27. Ellyatt, W. (2022). Education for human flourishing - A new conceptual framework for promoting ecosystemic wellbeing in schools. Challenges, 13(2), 58. https://doi.org/10.3390/challe13020058

28. Eshach, H. (2007). Bridging in-school and out-of-school learning: Formal, non-formal, and informal education. Journal of Science Education and Technology, 16, 171–190. https://doi.org/10.1007/s10956-006-9027-1

29. Estoque, R. C., Togawa, T., Ooba, M., Gomi, K., Nakamura, S., Hijioka, Y., & Kameyama, Y. (2019). A review of quality of life (QOL) assessments and indicators: Towards a "QOL-Climate" assessment framework. Ambio, 48(6), 619–638. https://doi.org/10.1007/s13280-018-1090-3

30. Feuerstein, R., Feuerstein, R. S., & Falik, L. H. (2014). Além da inteligência: Aprendizagem mediada e a capacidade de mudança do cérebro. Petrópolis, RJ: Editora Vozes.

31. Fonseca, V. (2014). Papel das funções cognitivas, conativas e executivas na aprendizagem: Uma abordagem neuropsicopedagógica. Revista de Psicopedagogia, 31(96), 236–253. Available at: http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S0103-84862014000300002&lng=pt&nrm=iso. Accessed on: January 26, 2021.

Revista ARACÊ
ISSN: 2358-2472

32. Fonseca, V. (2016). Importância das emoções na aprendizagem: Uma abordagem neuropsicopedagógica. Revista de Psicopedagogia, 33(102), 365–384. Available at: http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S0103-84862016000300014&lng=pt&nrm=iso. Accessed on: January 26, 2021.

33. Fonseca, V. (2021). A educabilidade cognitiva e neuropsicopedagógica: Novos paradigmas da educação. Rio de Janeiro, RJ: Editora Wak.

34. Freitas, N. K. (2006). Desenvolvimento humano, organização funcional do cérebro e aprendizagem no pensamento de Luria e Vygotsky. Ciências & Cognição, 9, 91–96. Available at: http://www.cienciasecognicao.org/revista/index.php/cec/article/view/606. Accessed on: May 5, 2021.

35. Gigerl, M., Sanahuja-Gavaldà, J. M., Petrinska-Labudovikj, R., Moron-Velasco, M., Rojas-Pernia, S., & Tragatschnig, U. (2022). Collaboration between schools and museums for inclusive cultural education: Findings from the INARTdis-project. Frontiers in Education, 7, Article 979260. https://doi.org/10.3389/feduc.2022.979260

36. Girotti, M., Adler, S. M., Bulin, S. E., Fucich, E. A., Paredes, D., & Morilak, D. A. (2018). Prefrontal cortex executive processes affected by stress in health and disease. Progress in Neuro-Psychopharmacology & Biological Psychiatry, 85, 161–179. https://doi.org/10.1016/j.pnpbp.2017.07.004

37. Gkintoni, E., Vantazaki, F., Skoulidi, C., Anastassopoulos, P., & Vantarakis, A. (2024). Promoting physical and mental health among children and adolescents via gamification - A conceptual systematic review. Behavioral Sciences, 14(2), 102. https://doi.org/10.3390/bs14020102

38. Gonzalez-Sicilia, D., Brière, F. N., & Pagani, L. S. (2019). Prospective associations between participation in leisure-time physical activity at age 6 and academic performance at age 12. Preventive Medicine, 118, 135–141. https://doi.org/10.1016/j.ypmed.2018.10.017

39. Hannan, A. J. (2007). Phylogeny, ontogeny and brain dysfunction: Integrating evolutionary, developmental and clinical perspectives in cognitive neuroscience. Acta Neuropsychiatrica, 19(3), 149–158. https://doi.org/10.1111/j.1601-5215.2007.00205.x

40. Harley, B., & Wang, W. (2014). The critical period hypothesis: Where are we now? In A. M. B. Groot & J. F. Kroll (Eds.), Tutorials in bilingualism: Psycholinguistic perspectives (pp. 19–51). New York, NY: Lawrence Erlbaum Associates Publishers.

41. Hensch, T. K. (2005). Critical period plasticity in local cortical circuits. Nature Reviews Neuroscience, 6(11), 877–888. https://doi.org/10.1038/nrn1787

42. Howard-Jones, P. (2010). Introducing neuroeducational research: Neuroscience, education and the brain from contexts to practice. Abingdon: Routledge.

43. Hunt, A., Merola, G. P., Carpenter, T., & Jaeggi, A. V. (2024). Evolutionary perspectives on substance and behavioural addictions: Distinct and shared pathways to understanding, prediction, and prevention. Neuroscience & Biobehavioral Reviews, 159, 105603. https://doi.org/10.1016/j.neubiorev.2024.105603

Revista ARACÊ
ISSN: 2358-2472

44. INEP (Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira). (2021). Censo Escolar 2020: Divulgação dos resultados. Brasília: MEC. Available at: https://download.inep.gov.br/censo_escolar/resultados/2020/apresentacao_coletiva.pdf. Accessed on: July 2, 2021.

45. Ishiguro, C., Ishihara, T., & Morita, N. (2023). Extracurricular music and visual arts activities are related to academic performance improvement in school-aged children. NPJ Science of Learning, 8, Article 7. https://doi.org/10.1038/s41539-023-00155-0

46. Ishii, K., Aoyagi, K., Shibata, A., Koohsari, M. J., Carver, A., & Oka, K. (2020). Joint associations of leisure screen time and physical activity with academic performance in a sample of Japanese children. International Journal of Environmental Research and Public Health, 17(3), 757. https://doi.org/10.3390/ijerph17030757

47. Jakobovich, R., Berry, E. M., Levita, A., & Levin-Zamir, D. (2023). Developing healthy lifestyle behaviors in early age - An intervention study in kindergartens. Nutrients, 15(11), 2615. https://doi.org/10.3390/nu15112615

48. Kilic, M., & Yaman, S. (2023). Life quality and factors affecting in primary school students: A multivariate analysis. Child Indicators Research, 16, 1503–1526. https://doi.org/10.1007/s12187-023-10027-z

49. Kisilevsky, B. S., Hains, S. M., Lee, K., Xie, X., Huang, H., Ye, H. H., Zhang, K., & Wang, Z. (2003). Effects of experience on fetal voice recognition. Psychological Science, 14(3), 220–224. https://doi.org/10.1111/1467-9280.02435

50. Krägeloh-Mann, I., Lidzba, K., Pavlova, M. A., Wilke, M., & Staudt, M. (2017). Plasticity during early brain development is determined by ontogenetic potential. Neuropediatrics, 48(2), 066–071. https://doi.org/10.1055/s-0037-1599234

51. Lacoe, J., Painter, G. D., & Williams, D. (2020). Museums as classrooms: The academic and behavioral impacts of “School in the Park”. AERA Open, 6(3). https://doi.org/10.1177/2332858420940309

52. Lima, R. F. (2005). Compreendendo os mecanismos atencionais. Ciências & Cognição, 5(1), 113–122. Available at: http://pepsic.bvsalud.org/pdf/cc/v6n1/v6a13.pdf. Accessed on: September 7, 2016.

53. Lin, Y. M., Kuo, S.-Y., Chang, Y.-K., Lin, P.-C., Lin, Y.-K., Lin, P.-H., & Chen, S.-R. (2021). Effects of parental education on screen time, sleep disturbances, and psychosocial adaptation among Asian preschoolers: A randomized controlled study. Journal of Pediatric Nursing, 56, e27–e34. https://doi.org/10.1016/j.pedn.2020.07.003. Accessed on: November 20, 2024.

54. Liu, S., Zaigham, G. H. K., Rashid, R. M., & Bilal, A. (2022). Social media-based collaborative learning effects on student performance/learner performance with moderating role of academic self-efficacy. Frontiers in Psychology, 13, Article 903919. https://doi.org/10.3389/fpsyg.2022.903919

Revista ARACÊ
ISSN: 2358-2472

55. Majewska, A., & Sur, M. (2003). Motility of dendritic spines in visual cortex in vivo: Changes during the critical period and effects of visual deprivation. Proceedings of the National Academy of Sciences of the United States of America, 100(26), 16024–16029. https://doi.org/10.1073/pnas.2636949100

56. Maleki, M., Mardani, A., Mitra Chehrzad, M., Dianatinasab, M., & Vaismoradi, M. (2019). Social skills in children at home and in preschool. Behavioral Sciences, 9(7), 74. https://doi.org/10.3390/bs9070074

57. Maniaci, G., La Cascia, C., Giammanco, A., Ferraro, L., Palummo, A., Saia, G. F., Pinetti, G., Zarbo, M., & La Barbera, D. (2023). The impact of healthy lifestyles on academic achievement among Italian adolescents. Current Psychology, 42, 5055–5061. https://doi.org/10.1007/s12144-021-01614-w

58. Marian, V., & Hayakawa, S. (2019). Neuroemergentism: At the intersection of ontogeny and phylogeny. Journal of Neurolinguistics, 49, 252–254. https://doi.org/10.1016/j.jneuroling.2018.05.001

59. Marzola, P., Melzer, T., Pavesi, E., Gil-Mohapel, J., & Brocardo, P. S. (2023). Exploring the role of neuroplasticity in development, aging, and neurodegeneration. Brain Sciences, 13(12), 1610. https://doi.org/10.3390/brainsci13121610

60. Mathunjwa, M. L., Shandu, N. M., Ndwandwe, K., Shongwe, N., Linda, N., Elumalai, V., Syed, K., Avramov, D., Shaw, I., & Shaw, B. (2024). Nutrition and academic success: Exploring the vital link for university students. American Journal of Biomedical Science & Research, 22(6). https://doi.org/10.34297/AJBSR.2024.22.003013

61. Martikainen, S., Linnavalli, T., & Kalland, M. (2024). Children's health-related quality of life in early childhood education and care. European Early Childhood Education Research Journal, 1–16. https://doi.org/10.1080/1350293X.2024.2351084

62. Menezes-Júnior, L. A. A., de Moura, S. S., Miranda, A. G., de Souza Andrade, A. C., Machado-Coelho, G. L. L., & Meireles, A. L. (2023). Sedentary behavior is associated with poor sleep quality during the COVID-19 pandemic, and physical activity mitigates its adverse effects. BMC Public Health, 23, Article 1116. https://doi.org/10.1186/s12889-023-16041-8

63. Miguel, A. C., Cardoso, F. B., & Sholl-Franco, A. (2016). Treinamento e capacitação de professores e profissionais da educação: Importância para o ensino infantil. In M. Barr (Ed.), Neurociências e educação na primeira infância: Progressos e obstáculos (pp. 109–120). Brasília, DF: Senado Federal.

64. Miguel, A. C., & Sholl-Franco, A. (2019). Linguagem emocional como sistema modelizante secundário no contexto educacional. In A. Conforte & C. Correia (Eds.), Semiótica, pesquisa e ensino (pp. [inserir páginas]). Rio de Janeiro, RJ: Dialogarts.

65. Neville, H. J., & Bavelier, D. (2001). Variability of developmental plasticity. In J. McClelland & R. Siegler (Eds.), Mechanisms of cognitive development: Behavioral and neural perspectives (pp. [inserir páginas]). New York, NY: Psychology Press.

Revista ARACÊ
ISSN: 2358-2472

66. Osher, D., Cantor, P., Berg, J., Steyer, L., & Rose, T. (2018). Drivers of human development: How relationships and context shape learning and development. Applied Developmental Science, 24(1), 6–36. https://doi.org/10.1080/10888691.2017.1398650

67. Piaget, J. (1986). A psicologia da criança (O. M. Cajado, Trans.). Rio de Janeiro, RJ: Difusão Editorial.

68. Rakesh, D., McLaughlin, K. A., Sheridan, M., Humphreys, K. L., & Rosen, M. L. (2024). Environmental contributions to cognitive development: The role of cognitive stimulation. Developmental Review, 73, Article 101135. https://doi.org/10.1016/j.dr.2024.101135

69. Rosen, M. L., Amso, D., & McLaughlin, K. A. (2019). The role of the visual association cortex in scaffolding prefrontal cortex development: A novel mechanism linking socioeconomic status and executive function. Developmental Cognitive Neuroscience, 39, Article 100699. https://doi.org/10.1016/j.dcn.2019.100699

70. Russo, R. M. T. (2015). Neuropsicopedagogia clínica: Introdução, conceitos, teoria e prática. Curitiba, PR: Juruá Editora.

71. Samimi, Z., Hokmabadi, M. E., Lobnani, S. P., Khaneghaee, R., Momeni, N. S., & Taghavi, A. (2019). The effectiveness of emotion management training on social skills and the sense of competence in school students. Religación. Revista de Ciencias Sociales y Humanidades, 4(13), 383–395. Available at: https://revista.religacion.com/index.php/religacion/article/view/761. Accessed on: November 20, 2024.

72. Sánchez, F., & Sebastián, C. (2024). Integrating affection, emotion, and aesthetics into a general theory of learning. Theory & Psychology, 34(2), 233–256. https://doi.org/10.1177/09593543241229740

73. Santos, G. M., & Sholl-Franco, A. (2022). Perspectivas das ciências da mente, cérebro e educação para a educação infantil brasileira pós-pandemia da COVID-19. Humanidades & Inovação, 9(27), 265–282. Available at: https://revista.unitins.br/index.php/humanidadeseinovacao/article/view/6807. Accessed on: November 20, 2024.

74. Santos, G. M., & Sholl-Franco, A. (2017). Neuroeducação e aprendizagem de leitura e escrita: A importância da ludicidade e das narrativas na alfabetização inclusiva. In N. R. W. Lima, C. M. C. Delou, & L. T. Perdigão (Eds.), Pontos de vista em diversidade e inclusão (Vol. 3, pp. 127–133). Niterói, RJ: Associação Brasileira de Diversidade e Inclusão (ABDIn).

75. Schenka-Ribeiro, N. S., & Sholl-Franco, A. (2018). Desafios educacionais em contextos multilíngues de ensino: Uma proposta curricular inclusiva com língua de sinais e neurociências. In Colbeduca – Colóquio Luso-Brasileiro de Educação, 4., 2018, Braga, Portugal. Anais (Vol. 3). Braga, Portugal: Universidade do Minho. Available at: http://www.revistas.udesc.br/index.php/colbeduca/article/view/11460. Accessed on: September 20, 2019.

76. Schenka-Ribeiro, N. S., & Sholl-Franco, A. (2021). Inclusão de alunos surdos no ensino: Guia prático-informativo para professores de inglês. Niterói, RJ: Ciências e Cognição.

Revista ARACÊ
ISSN: 2358-2472

77. Shaner, D. E., & Hutchinson, R. D. (1990). Neuroplasticity and temporal retardation of development (paedomorphic morphology) in human evolution: A consideration of biological requirements for the plasticity of human cognition and the potential acquisition of culturally dependent ethical world views. Human Evolution, 5, 177–193. https://doi.org/10.1007/BF02435473

78. Sholl-Franco, A. (2015). Bases morfofuncionais do sistema nervoso. In Neuropsicologia hoje (2nd ed., pp. 25–48). Porto Alegre, RS: Grupo A Artmed.

79. Sholl-Franco, A. (2019). A percepção em fronteiras interdisciplinares: Convergências e aspectos conflitantes. In A. Conforte & C. Correia (Eds.), Semiótica, pesquisa e ensino (pp. [inserir páginas]). Rio de Janeiro, RJ: Dialogarts.

80. Sholl-Franco, A., & Aranha, G. (2015). Tecnologia para aprender. Revista Neuroeducação, 5, 42–49. Available at: https://revistaneuroeducacao.com.br/. Accessed on: May 15, 2024.

81. Sholl-Franco, A., Assis, T. S., & Marra, C. (2012). Neuroeducação: Caminhos e desafios. In G. Aranha & A. Sholl-Franco (Eds.), Caminhos da neuroeducação (2nd ed., pp. 9–22). Rio de Janeiro: Ciências e Cognição.

82. Sholl-Franco, A., Barreto, T. M., & Assis, T. S. (2014). Neuroeducação e inteligência: Como as artes e a atividade física podem contribuir para a melhora cognitiva. In A. M. R. Virgolim & E. C. Konkiewitz (Eds.), Altas habilidades/superdotação, inteligência e criatividade: Uma visão multidisciplinar (pp. [inserir páginas]). Campinas, SP: Papirus.

83. Silva, C. D., Aranha, G., & Sholl-Franco, A. (2019). Percepção, sensação e metacognição: Reflexões sobre as abordagens das tecnologias digitais de informação e comunicação como signo. In A. Conforte & C. Correia (Eds.), Semiótica, pesquisa e ensino (pp. [inserir páginas]). Rio de Janeiro, RJ: Dialogarts.

84. Simão, G. F., Corrêa, T. H. B., & Ferrandini, L. M. (2020). Contribuições da neuropsicopedagogia no contexto educacional: Um novo olhar para a instituição escolar. Revista Educere et Educare, 15(36). https://doi.org/10.17648/educare.v15i36.25115

85. Takesian, A. E., & Hensch, T. K. (2013). Balancing plasticity/stability across brain development. Progress in Brain Research, 207, 3–34. https://doi.org/10.1016/B978-0-444-63327-9.00001-1

86. Tokuhama-Espinosa, T. (2000). Raising multilingual children: Foreign language acquisition and children. Westport, CT: Greenwood.

87. Tokuhama-Espinosa, T. (2010). Mind, brain, and education science: The new brain-based learning. New York, NY: W.W. Norton.

88. Tokuhama-Espinosa, T. (2018). Advances in mind, brain, and education science over the past decade. New York, NY: American Educational Research Association.

89. Tokuhama-Espinosa, T., & Nouri, A. (2020). Evaluating what mind, brain, and education has taught us about teaching and learning. Access: Contemporary Issues in Education, 40(1), 63–71. https://doi.org/10.46786/ac20.1386

Revista ARACÊ
ISSN: 2358-2472

90. Umennuihe, C. L., Nnubia, U. I., Onyekachi, C. C., Alutu, C. E., & Odoh, O. E. (2022). Engagement in leisure activities and academic performance of primary school pupils in Enugu East Local Government Area. Journal of Family and Society Research, 1(2), 29–40. Available at: https://jfsr.afass.org.ng/index.php/JFSR/article/view/20. Accessed on: May 20, 2024.

91. Vasundhara, P., & Nagaraju, P. (2024). Impact of balanced lifestyles on childhood development: A study at crèche. Journal of Addiction Therapy and Research, 8(1), 1–8. Available at: https://www.addictiontherjournal.com/abstract/jatr-aid1028. Accessed on: May 20, 2024.

92. Vorkapic, C., Leal, S., Alves, H., Douglas, M., Britto, A., & Dantas, E. H. M. (2021). Born to move: A review on the impact of physical exercise on brain health and the evidence from human controlled trials. Arquivos de Neuro-Psiquiatria, 79(6), 536–550. https://doi.org/10.1590/0004-282X-ANP-2020-0166

93. Vygotsky, L. S. (2007). A formação social da mente: O desenvolvimento dos processos psicológicos superiores. São Paulo, SP: Martins Fontes.

94. Vygotsky, L. S. (1989). Pensamento e linguagem. São Paulo, SP: Martins Fontes.

95. Wickham, S.-R., Amarasekara, N. A., Bartonicek, A., & Conner, T. S. (2020). The big three health behaviors and mental health and well-being among young adults: A cross-sectional investigation of sleep, exercise, and diet. Frontiers in Psychology, 11, Article 579205. https://doi.org/10.3389/fpsyg.2020.579205

96. Yadav, M. (2022). Diet, sleep and exercise: The keystones of healthy lifestyle for medical students. JNMA; Journal of the Nepal Medical Association, 60(253), 841–843. https://doi.org/10.31729/jnma.7355

97. Zelazo, P. D., & Carlson, S. M. (2012). Hot and cool executive function in childhood and adolescence: Development and plasticity. Child Development Perspectives, 6, 354–360. https://doi.org/10.1111/j.1750-8606.2012.00246.x

98. Zhou, Y., Ferraro, F. V., & Fan, C. (2024). Artistic sports activities effectiveness for enhancing students' academic performance among left-behind children: Mediating effects of loneliness. Frontiers in Psychology, 15, Article 1366501. https://doi.org/10.3389/fpsyg.2024.1366501