

**Andragogical innovation to enhance neuroplasticity in adults through english language teaching strategies
(Literature Review).****Innovación andragógica para mejorar la neuroplasticidad en adultos mediante estrategias de enseñanza del inglés
(Revisión de la Literatura).**

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Abstract

The present study aboard the interest in analyzing neuroscience reveals the remarkable capacity for brain plasticity that persists throughout adulthood, challenging traditional concepts that considered cognitive development a static process. Under that necessity, a literature review analysis is presented in order to examine how andragogical innovations applied to English language teaching can impact the generation of neuroplastic changes in adult learners. The recovery from different sources of study, such as scientific articles published between the last five years, 2020 and 2025, focusing on those that address pedagogical methodologies aimed at stimulating active learning, cognitive engagement, and second language acquisition. The results reveal a significant relationship between student-centered strategies, particularly task-based learning and metacognitive techniques, and the enhancement of neural adaptation processes. The study examination concludes that incorporating neuroeducational principles into adult language teaching represents a promising avenue for promoting lifelong learning and strengthening cognitive resilience, highlighting its potential impact on the comprehensive development of linguistic and cognitive skills.

Keywords: Neurolearning, andragogy, linguistic, English learning, neuroplasticity

Resumen

El presente estudio, que aborda el interés por analizar la neurociencia, revela la notable capacidad de plasticidad cerebral que persiste a lo largo de la edad adulta, desafiando los conceptos tradicionales que consideraban el desarrollo cognitivo como un proceso estático, plantea una revisión bibliográfica para examinar cómo las innovaciones andragógicas aplicadas a la enseñanza del inglés pueden influir en la generación de cambios neuroplásticos en estudiantes adultos. Se recupera información de diferentes fuentes de estudio, como artículos científicos publicados entre 2020 y 2025, centrándose en aquellos que abordan metodologías pedagógicas destinadas a estimular el aprendizaje activo, la participación cognitiva y la adquisición de una segunda lengua. Los resultados revelan una relación significativa entre las estrategias centradas en el estudiante, en particular el aprendizaje basado en tareas y las técnicas metacognitivas, y la mejora de los procesos de adaptación neuronal. El estudio concluye que la incorporación de principios neuro educativos en la enseñanza de idiomas para adultos representa una vía prometedora para promover el aprendizaje permanente y fortalecer la resiliencia cognitiva, destacando su potencial impacto en el desarrollo integral de las habilidades lingüísticas y cognitivas.

Palabras clave: Neuroaprendizaje, andragogía, lingüística, aprendizaje del inglés, neuroplasticidad.

Introduction

Neuroplasticity, understood in the brain with its capacity to analyze and consider better experiences and knowledge, definitely it is definitely fundamental to learning and cognitive development (Kolb & Whishaw, 2015). In the context of adult learning, andragogy has emerged as an educational theory that focuses on self-directed learning, prior experience, and intrinsic motivation (Knowles, 1980). However, the relationship between andragogical methodologies and neuroplasticity in the learning process remains understudied.

The aim of this study is to investigate how andragogical methodologies can be designed to enhance neuroplasticity in the adult learning process, using mixed methods that combine qualitative and quantitative analysis, including surveys, interviews, and neuroimaging techniques (Merriam & Bierema, 2013; Kolb & Whishaw, 2015). This study is expected to contribute to the understanding of how andragogical strategies can enhance neuroplasticity and improve the effectiveness of learning and cognitive development in adults.

Neuroplasticity is a process activated in response to experience and learning, allowing the brain to create new neural connections and reorganize existing ones (Kolb & Whishaw, 2015). In the context of adult learning, andragogy has been developed as an educational theory that emphasizes self-directed learning, prior experience, and intrinsic motivation (Knowles, 1980). These andragogical principles may be essential for the development of neuroplasticity in the learning process, as they promote autonomy, critical reflection, and the practical application of acquired knowledge.

The relevance of this study lies in the need to understand how andragogical methodologies can be designed to enhance neuroplasticity in the adult learning process. This is crucial for the cognitive development and lifelong learning of this population, as

neuroplasticity is fundamental to learning and adapting to new challenges (Merriam & Bierema, 2013).

To achieve the objective of this study, mixed methods will be used, combining qualitative and quantitative analysis. Surveys and interviews will be conducted with students and teachers to identify the most effective andragogical strategies for developing neuroplasticity. In addition, neuroimaging techniques will be used to measure changes in brain activity during the learning process (Kolb & Whishaw, 2015).

This study is expected to make a significant contribution to the field of andragogy and neuroplasticity by providing empirical evidence on how andragogical methodologies can be designed to enhance neuroplasticity in the adult learning process. The objective of this study is to investigate how the development of andragogical methodologies can improve neuroplasticity in adult learning. To this end, mixed methods will be used, combining qualitative and quantitative analysis, including surveys, interviews, and neuroimaging techniques (Merriam & Bierema, 2013). This study is expected to contribute to the understanding of andragogical strategies, such as problem-based learning and deep learning can enhance neuroplasticity and improve the effectiveness of learning and cognitive development in adults. The results of this research could be implemented in adult continuing education programs in order to leverage brain plasticity and facilitate more meaningful and lasting learning.

The results of this research could be implemented in adult continuing education programs to improve learning effectiveness and cognitive development.

Methodology

This study adopted a thematic literature review design to investigate the intersection between andragogical strategies and neuroplasticity in the context of adult English language learning. The methodological process consisted of four sequential stages: literature search, study selection, application of inclusion and exclusion criteria, and thematic analysis of the findings.

Literature Search

As a main strategy of searching for bibliographic sources for the present study, it was essential to find in academic repositories with high media and low impact. Under those circumstances, the most common databases were Scopus, ERIC, and Google Scholar, to identify studies relevant to andragogical innovation and neuroplasticity. The search strategy combined keywords and Boolean operators, such as “andragogy”, “neuroplasticity”, “adult education”, “language learning”, and “English language teaching”. The temporal scope encompassed peer-reviewed publications between 2020 and 2025, and only studies published in English and Spanish were considered to ensure both regional and international coverage.

Study Selection

The initial search yielded a broad set of sources, which were subsequently screened for relevance and academic rigor. The article review, which was data-based, included some peer-reviewed articles. It was also necessary to analyze book chapters from recent years and conference proceedings that provided empirical or theoretical insights into the relationship between adult learning methodologies and neuroplasticity. Conversely, non-scholarly sources such as blogs, magazines, opinion papers, and documents lacking methodological transparency were excluded. Duplicates were removed to ensure the integrity of the final dataset.

Data Analysis

The selected studies underwent a thematic content analysis to identify recurring patterns, theoretical frameworks, and empirical evidence connecting andragogical strategies to cognitive enhancement and neuroplastic adaptations in adult learners. The studies were organized into thematic clusters, which allowed for the synthesis of trends, the identification of convergent and divergent findings, and the recognition of gaps in the existing literature that could inform future research in adult English language teaching.

Diagram PRISMA:

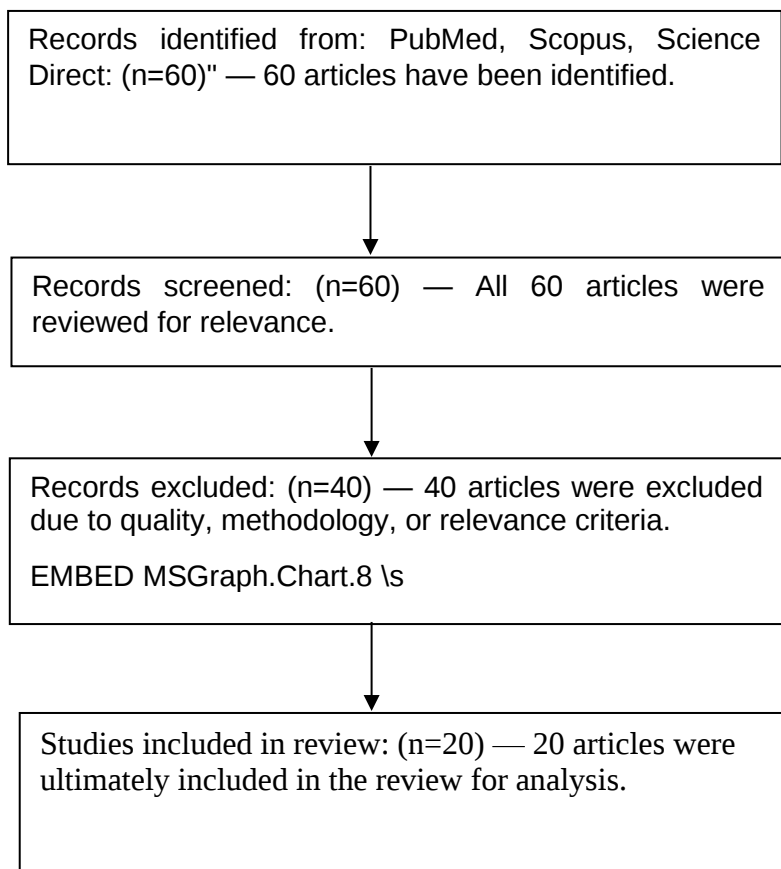
As a strong relevance of the present research and to ensure clarity in the methodological process, a PRISMA flow diagram was designed to exemplify better the study selection. The model diagram PRISMA represents the optimal option for data analysis, as it is widely adopted in thematic literature reviews to evidence the identification, titles, model, study, and source of eligibility of studies. In this review, the diagram reflects the sequential process from the initial database search and removal of duplicates to the screening of titles and abstracts, the full-text assessment based on inclusion and exclusion criteria, and the final selection of studies included in the thematic synthesis. This visual representation enhances the credibility of the review by clearly documenting how the final corpus of literature was obtained.

During the initial identification stage, a total of 60 records were retrieved from academic databases such as PubMed, Scopus, and ScienceDirect. These studies constituted the initial pool of literature for the review. In the screening phase, all 60 records were examined to determine their relevance and alignment with the predefined inclusion criteria. Subsequently, during the exclusion stage, 40 records were removed because they did not meet the established standards regarding study type, methodological rigor, or thematic relevance. Finally, 20 studies met all inclusion criteria

and were retained for the thematic literature review, forming the final corpus of analysis for this study. (See picture No.1).

Figure 1.

Detailed PRISMA FLOW DIAGRAM



Source: The authors

Analysis of results and discussion

From the perspective of Andragogical Innovation

Below, a clear and detailed narrative interpretation of scientific articles related to andragogical innovation is presented. Their content and development highlight the most relevant and most supportive aspects of the research conducted, directly motivated by the context of andragogical innovation in English teaching.

The application of andragogical strategies in English teaching has proven to be a highly effective approach for adult learning. In a study conducted by Acosta et al. (2022), various andragogical strategies such as group work and problem-solving were implemented, showing significant improvements in the English proficiency of participating teachers. The results revealed that strategies focused on active learning favor foreign language acquisition in adults, suggesting that these methodologies are fundamental for adult teaching.

In the context of higher education, Naumova (2024) explored the implementation of andragogical principles in distance learning of a professional language, highlighting how psychological, social, and technological obstacles can be overcome through an andragogical approach. Research underscores that autonomy and self-regulation in adult learners are essential to improving their motivation and facilitating the acquisition of language skills.

Naumova and Yudina's (2021) study on language teaching to adults through andragogical principles also highlights the importance of personalizing learning to meet students' specific needs. They identified a focus on individualization and cooperation as crucial to overcoming the barriers adults face when learning a language in an online learning environment, especially during the pandemic.

Babenko (2023) delves into how andragogical principles can be applied to teachers' professional development, highlighting the need for teaching based on the adult learner's experience. Research indicates that autonomous learning and teacher-student cooperation are crucial elements for successful adult education, while also emphasizing the importance of tailoring learning experiences to students' individual characteristics.

Similarly, the work of Ibrahim, Darus, and Radzi (2022) confirms that andragogical methods implemented through online distance learning (ODL) have a

positive impact on adult learners' motivation and academic performance. According to this study, strategies such as flexible learning time and space, along with technology, are essential for maintaining adults' motivation and improving their performance in English learning

Furthermore, Azmi and Anggrainy's (2020) study, which focused on teaching English speaking skills to university students, shows that the andragogical approach is appropriate for this age group, as it promotes active participation and decision-making on the part of students. This approach allows them not only to improve their language skills but also to develop greater confidence in their ability to communicate in English.

An essential aspect of andragogy also highlighted the approach's ability to modernize and humanize the training of students at the master's and doctoral levels. Tsokur asserts that incorporating andragogical methods can facilitate the adaptation of educational programs to the current needs of adult learners, who seek greater practical relevance and applicability of the content learned (Tsokur, 2023).

Under the following circumstances, the analysis of the implementation of an andragogical approach to teacher professional development, according to Babenko (2023), underlines the importance of cooperative and self-guided learning. By incorporating teachers' experience and promoting their autonomy, more effective and personalized training is facilitated, which benefits both educators and students in the long term.

In this sense, the analysis of the present bibliography database clearly demonstrates the implementation of andragogical methods, such as student-centered teaching, the integration of prior experiences, and flexibility in learning, are fundamental to improving English learning in adults. These innovations not only favor language acquisition but also reinforce students' intrinsic motivation, allowing for more effective education adapted to the needs of students.

Neuroplasticity in Adults

In the purely educational research on neuroplasticity in adults, based on the ten articles provided, a broader perspective and citing all relevant studies allows for an analysis of the variations and implications of neuroplasticity in the context of language acquisition and other cognitive processes in adults.

Neuroplasticity in adults, especially in the context of second language acquisition, has been widely studied in recent years. A seminal study by Gallo et al. (2025) explores experience-dependent neuroplasticity in the hippocampus of young bilingual adults. The results show a nonlinear relationship between second language engagement and hippocampal gray matter volume, suggesting that bilingualism promotes learning-related structural changes in the brain. This finding highlights the adult brain's capacity for adaptation and functional reorganization in response to language experience, underscoring the importance of bilingualism as a driver of neuroplasticity.

On the other hand, Ware et al. (2021), in their systematic review on the impact of second language learning on neuroplasticity in older adults, found that, despite mixed results, there is evidence that language learning in old age improves certain cognitive functions, such as working memory, attention, and inhibition. This study highlights the possibility that second language learning in later life serves as a powerful tool for cognitive reserve, contributing to the delay of neurodegenerative diseases.

Marzola et al. (2023) analyze how neuroplasticity affects the brain during development, aging, and neurodegeneration, recognizing the brain's remarkable flexibility to face novel demands, such as mastering a second language, plays a crucial role in maintaining cognitive functions. In the context of aging, neuroplasticity allows the brain to adapt to age-related changes

Another noteworthy study by Drigas and Sideraki (2024) examines the application of virtual reality (VR) and brain-computer interfaces (BCIs) in enhancing neuroplasticity. These technological approaches enable the manipulation of sensory inputs and the real-time monitoring of neural activity, facilitating changes in cognitive functions such as memory and perception. This study suggests that emerging technologies hold promise for cognitive rehabilitation, especially for treating disorders such as phobias and anxiety, while simultaneously promoting neuroplasticity. The research by Wei et al. (2023) on white matter plasticity in adults demonstrates that acquiring a second language leads to structural changes in brain language networks, especially in the left and right hemispheres. The results suggest that reduced interhemispheric connectivity could facilitate language processing in the left hemisphere, demonstrating a structural reorganization of the brain during new language learning.

Regarding the interaction between physical exercise and language learning, combining aerobic exercise with language learning enhances both language performance and cognitive function in older adults. This suggests that the integration of physical and cognitive interventions could enhance neuroplastic effects, benefiting both working memory and language skills (Qian et al., 2024).

Regarding rapid learning and the interaction between short- and long-term plasticity in perceptual learning, MacLean et al. (2024) investigated how musicians and non-musicians show different patterns of cortical plasticity when learning to identify sounds. Musicians, due to their auditory training, experience faster and more localized changes in the brain, suggesting that prior experience can significantly influence brain plasticity during perceptual learning tasks.

Isel's (2021) study demonstrated that neuroplasticity in second language vocabulary acquisition highlights the fact that repeated exposure to a second language causes both functional and structural changes in the brain. This process of neuronal

plasticity occurs even over short periods of time, suggesting that plasticity in adults is more dynamic than previously thought (Isel, 2021). (See Chart N°1).

Table 1.

Main characteristics of Bibliographic review.

Year	Title	Study model
2025	Experience-dependent neuroplasticity in the hippocampus of bilingual young adults	Quantitative
2023	Exploring the Role of Neuroplasticity in Development, Aging, and Neurodegeneration	Mixed
2024	Brain Neuroplasticity Leveraging Virtual Reality and Brain-Computer Interface Technologies	Mixed
2021	Neuroplasticity	Qualitative
2021	How Brain Changes as We Learn	Qualitative
2024	Short- and long-term neuroplasticity interact during the perceptual learning of concurrent speech	Mixed
2021	Does Second Language Learning Promote Neuroplasticity in Aging? A Systematic Review of Cognitive and Neuroimaging Studies	Qualitative
2023	White matter plasticity during second language learning within and across hemispheres	Mixed
2024	The Influence of Separate and Combined Exercise and Foreign Language Acquisition on Learning and Cognition	Qualitative
2021	Neuroplasticity of second language vocabulary acquisition	Qualitative
2022	Promoting the English language learning through the use of effective andragogical strategies	Mixed
2022	Cultural Representation in the Practice of Andragogy in the Academic	Qualitative
2020	The Andragogical Approach for Teaching English Speaking Skill for College Students	Qualitative
2024	Psychological Model of Andragogical Guide in Adult Online Teaching a Professional Foreign Language	Qualitative
2021	Andragogical principles in teaching professional foreign languages: challenges and perspectives	Qualitative
2023	Andragogical features of foreign language teaching for adult learners	Qualitative
2023	THE ANDRAGOGICAL APPROACH AS A CONCEPTUAL FOUNDATION FOR MODERNIZATION AND HUMANIZATION OF NATIONAL AND FOREIGN STUDENTS' TRAINING	Quantitative
2023	USING AN ANDRAGOGICAL APPROACH IN THE SYSTEM OF PROFESSIONAL DEVELOPMENT OF TEACHERS	Mixed
2022	Students' Acceptance and Motivation on Andragogical Approaches Towards their Academic Performance	Mixed
2024	Models For Andragogy: A Systematic Review and Meta-Analysis	Qualitative

Source: The authors

This flow highlights how articles were selected to ensure that only the most relevant, high-quality articles that met the review criteria were considered in the final analysis.

Conclusions y Recommendations

Neuroplasticity in adults is an active and dynamic process that can be enhanced through appropriate educational strategies. Even though learning might be slower than in children, adults can still improve their brain function, particularly in the context of second language acquisition, such as English.

Student-centered andragogical methodologies, including task-based learning, metacognitive strategies, and personalized instruction, positively influence neural reorganization and strengthen cognitive functions. Learning a second language not only improves communication skills but also keeps the brain active and healthy over the time

Integrating neuroeducational principles into adult English language teaching not only improves linguistic acquisition but also fosters cognitive resilience and lifelong learning. In the end, adult learners become more resilient, confident and motivated to keep learning throughout their lives.

The literature review reveals a strong connection between emerging technologies (e.g., virtual reality and brain-computer interfaces) and the stimulation of neuroplasticity, offering new possibilities for adult education. It can also open new paths of personalized, engaging and lifelong learning experiences

The andragogical approach helps overcome psychological, social, and technological barriers, promoting autonomous, collaborative, and meaningful learning in both face-to-face and virtual environments making education more flexible and powerful.

Design adult English language programs that incorporate andragogical strategies, such as experiential learning, problem-solving, and self-regulation, to

stimulate neuroplasticity, helping learners adapt and improve cognitively in both classrooms and online settings.

Integrate innovative educational technologies, including virtual reality and interactive tools, to provide multisensory and personalized learning experiences tailored to each adult learner's need

Promote teacher training in neuro-education and andragogy, enabling educators to adapt their methodologies to the cognitive needs of adult learners. By combining insights of neuroscience and adult learning principles, educators can create meaningful and more effective learning environments.

Conduct longitudinal research using neuroscientific techniques, such as neuroimaging, to assess the real impact of andragogical strategies on adult brain structure and function. Researchers can better understand how adult education improves knowledge but also enhances cognitive flexibility, emotional regulation and neural connectivity.

Encourage educational policies that support lifelong learning, recognizing the value of neuroscience-informed curriculum design in adult education programs. These policies can help create learning environments that respect adults learn best through autonomy, relevance and practical application.

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