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ARTICLE

Impact of Neuroscience-Based Interventions on Early Learning

Impacto de las Intervenciones Basadas en Neurociencia en el Aprendizaje Temprano

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ABSTRACT

In recent years, the application of neuroscience in education has grown significantly because it explains how the brain learns. This research aimed to systematize the available empirical evidence on the impact of neuroscience-based interventions for early learning. The study adopted a hermeneutic-interpretive paradigm, a systemic method, a qualitative approach, a thematic narrative design, a documentary-bibliographic review design, and a cross-sectional scope. The search covered Scopus, Web of Science (WoS), and Google Scholar, and the final sample comprised 14 articles. The review used Covidence and the PRISMA technique for selection and analysis through a three-level flow. The findings indicated that interventions such as emotional regulation and executive function programs, kinesthetic and sensorimotor activities, and multisensory/technology-assisted interventions were grounded in principles of neuroplasticity, sensory stimulation, emotional co-regulation, and sensorimotor integration. These interventions produced positive effects on early learning and on specific areas such as cognitive, socioemotional, and motor development, and most studies used experimental and quasi-experimental designs with pre- and post-intervention assessments in children aged 0 to 6 years. The review concluded that this intervention approach strengthens child well-being and supports the design of learning environments that are more responsive to the needs of comprehensive development in early childhood.

KEYWORDS: Interventions, neuroscience, early learning, impact, systematic review.

RESUMEN

En los últimos años, la aplicación de la neurociencia en la educación ha mostrado un crecimiento significativo, dado que proporciona explicaciones sobre como aprende el cerebro. El objetivo de la investigación consistió en sistematizar la evidencia empírica disponible sobre el impacto de las intervenciones fundamentadas en neurociencia dirigidas al aprendizaje temprano. El trabajo se enmarcó en el paradigma hermenéutico-interpretativo, método sistémico, enfoque cualitativo, diseño narrativo temático, tipo documental bibliográfico y de corte transversal; la población se abordó en Scopus, Web of Science (Wos) y Google Scholar, con una muestra de 14 artículos; en la selección y análisis se empleó COVIDENCE y la técnica de PRISMA en tres niveles de flujo. Los hallazgos indicaron que, intervenciones como programas de regulación emocional y función ejecutiva, actividades cinestésicas y sensoriomotoras e intervenciones multisensoriales/asistidas por tecnología, son aplicadas bajo principios de neuroplasticidad, estimulación sensorial y corregulación emocional e integración sensoriomotora, y generan impactos positivos en el aprendizaje temprano y en áreas específicas como el desarrollo cognitivo, socioemocional y motor, siendo en su mayoría estudios con diseños experimentales y cuasiexperimentales con evaluaciones pre y post intervención en niños de 0 a 6 años. Se concluye que este enfoque de intervención contribuye al fortalecimiento del bienestar infantil y al diseño de entornos de aprendizaje más sensibles a las necesidades del desarrollo integral en la primera infancia.

PALABRAS CLAVE: Intervenciones, neurociencia, aprendizaje temprano, impacto, revisión sistemática.

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Introduction

In recent years, the application of neuroscience in education has grown significantly because it explains brain functioning. Neuroscience has gained relevance in the educational field by providing scientific foundations for brain functions and their relationship with learning (Guillén & Guillen, 2025; Leisman, 2022; Punto et al., 2025). In early childhood, a stage characterized by rapid growth and the consolidation of neural circuits (Pardo et al., 2023; Wendie & Berhanu, 2025), this approach helps explain how early stimuli (Liu & Fisher, 2022; Vargas et al., 2016) influence cognitive, linguistic, emotional, and social development (Uğraş et al., 2023) and support developmental potential. The contributions of this discipline have promoted the design of interventions oriented toward learning from the first years of life and have consolidated it as an interdisciplinary field of research between education and brain sciences.

However, in the context of early childhood, pedagogical practices have not yet fully integrated advances in neuroscience. Recent literature indicates that this gap stems from the lack of specialized teacher training, beliefs in neuromyths, and the dispersion of empirical evidence on the impact of interventions grounded in neuroscientific principles on early learning (Ferreira & Rodríguez, 2022; Goldberg, 2022; Walsh et al., 2024). From the perspective of the present study, this situation still reflects limited integration and systematization of knowledge, which produces conceptual and methodological fragmentation, hinders clear conclusions, and limits the capacity to use its potential in learning at early ages.

Various studies have attempted to reduce this gap through neuroscience-based interventions designed to stimulate essential learning processes (Castro & Cevallos, 2021; León et al., 2025; W. Vargas et al., 2024), such as attention (Alvarez et al., 2025), memory (Sagnay, 2024), language (Coello et al., 2022; Vera & Carrión, 2023), and emotional self-regulation (Pardo et al., 2023; Rodríguez et al., 2025). Although these studies highlight alternatives based on neuroscientific principles, they reveal the need for a systematic review that synthesizes the findings of current scientific production and clarifies the impact of these alternatives on children's early learning in different contexts.

Accordingly, the study aims to systematize the available empirical evidence on the impact of neuroscience-based interventions for early learning. For this purpose, it identifies which types of interventions have produced effects, which neuroscientific foundations are addressed in the interventions, and what methodological characteristics are common among the studies included. Within this scope, the guiding question of this research is: What empirical evidence is available on the impact of neuroscience-based interventions for early learning?

Methodology

To address the stated objective and align with the research lines and the purpose of knowledge generation, the study adopted a hermeneutic-interpretive paradigm, which provided an epistemological basis for in-depth analysis through the understanding and interpretation of texts (Chang, 2022; French et al., 2022). In parallel, PRISMA guided the systematic method; according to authors such as Mengist et al. (2020), this method provides transparency, transferability, and replicability to the work. This integration strengthened the study because systematization structured the search and screening process and presented the findings clearly, while hermeneutics facilitated an interpretive synthesis of the selected records associated with the impact of neuroscience-based interventions on early learning.

The study adopted a qualitative approach focused on a deep understanding of contextual phenomena and the interpretive analysis of evidence (Flemming & Noyes, 2021). Through a thematic narrative design, the review synthesized, described, and examined the findings and identified relevant contributions to the body of knowledge. In this way, the analysis organized the results into types of intervention, neuroscientific foundations, methodological characterization, and findings on impact. Accordingly, the design went beyond a descriptive summary of the data, as it sought to interpret the material and elucidate its underlying meaning (Maguire & Delahunt, 2017).

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The study used a documentary-bibliographic review design, which included the compilation, selection, organization, and analysis of existing studies (Davidescu et al., 2022). In other words, the review generated no original data and involved no direct intervention in a population. The approach was cross-sectional, since the compilation, selection, and analysis took place within a short and defined period (Pérez et al., 2024), which allowed the current state of knowledge to be described up to the present.

The population, understood as the frame of reference for the total set of units that share common characteristics in a context (Ahmed, 2024; Rudolph et al., 2023), comprised peer-reviewed scientific articles published between January 2015 and August 2025 and indexed in academic databases such as Scopus, Web of Science (WoS), and Google Scholar, with versions in English or Spanish. In addition, the review defined the geographic scope (studies conducted in any region of the world) and the nature of the interventions examined (qualitative, quantitative, and mixed-methods studies focused on the impact of neuroscience on early learning). To obtain the total number of units, the review established structured search strings with English keywords and Boolean operators in the search engines (Table 1). The reviewers exported all documents in RIS format.

Table 1

Search Strategies.

Database	Strategy
Scopus	TITLE-ABS-KEY (neuroscientific strategies AND early learning AND early childhood)
Web of Science (WoS)	((TS= (neuroscientific interventions)) AND TS= (early learning)) AND TS= (early childhood)
Google Scholar	(neuroscientific strategies AND early learning AND early childhood)

Note. The search strings generated in the databases, own elaboration (2025).

The study used the bibliographic review technique to examine source data without conducting fieldwork (Ocaña & Fuster, 2021). In addition, this technique provided a solid foundation for the development of the research report. Accordingly, the procedure followed methodological steps that ensured the quality and coherence of the review process. The review team initially used the web-based Covidence software (Fernández & Enríquez, 2020) to import and manage the records in Excel format, including automated duplicate removal and structured screening of titles, abstracts, and full texts based on the inclusion and exclusion criteria (Table 2).

After the review, the team extracted relevant data in an organized manner and subsequently exported them to an external matrix for qualitative content analysis. The interpretive phase applied the criteria of coherence, recurrence, and relevance to identify thematic patterns in the extracted material. Two independent reviewers applied all interpretive criteria and resolved discrepancies by consensus. This integrated workflow ensured methodological consistency, minimized bias, and strengthened the rigor of the evidence synthesis.

Table 2

Eligibility Criteria.

Inclusion criteria	Exclusion criteria
Publication date: Studies from 2015 onward	Publication date: Studies published before 2015
Target population: children aged 0 to 6 years	Target population: older than 6 years
Document type: Scientific articles with available access	Document type: Essays, proceedings, book chapters, among others
Language: Publications in Spanish and English	Language: studies not in Spanish or English
Results: Articles addressing the impact of neuroscience-based interventions for early learning	Topic: Articles that do not assess the impact of interventions or are not grounded in neuroscience for early learning

Note. The table summarizes the eligibility criteria established for the systematic selection of scientific articles, own elaboration (2025).

PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), as a technique incorporated into the Covidence workflow, enabled the review team to document the search pathway and screening decisions and to strengthen transparency in the evidence identification process. Figure 1 presents the selection flow. In the identification phase, the search strategy yielded a total of 3,115 records, distributed across Scopus (n = 244), Web of Science (n = 1,005), and Google Scholar (n = 1,866). Before screening, the reviewers

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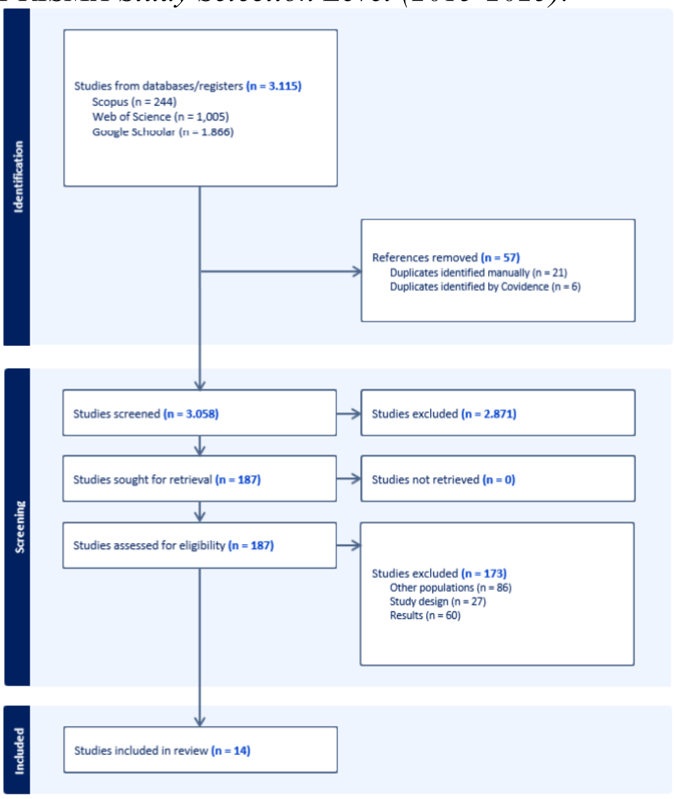
removed 57 records during deduplication and preliminary screening. Subsequently, the reviewers screened 3,058 records by title and abstract and excluded 2,871 because they did not meet the predefined inclusion criteria. In the retrieval phase, the reviewers sought 187 studies for full-text assessment and retrieved all of them; therefore, no studies remained unretrieved (n = 0). Then, the reviewers assessed 187 studies for eligibility and excluded 173 because they did not correspond to the target population (n = 86), did not present a relevant methodological design (n = 27), or did not provide results related to the impact of neuroscience-based interventions on early learning (n = 60). Finally, 14 scientific articles met the eligibility criteria and formed the final sample of the systematic review.

Figure 1
PRISMA Study Selection Level (2015-2025).



Note. Process based on the PRISMA statement, own elaboration (2025).

To support the research, the review applied content analysis to examine, organize, and interpret the information from the selected articles. This process facilitated the identification of patterns of meaning and conceptual relationships within the qualitative dataset (Ahmed et al., 2025). The procedure followed four phases: exhaustive reading of the texts to become familiar with the content; coding of units to systematically identify significant characteristics; categorization of codes into central themes; and a final synthesis that integrated the results critically and coherently into a table.

To ensure the rigor and quality of the analytical process, the review established three interpretation criteria: coherence, understood as the congruence between the data and the research objectives; recurrence, which identified repeated and representative themes in the reviewed studies; and relevance, which ensured that the content was directly related to the central purpose of the work. These criteria strengthened the internal validity and credibility of the results obtained.

The research process did not involve direct contact with human populations, nor did it deliberately manipulate variables. For this reason, it did not require approval from an institutional ethics committee. Nevertheless, the study followed the ethical principles of scientific research outlined in the Declaration of Helsinki and the COPE (Committee on Publication Ethics) guidelines (Parums, 2024), and ensured transparency, academic integrity, source traceability, and respect for copyright. In addition, the authors ensured complete and verifiable citation of all analyzed documents, as well as the exclusive use of publicly available information.

Results

The systematic review drew its results from the qualitative and interpretive analysis of the selected studies, which the review examined to identify patterns, recurrences, and relevant contributions on the impact of neuroscience-based interventions on early learning. After the systematization of the empirical evidence, the analysis organized the findings into analytical categories that described the types of interventions implemented, the neuroscientific foundations that supported them, the predominant methodological characteristics, and the main reported effects on the cognitive, socioemotional, and motor development of children aged 0 to 6 years. This organization supported a

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structured and comparative understanding of the current state of knowledge in the field.

Table 3

Systematization of Available Empirical Evidence (2015-2025).

Authors and year of publication	Database	Type of intervention	Neuroscientific basis	Study design and sample	Outcome measures	Main empirical findings
(Housman, 2017)	Scopus/WoS	ECSEL: emotional, cognitive, and social early learning program	Neuronal plasticity; emotional co-regulation supporting executive functions	Theoretical review with applied classroom experience (children aged 0 to 6 years)	Practical classroom indicators	Improvements were reported in emotional competence, self-regulation, and social skills.
(Golding et al., 2016)	Scopus/WoS	Developmental dance movement	Plasticity; sensorimotor integration	Quantitative; preschool children; Goodenough-Harris test	Visuomotor integration test	Significant improvement in visuomotor and developmental maturity ($p = .005$).
(Pereira et al., 2019)	Scopus	Group neuropsychological intervention (Karate-Do)	Early developmental plasticity	Experimental; n = 52 children (4-6)	Kolmogorov-Smirnov; Wilcoxon	Significant improvement in sensorimotor development ($p = .000$).
(Hermida et al., 2015)	Google Scholar	Educational intervention focused on executive function	Neuroplasticity and executive function development	Quasi-experimental; n = 49 kindergarten children	Pre-post assessments (academic indicators)	Significant improvements in academic performance in language and mathematics, autonomy, and peer contact.
(Castro & Cevallos, 2021)	Google Scholar	Brain stimulation strategies	Neuronal plasticity during early childhood	Quasi-experimental; 10 teachers	Teacher surveys	High percentages of teacher-perceived benefits in learning and development.
(Mayorga et al., 2025)	Google Scholar	Neurotechnology-based intervention	Principles of neuroeducation	Mixed methods; n = 42 children and 4 teachers	Neurocognitive tests and interviews	Mean improvement of 3.87 points in neuropsychological development; increased attention and academic skills.
(Manzano et al., 2024)	Google Scholar	Comparative early literacy methods: neuroeducation vs. traditional methods	Foundations of neuroeducation	Quasi-experimental; n = 60	Standardized tests and observations	Higher scores in memory, attention, logical reasoning, and language in the neuroeducation group.
(Alvarez et al., 2025)	Google Scholar	Sensorimotor play activities	Developmental neuroscience; sensory stimulation	Quasi-experimental; n = 60 (3-5 years)	Cognitive function assessments	Significant improvement in attention, working memory, perception, and emotional regulation ($p < .001$).
(Torres et al., 2025)	Google Scholar	Early stimulation through play-based neuroeducational strategies	Plasticity and socioemotional circuits	Mixed; n = 200 (3-5 years)	Pre- and post-tests; interviews; observations	Increased empathy and emotional regulation; positive correlation between both constructs.
(Coello, 2021)	Google Scholar	Early stimulation programs	Neuroplasticity favors cognitive, linguistic, and	Phenomenological/correlational; n = 400	Ortiz Abbreviated Development Scale	Increases in linguistic, motor, and socioaffective

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			socioaffective development			development indicators.
(Flor et al., 2025)	Google Scholar	Multisensory classroom program	Plasticity; multisensory stimulation	Mixed; n = 160 children and 6 teachers	Standardized tests and structured observations	Improvements in attention, memory, verbal comprehension, emotional regulation, and social skills.
(Ayala, 2023)	Google Scholar	NeuronUP Kids neuropsychological program	Neuronal plasticity	Quasi-experimental; daily sessions; n = 5-6 years	Pre- and post-cognitive and literacy assessments	Improvements in reading and writing; no significant change in mathematics.
(Herrera et al., 2025)	Google Scholar	Augmented reality cognitive development program	Neuroeducation; multisensory stimulation	Mixed; n = children aged 4 to 6 years	Cognitive assessments; qualitative observations	Quantitative increases in attention (+13.7%), memory (+13.6%), and creativity (+13.3%).
(Cetre et al., 2024)	Google Scholar	Parent training in early stimulation	Principles of neuroeducation	Mixed: 2 teachers, 18 parents, 18 children	Surveys; interviews; observation checklists	Increased application of stimulation techniques by parents and improvements in all developmental domains.

Note. The table summarizes the main data extracted from the selected scientific articles, own elaboration (2025).

Table 4

Qualitative Content Analysis Matrix.

Category	Subcategory	Description	Units of meaning
A. Types of intervention	A1. Emotional regulation and executive function programs	Programs aimed at emotional competence, self-regulation, and EF	“ECSEL”, “co-regulation”, “executive function activities”
	A2. Kinesthetic and sensorimotor activities	Motor integration interventions based on movement	“Karate-Do”, “dance movement”, “sensorimotor games”
	A3. Multisensory/technology-assisted interventions	Interventions using multisensory environments or digital tools	“Augmented reality”, “multisensory classrooms”, “neurotechnology”
B. Neuroscientific foundations	B1. Neuronal plasticity	References to plasticity, early windows, and neuronal adaptability.	“Brain plasticity”, “critical periods”, “experience-dependent circuits”
	B2. Multisensory stimulation and emotional co-regulation	Integration of multiple sensory pathways for learning	“Multisensory input”, “sensory circuits”, “pathways linked to perception”
	B3. Sensorimotor integration	Motor and cognitive connections	“Visuomotor integration”, “sensorimotor development”
C. Methodological characteristics	C1. Study design	experimental, quasi-experimental, mixed, theoretical	“pre-post”, “quasi-experimental”, “mixed methods”
	C2. Assessment strategies	Standardized tests, scales, and teacher reports	“Goodenough-Harris”, “pre-posttests”, “observations”
	C3. Sample characteristics	Age, size, educational level	“n=60”, “preschool children”, “parents and teachers”

Note. The table summarizes the main data from the qualitative content analysis, own elaboration (2025).

Results of the Main Interventions

The interventions identified focused on early learning in children aged 0 to 6 years and were grouped into three main subcategories derived from the content analysis: emotional regulation and executive function programs, kinesthetic and sensorimotor activities, and multisensory or technology-assisted interventions.

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Results of the Main Neuroscientific Foundations Used in the Interventions

The neuroscientific foundations identified in the studies were primarily linked to codes such as neuronal plasticity, understood as the brain's capacity to adapt and reorganize in response to appropriate stimuli during sensitive developmental periods such as early childhood; multisensory stimulation to reinforce neural connections associated with executive functions, emotional regulation, and effective learning; and sensorimotor integration as a foundation for cognitive and motor development, as well as the role of early experiences as determinants of brain circuits essential for academic performance and comprehensive development.

Results of the Main Methodological Characteristics Used in the Selected Studies

Most studies adopted quasi-experimental designs (42.9%), followed by mixed methods designs (28.6%), while other studies included exclusively quantitative approaches (7.1%), theoretical reviews (7.1%), and phenomenological/correlational field designs (7.1%). In addition, samples ranged from 18 to 400 participants, and assessment strategies such as pre- and post-intervention evaluations were recurrent in empirical research; studies also combined standardized tests with qualitative techniques to contextualize the educational applicability of the interventions.

Discussion

The systematic review answers the guiding question of the study by showing that neuroscience-based interventions grounded in principles such as neuroplasticity, sensory stimulation, and emotional co-regulation produce beneficial and measurable effects on early learning in specific areas such as cognitive, socioemotional, and motor development. This finding supports the role of neuroscience as a theoretical and practical foundation for understanding learning processes in the first years of life from a comprehensive perspective. As Manobanda & Bonilla (2025) explain, this period constitutes a unique window of opportunity to promote developmental areas and establish the foundations for healthy growth and successful future learning.

A substantial contribution involved identifying the interventions, which revealed predominant approaches in neuroscience and the dimensions of child development that early learning strengthens through targeted experiences. Among them, interventions oriented toward cognitive training and executive functions through multisensory stimulation and neuroeducational games were prominent; those centered on emotional co-regulation and socioaffective neuroeducation, which seek to improve empathy, emotional regulation, and self-regulation; and those that integrate neuroplasticity and body movement to stimulate coordination, attention, and motor memory.

The results align with those reported by Mondi et al. (2021), who demonstrated that socioemotional interventions strengthen empathy and self-regulation in early childhood. Likewise, Hosokawa et al. (2024) showed that social-emotional learning programs improve emotional regulation and executive functions, results that coincide with the reported improvements. Pacheco et al. (2025), in turn, confirmed that activities integrating body movement and cognitive stimulation increase attention and motor memory. Together, these findings reinforce the need for comprehensive early learning interventions that involve active and affective experiences to optimize brain development.

Accordingly, this analysis is relevant because it clarifies in a structured and evidence-based way how neuroscientific principles are translated into effective pedagogical strategies and shows a growing trend toward comprehensive and cross-cutting interventions. Such strategies operate on solid scientific principles that recognize the brain's capacity to adapt and undergo structural and functional adaptive changes in response to environmental demands during critical developmental periods (Förster & López, 2022; Rozo et al., 2024). Therefore, understanding neuroscientific mechanisms allows evidence to be articulated with contextualized and effective educational practices in educational settings.

The systematic analysis also helped define common methodological characteristics and emphasized quasi-experimental designs,

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standardized instruments, and pre/post assessments. This pattern coincides with Prime et al. (2023), who show that trials with pre/post designs and standardized measures achieve consistent improvements. Similarly, Bernabe et al. (2025) indicate that studies with a control group, sufficient intervention dose, and larger samples generate more robust effects. Conversely, Muir et al. (2023) emphasize that interventions with less methodological control present less consistent results. Thus, the critical synthesis of this study guides future research toward more experimental and empirically grounded models and strengthens the evidence on the effectiveness of neuroeducational strategies in early childhood contexts.

However, despite the positive evidence, the review identified significant gaps that limit the scope, homogeneity, and sustainability of the interventions. Although several studies used experimental and quasi-experimental designs with pre- and post-intervention assessments, heterogeneity in the samples and the absence of longitudinal follow-ups hinder direct comparison between approaches and the generalization of results to broader populations.

The review found a majority concentration of interventions aimed at children aged 3 to 6 years, which shows limited attention to groups aged 0 to 2 years. This limitation represents an opportunity for future research, since intervening at this stage may generate a deeper and more lasting impact on the child's comprehensive development. In addition, the lack of standardized approaches and longitudinal evaluations reduces the capacity to determine the real effectiveness and sustainability of the designed interventions. Consequently, future studies should strengthen the methodological design, expand the age range of participants, and undertake longitudinal research that validates and optimizes these neuroscientific interventions in early childhood.

Another relevant limitation is the predominant emphasis on interventions designed to optimize isolated individual skills, such as executive functions or specific cognitive abilities, without sufficiently integrating strategies that foster secure affective relationships, family support, or community participation, which are essential aspects for comprehensive and sustainable development during early childhood. Likewise, the application of advanced technologies such as augmented reality and neurotechnologies, although promising in terms of personalization and motivation for learning at an early age, also poses challenges in terms of accessibility, limited technology time for children aged 0 to 6 years, teacher training, and equity in contexts with limited resources.

Additionally, the training and awareness of educational staff and the active inclusion of families emerge as key factors to ensure successful implementation and learning transfer. In this regard, teacher training in applied neuroscience helps overcome pedagogical resistance and provide better quality in the execution of interventions designed under neuroscientific principles, while parental involvement creates enriched learning environments that enhance brain plasticity and support the consolidation of skills in the different areas of child development and learning processes in early childhood.

The findings also indicate the need to move toward a more holistic and multidimensional model that combines neuroscience with pedagogical and sociocultural approaches and promotes integrated and contextualized interventions, while acknowledging the complexity of early learning. From this perspective, this model should consider emotional, motivational, relational, and sociocultural factors that influence learning and child well-being, and promote inclusive and equitable practices adapted to diversity in early childhood contexts.

In summary, the systematic review provides significant evidence on the transformative potential of neuroscience-based interventions for early learning and also underscores the need to strengthen methodological standardization, expand the sample, incorporate a focus on social and contextual dimensions, and include teacher training and family participation to maximize results. The concerted application of these elements may advance educational systems that enhance children's comprehensive development, establish solid foundations for early learning in the first years of life, and support sustained long-term academic and developmental success.

Conclusions

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The systematic review demonstrates the relevance of neuroscience-based interventions as a significant contribution to understanding and optimizing early learning. The results indicate that the application of neuroscientific principles, supported by neuroplasticity, promotes cognitive, socioemotional, and motor development and consolidates a knowledge framework that strengthens the effectiveness of educational programs designed from the perspective of the developing brain. This approach strengthens child well-being and supports the design of learning environments that are more responsive to the needs of comprehensive development in early childhood.

In alignment with the proposed objectives, the study enabled the identification and analysis of various intervention modalities designed to stimulate brain plasticity, emotional self-regulation, multisensory stimulation, and sensorimotor integration, which showed substantial improvements in the fundamental competencies for learning. These findings suggest future implications for educational practice through the implementation of evidence-based neuroeducational methodologies. However, the review recognizes the need to strengthen the methodological rigor of quasi-experimental designs, expand sample diversity, and deepen teacher training and family participation as decisive factors for the overall sustainability and effectiveness of interventions.

Future research should move toward the standardization of methodological procedures and broaden the age range of study, especially in the population aged 0 to 2 years, a key stage for the consolidation of neuroplasticity. Researchers should also develop robust longitudinal studies that evaluate the permanence of effects and promote a broader and sustained understanding of the long-term impact of neuroeducational interventions. In addition, future studies should adopt a holistic approach that strengthens the training and awareness of teachers and families to ensure the adequate and contextualized implementation of strategies derived from neuroscience applied to early childhood education.

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Declaration of Conflicts of Interest

The author declares that there are no conflicts of interest related to the conduct of this study or to the interpretation of its results. Likewise, they state that they do not maintain personal, academic, or financial relationships that could influence the development or findings of the research.

Funding Statement

The authors declare that this research did not receive funding from public, private, or commercial institutions and that it was developed with their own resources, which guarantees the independence of the research process.

Ethics Statement

This study did not require approval from an institutional ethics committee, as it was a systematic review based on scientific articles indexed in Scopus, Web of Science, and Google Scholar, without direct contact with participants or manipulation of variables. Transparency, academic integrity, source traceability, verifiable citation, and respect for copyright were guaranteed.

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