

FINE MOTOR SKILLS IN EARLY CHILDHOOD EDUCATION: A
BIBLIOMETRIC ANALYSIS OF SCOPUS PUBLICATIONS
(2021–2026) USING THE PRISMA APPROACH

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ARTICLE INFO	ABSTRACT
Article History: Received: date of received article Accepted: date of accepted article Keywords: Keywords 1: Fine motor skill Keywords 2: early childhood education Keywords 3: bibliometric analysis Keywords 4: child development	<i>Fine motor skills in early childhood education are closely associated with children’s cognitive, emotional, communicative, and pedagogical development. This study aimed to bibliometrically analyze the scientific production on fine motor skills in early childhood education indexed in Scopus during 2021–2026. A quantitative, descriptive, and documentary bibliometric study was conducted following the PRISMA approach. Data were retrieved from the Scopus database in June 2026 using English and Spanish search terms. A total of 29 documents met the inclusion criteria and were analyzed. Bibliometric indicators were obtained using the Scopus Analyze Search Results tool, and the data were organized for descriptive analysis. The results showed sustained growth in scientific production over the study period. Scientific articles represented 83% of the analyzed documents, followed by review articles (14%) and conference papers (3%). Social sciences accounted for 33% of the publications, while Indonesia, Australia, and Spain were the leading contributors. Ecuador showed limited scientific production. The findings indicate that fine motor skills constitute an expanding field of research and highlight the need to strengthen scientific production, international collaboration, and evidence-based pedagogical practices in Ecuador.</i>

1. INTRODUCTION

Motor skills in early childhood education are configured, in a contemporary scenario, as a backbone of comprehensive child development, by articulating cognitive, socio-emotional, and physical dimensions in the early years of life. In this sense, the scientific production indexed in high-impact databases such as Scopus shows a sustained growth of research highlighting the

relevance of early motor stimulation in the construction of meaningful and lasting learning. Various studies conducted in European and Asian contexts highlight that the implementation of structured motor programs promotes brain plasticity, language development, and emotional self-regulation, thereby consolidating more inclusive and dynamic educational environments (KetutYoda et al., 2024). Likewise, in countries such as Canada, Australia, and Finland, an effective integration of motor skills within educational curricula is observed, which strengthens innovative pedagogical practices aimed at active and experiential learning from an early age (Li et al., 2024).

Comparative studies at the international level reflect those educational systems that prioritize motor skills in early childhood achieve better indicators of child development, particularly in executive skills and social competencies. The scientific literature highlights that these approaches not only focus on physical activity as such but also incorporate interdisciplinary didactic strategies that promote exploration, free play, and interaction with the environment (Sahid et al., 2025). In contrast, although Ecuador has shown progress in incorporating motor skills within the curricular guidelines for early education, it is still in a process of consolidation regarding the systematization of pedagogical practices based on international scientific evidence (Stanley et al., 2016). This comparison allows for the identification of opportunities to strengthen and adapt successful models implemented on other continents, thereby favoring the construction of relevant and sustainable educational proposals.

When analyzing the Latin American context, it is noticeable that the way motor skills are developed in early education varies significantly between countries. In Chile and Colombia, for example, policies have been promoted that highlight the importance of movement in child development, including teacher training programs and specific educational materials (Taylor et al., 2024). On the other hand, in Peru and Mexico, significant advances in research have been achieved, but this is not always reflected in the same way in educational centers (Garcia Alvarado et al., 2025). This shows that the region is gradually placing more value on motor skills within learning, although there are still difficulties in how it is applied, its extent, and how it is evaluated.

In Ecuador, some studies show that, although the curriculum recognizes the importance of motor skills, in practice there are various limitations, mainly due to the lack of resources, teacher training, and pedagogical planning (Mamani-Jilaja et al., 2024). Even so, there are institutions that have creatively incorporated motor activities, achieving positive results and demonstrating that it is indeed possible to improve this aspect (Borg et al., 2024). All of this shows that motor skills are starting to gain more importance in both research and education, but there is still a need to better organize the information and delve deeper into its analysis.

However, in the Ecuadorian context, the available evidence shows a situation that requires attention from both the research and educational fields. Various studies have reported that motor skills are not systematically or plannedly addressed in several early childhood education centers, limiting the holistic development of boys and girls (Delyana et al., 2025). This issue is exacerbated by the limited indexing in high-impact databases, which hinders the visualization and analysis of pre-professional practices (Blume & Mikkelsen, 2025). Additionally, there are deficiencies in teacher training regarding didactic strategies aimed at motor development, as well as a limited connection between theory and classroom implementation (Machay et al., 2026).

In Ecuador, there are still few bibliometric studies that analyze how research on motor skills in early childhood education has developed, which represents a significant limitation. This situation creates a knowledge gap, as it hinders the identification of research trends, relevant authors, collaboration networks, and main thematic lines (Muji et al., 2025). Likewise, the lack of this type of systematic analysis not only reduces the possibilities of making fundamental evidence-based decisions but also limits the international visibility of national educational production. In this sense, if the processes of review and bibliometric analysis are not strengthened, there is a risk that pre-professional practice will continue to be based primarily on empirical experience rather than rigorous scientific foundations, which could affect the quality of early childhood education (Chen & Xu, 2024).

Based on the identified knowledge gap, the present study addresses the limited bibliometric evidence on fine motor skills in early childhood education, particularly in the Ecuadorian context. Unlike previous studies, which have mainly focused on the effects of fine motor skills on child development, this research provides a bibliometric analysis of Scopus-indexed publications from 2021 to 2026. By identifying publication trends, subject areas, country contributions, and research gaps, the study contributes evidence to support future research, strengthen international collaboration, and inform evidence-based educational practices in early childhood education.

In this context, it is essential to formulate a question that guides the development of the present research, considering the need to generate systematic and relevant knowledge. Therefore, the following research question arises: What are the characteristics, trends, and evolution of scientific production on motor skills in early childhood education indexed in databases such as Scopus database, and how does Ecuador position itself in this field of study compared to other international and regional contexts?

In correspondence with this question, the objective of the research is to bibliometrically analyze the scientific production on motor skills in early childhood education indexed in Scopus database, with the purpose of identifying trends, authors, collaboration networks, academic impact, and research gaps, establishing a comparison between the international, Latin American, and Ecuadorian contexts, in order to provide evidence that contributes to strengthening research and pedagogical practice in early childhood education.

For this reason, the following specific objectives are established: to analyze the main thematic trends and scientific production on fine motor skills in early childhood education, taking into account studies indexed in Scopus database, in order to understand how this field has evolved over time. Likewise, identify the most influential authors and scientific collaboration networks to understand how knowledge is produced and shared in this environment. Finally, the aim is to compare the academic impact and research gaps between the international, Latin American, and Ecuadorian contexts, seeking to generate contributions that strengthen both research and pedagogical practice in early childhood education.

2. METHODS

Research Approach

The present study adopted a quantitative approach, as it allowed for an objective and organized understanding of the behavior of scientific production related to fine motor skills and holistic development in early childhood education. Through this approach, statistical and documentary data were analyzed, which facilitated the identification of the evolution of research, the main thematic trends, and the scientific contributions generated within this area of study (Li et al., 2024).

The study followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure a transparent and systematic selection process. The search was conducted in the Scopus database in June 2026 using predefined search terms related to fine motor skills and early childhood education. After applying the eligibility criteria, 29 publications were included in the bibliometric analysis.

Similarly, the quantitative approach made it possible to examine relevant aspects such as the frequency of publications, the years with the highest academic output, the most representative authors, the predominant areas of knowledge, and the scientific participation of different countries. All of this allowed for the construction of a broader and more structured vision of the research growth that this topic has had within the international scientific context. Likewise, the research was supported by the positivist paradigm, as the analysis was conducted through systematic, verifiable procedures based on documentary evidence. Consequently, the results obtained favored an organized and reliable interpretation of the information collected in the Scopus database.

The research corresponded to a bibliometric study of quantitative, descriptive, and documentary nature. It was considered bibliometric because it allowed for the analysis of existing scientific production on fine motor skills and holistic development in early education through statistical indicators obtained from publications indexed in the Scopus database (Taylor et al., 2024).

Sources of information

The research used two types of sources: primary sources and secondary sources. The primary sources were based on scientific articles that are in the Scopus database. This database is useful because it has high-quality academic publications with international recognition. Some studies have said that Scopus is one of the best platforms for scientific research and multidisciplinary analysis (Marinšek et al., 2026).

The secondary sources included systematic reviews, comparative research, and scientific documents related to fine motor skills, psychomotor development, and educational strategies applied in early childhood education (García Alvarado et al., 2025).

Search strategy and PRISMA process

The search was conducted in the Scopus database in June 2026 using the following search query: TITLE-ABS-KEY (("fine motor skills" OR "motricidad fina") AND ("early childhood education" OR "educación inicial")) AND PUBYEAR > 2020 AND PUBYEAR < 2026.

The search retrieved 29 records. The study followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure a transparent and reproducible selection process. Records were screened according to the inclusion and exclusion criteria, and the final sample consisted of 29 documents included in the bibliometric analysis. No duplicate records were identified,

and all retrieved documents met the predefined inclusion criteria; therefore, all 29 records were included in the final bibliometric analysis.

The search for information was conducted systematically and organized in the Scopus database. A search formula was created using Boolean operators, keywords, and descriptors related to fine motor skills, motor development, early education, and child learning. For this reason, the search strategy was based on terms in English and Spanish to obtain more results and find more precise documents. The main terms that were used were: Fine motor skill, motor development, early childhood education, preschool children, and psychomotor development (Aadland et al., 2026).

Then, rules were created to decide which scientific documents were relevant. Articles that were in the Scopus database, had been published in peer-reviewed journals, and directly addressed the topic being researched were selected. Then, eligibility criteria were established to determine the relevance of the scientific documents. Articles indexed in the Scopus database, published in peer-reviewed journals, and directly related to fine motor skills in early childhood education were considered eligible. All retrieved records met the established criteria and were included in the final bibliometric analysis.

Techniques and instruments

The main technique used was the systematic documentary review, which allowed for the identification, selection, and organization of scientific information retrieved from the Scopus database. For this reason, it facilitates the orderly systematization of the data and allowed for quantitative comparisons between the different documents analyzed (Machay et al., 2026). As a data collection instrument, a bibliographic analysis matrix was used, designed to record information related to authors, year of publication, country of origin, scientific journal, keywords, number of citations, methodology employed, and main research contributions (Starrett et al., 2022).

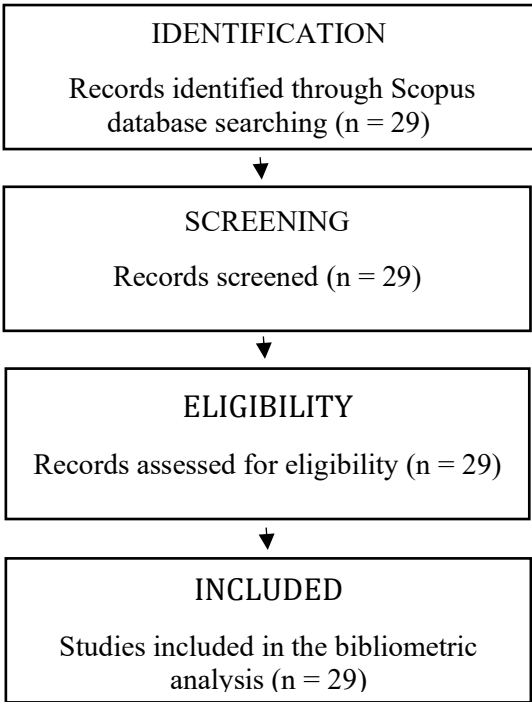
Analysis technique

The analysis of the information was carried out using bibliometric techniques and basic descriptive statistics. In this process, procedures for classification, categorization, and quantification of scientific publications related to fine motor skills in early education were applied (Rubio & Espinosa, 2023).

The bibliometric indicators related to publication trends, document types, subject areas, and country productivity were obtained using the Scopus Analyze Search Results tool. In addition, bibliometric network visualizations, including co-authorship and keyword co-occurrence analyses, were generated using VOSviewer software (version 1.6.20). The retrieved data were exported from Scopus and analyzed using descriptive statistics and network visualization techniques.

Likewise, an interpretative analysis of the obtained results was conducted, allowing the identification of research trends, temporal evolution of publications, scientific production by countries, authors with greater academic influence, and existing gaps within the field of study (Sari et al., 2025). The results were organized using tables, graphs, and analytical categories that facilitated the understanding of scientific information and allowed for the establishment of a comprehensive view on the research development of fine motor skills in early childhood education within the international, Latin American, and Ecuadorian contexts (Mamani-Jilaja et al., 2024).

Figure 1. PRISMA flow diagram of the document selection process

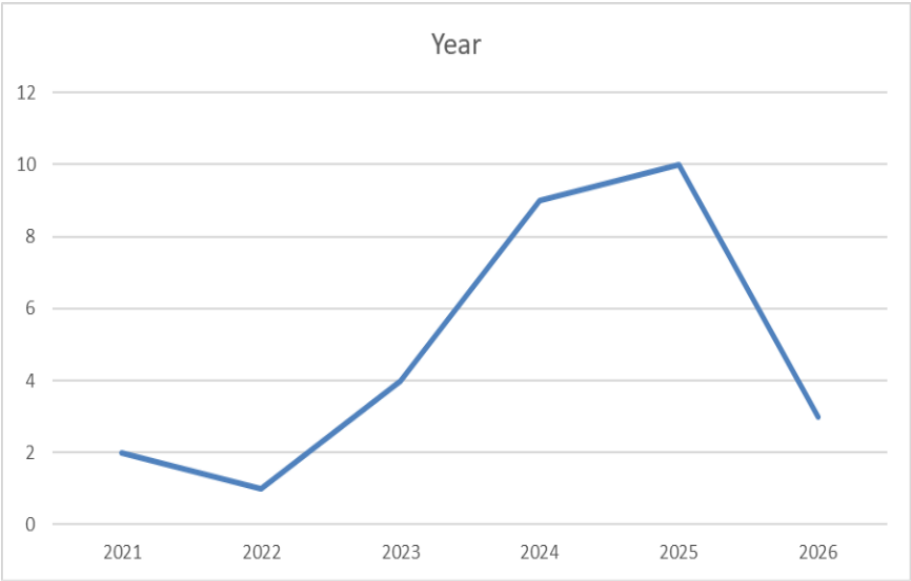


Source: Authors' elaboration based on data retrieved from the Scopus database (2026).

3. RESULTS AND DISCUSSION

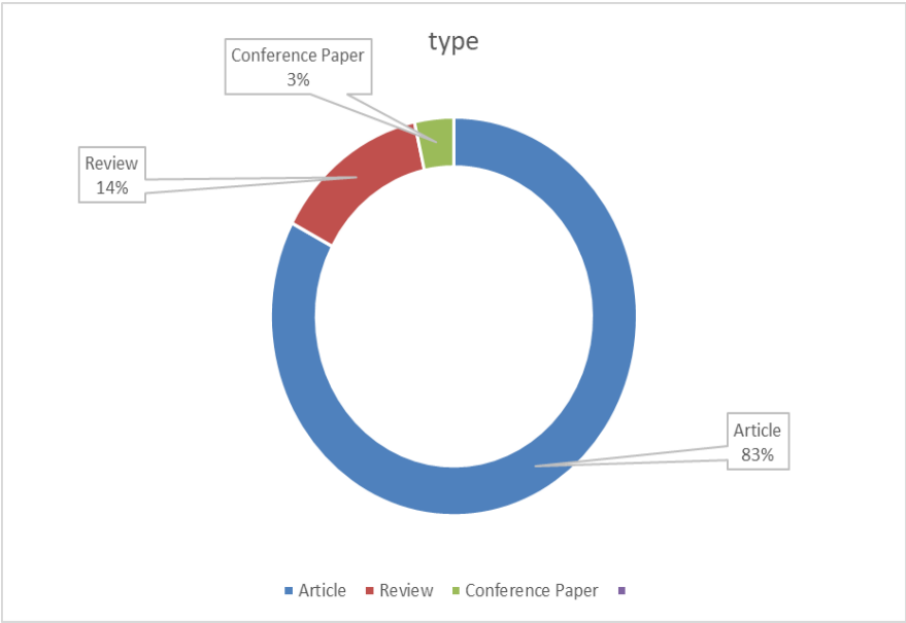
The following are the results derived from the bibliometric analysis of scientific production on fine motor skills in early childhood education, obtained from the Scopus database during the period 2021 - 2026. The graphs allow us to visualize the main characteristics and trends identified.

Figure 2. Documents per year on fine motor skills in early childhood education students determined from the Scopus database



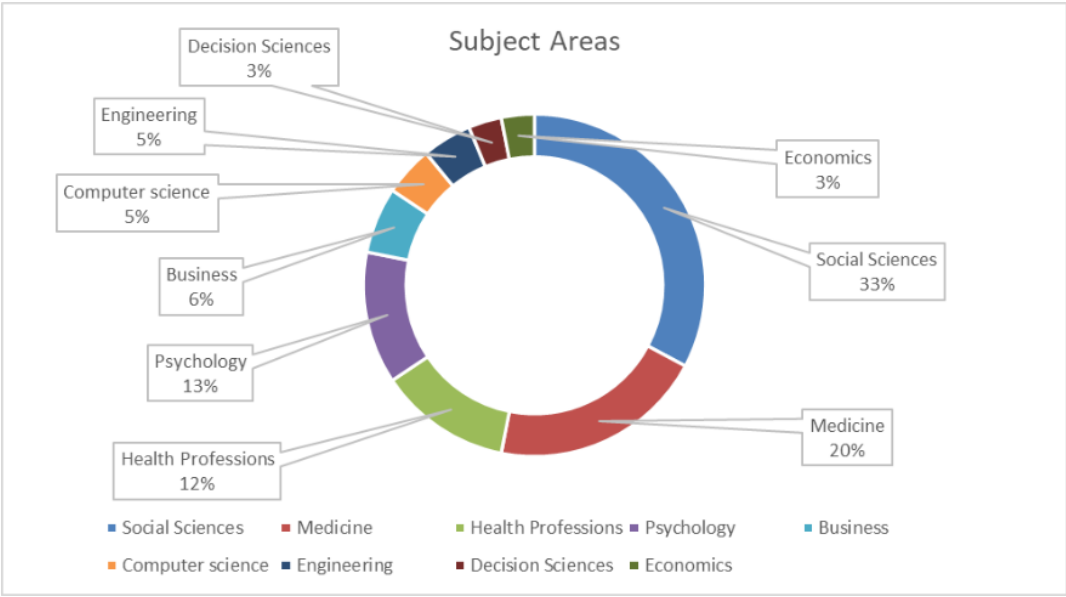
The results showed a variation in scientific production related to fine motor skills during the period 2021-2026. A progressive increase in the number of publications was observed from the early years analyzed, reaching its highest concentration in the most recent years. This behavior allowed for the identification of a growth trend in academic interest toward the topic. Likewise, the annual distribution showed a continuity in the generation of research, reflecting a consolidation of the field of study within early childhood education. The frequency of publications indicated a greater presence of scientific contributions toward the end of the period analyzed.

Figure 3. Documents by type on fine motor skills in early childhood education students determined from the Scopus database 2021-2026



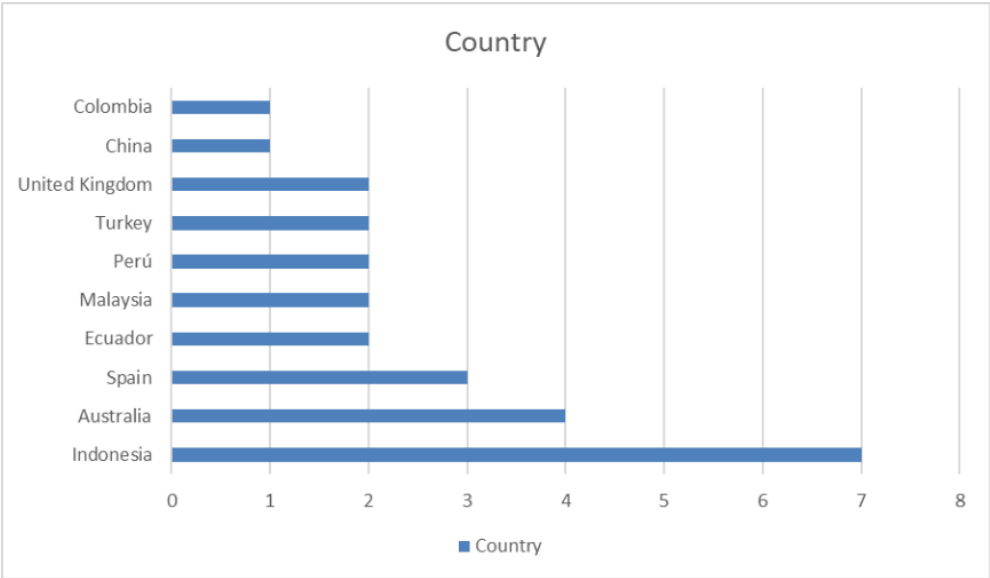
The classification of the documents of the documents showed that scientific article constituted the largest proportion of the recorded production, representing 83% of the total. Reviews accounted for a smaller share, with 14%, while conference papers represented 3%. These results evidenced a predominance of research published in indexed scientific journals. The observed document structure showed a greater orientation toward the dissemination of original results. Moreover, the reduced participation of other types of publications reflected a concentration of knowledge in formal academic formats.

Figure 4. Documents by area on fine motor skills in early childhood education students determined from the Scopus database 2021-2026



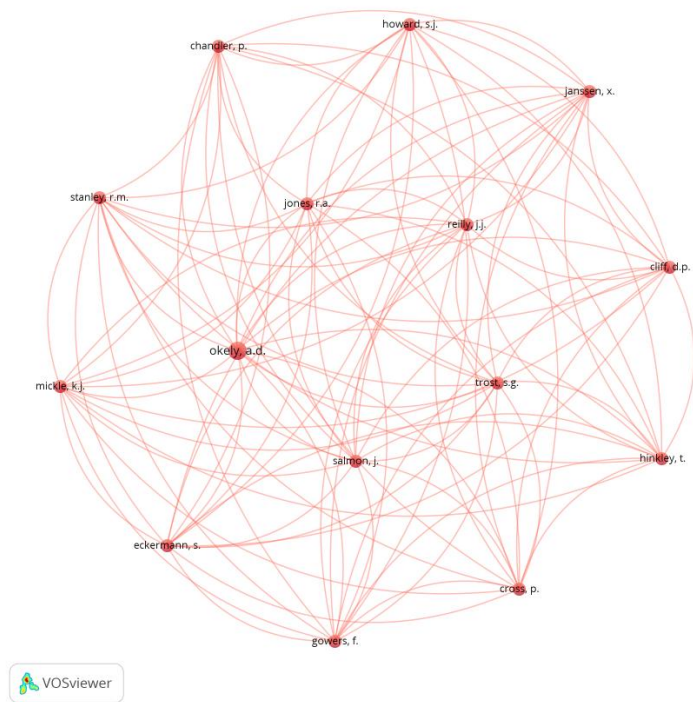
The distribution by fields of knowledge showed a predominant participation of social sciences, which accounted for 33% of the analyzed publications. Similarly, Medicine and health sciences showed a significant participation within scientific production. Psychology and health professions recorded similar percentages, highlighting the multidisciplinary nature of the topic. Other areas such as computer science, engineering, decision sciences, and economics showed a lower representation. These results allowed for the identification of the diversity of approaches present in the study of fine motor skills.

Figure 5. Documents by country obtained on fine motor skills in early childhood education students determined from the Scopus database 2021-2026



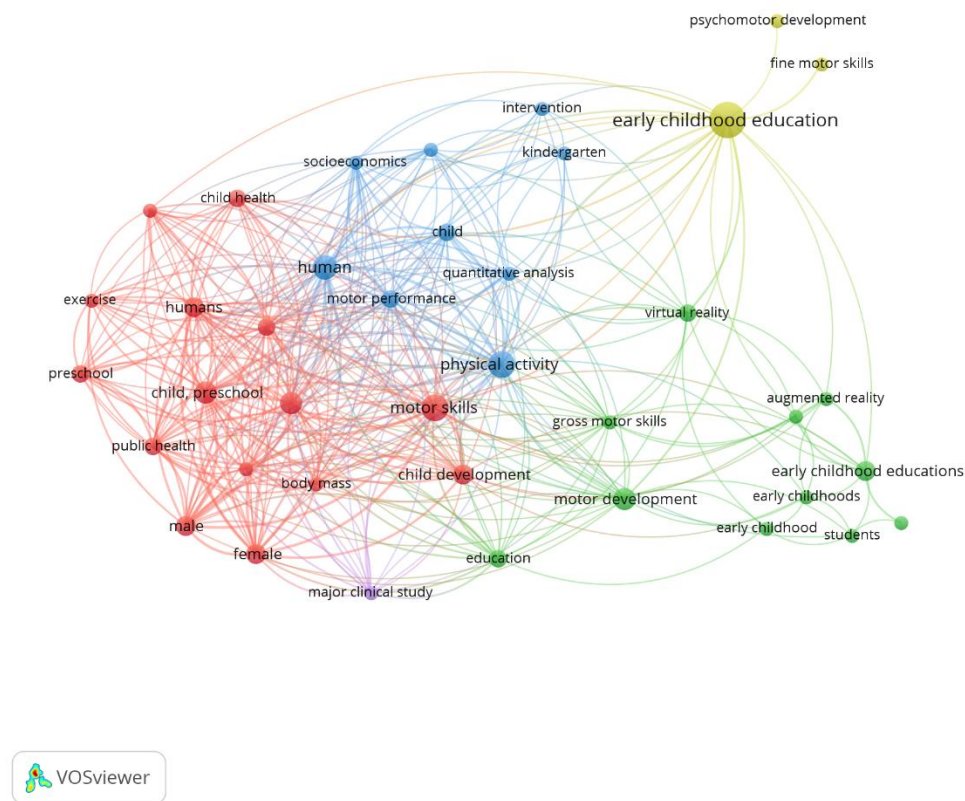
The results showed an international distribution of publications related to fine motor skills. Indonesia presented the highest number of registered documents, followed by Australia and Spain. The participation of countries such as China, the United Kingdom, Turkey, Colombia, Peru, Malaysia, and Ecuador were also identified. The presence of different notions evidenced a geographical breadth in the development of research on the topic. Likewise, scientific production was found to be distributed among different regions, reflecting a sustained interest in the study of fine motor skills in diverse educational contexts.

Figure 6. Co-authorship network of authors in research on fine motor skills in early childhood education.



The co-authorship network generated with VOSviewer revealed a fragmented collaboration structure. Most authors were connected through small collaborative groups with weak interconnections, indicating that research on fine motor skills in early childhood education remains dispersed and lacks strong international collaborative networks

Figure 7. Co-occurrence network of author keywords generated using VOSviewer.



The keyword co-occurrence analysis identified several thematic clusters that characterize the scientific literature on fine motor skills in early childhood education. The largest cluster was centered on "early childhood education", which showed strong connections with "fine motor skills" and "psychomotor development", highlighting these as the main research topics. A second cluster grouped terms related to motor development, including "gross motor skills", "physical activity", "education", and "virtual reality", suggesting growing interest in innovative educational strategies. Another cluster included terms such as "motor skills", "child development", "preschool", and "public health", reflecting the relationship between motor development, health, and early childhood learning. Overall, the network indicates that research in this field is multidisciplinary and increasingly integrates educational, developmental, and health-related perspectives.

The results obtained showed that the scientific production on fine motor skills in early childhood education experienced sustained growth during the period 2021-2026, with a higher concentration of publications in the most recent years. This behavior reflects an increase in academic interest in understanding the influence of motor development on learning processes during early childhood. The identified motor trend became a priority within international educational research agendas due to its relationship with cognitive development, school performance, and child well-being (KetutYoda et al.,

2024; Li et al., 2024; Taylor et al., 2024). From the interpretation of the study, this growth was not only due to an increase in scientific production but also to the need to generate evidence that supported increasingly comprehensive pedagogical interventions for early education.

The observed increase in publications could also be associated with the increase in research oriented toward active methodologies and educational settings that promoted movement as a learning strategy. Various authors argued that motor experiences developed through play, exploration, and interaction with the environment significantly favored holistic child development, strengthening both motor skills and social and cognitive abilities (Aadland et al., 2026; Caldwell et al., 2023; Sahid et al., 2025). Consequently, the bibliometric results allowed us to infer that scientific interest has shifted from focusing solely on the evaluation of psychomotor development to incorporating interdisciplinary perspectives related to pedagogy, health, and neuroeducation.

Regarding the type of documents published, the scientific article overwhelmingly predominated, accounting for 83% of the analyzed production. While reviews and conference papers had a considerably smaller share. This finding was consistent with the dynamics of indexed databases, where peer-reviewed journals constituted the main medium for disseminating validated scientific knowledge. Recent research also indicated that original articles represented the main source of empirical evidence on child motor skills, favoring the consolidation of the field through experimental, longitudinal, and intervention studies (Garcia Alvarado et al., 2025; Marinšek et al., 2026; Starrett et al., 2022). From an interpretative perspective, this predominance evidenced the progressive maturity of the research line, although it also highlighted the need to increase systematic reviews and bibliometric studies that would allow for the synthesis of existing knowledge and guide future research.

The distribution by areas of knowledge confirmed the multidisciplinary nature of fine motor skills. The social sciences concentrated the highest percentage of publications, followed by medicine, psychology, and health professions, which reflected that the study of motor development transcended the exclusively clinical field to fully integrate into educational processes. These situations coincided with research that described motor skills as a transversal component of human development closely linked to language acquisition, executive functions, emotional regulation, and school learning (Mamani-Jilaja et al., 2024; Rubio & Espinosa, 2023; Sáez-Sánchez et al., 2021). Likewise, other studies highlighted that the incorporation of educational technologies, digital tools, and innovative strategies expanded the research field toward disciplines such as engineering, computer science, and data analysis (Chen & Xu, 2024; Delyana et al., 2025; Machay et al., 2026). From this perspective, the results obtained demonstrated that fine motor skills ceased to be considered solely as a physical ability and became an interdisciplinary object of study with multiple educational applications.

Other relevant aspects corresponded to the geographical distribution of scientific production. Indonesia has the highest number of publications, followed by Australia and Spain, while Ecuador recorded a reduced participation within the analyzed set. These differences highlighted significant inequalities in the generation of scientific knowledge among different national contexts. Research conducted in Indonesia showed a strong interest in integrating pedagogical models based on local culture, play, and active methodologies to strengthen motor skills from an early age (KetutYoda et al.,

2024). Similarly, Australia consolidated numerous studies focused on physical activity, motor development, and the quality of educational environments intended for children (Caldwell et al., 2023; Stanley et al., 2016). The interpretation derived from the analysis allowed us to recognize that those countries where there was a greater investment in educational research also showed a more consistent and diversified scientific production.

These findings are consistent with previous bibliometric studies in education, which have shown that countries with stronger research systems, greater international collaboration, and sustained investment in scientific development tend to lead academic production. In contrast, countries with emerging research systems often face challenges related to funding, publication opportunities, and international visibility. Therefore, the leadership of Indonesia, Australia, and Spain may be associated not only with their research capacity but also with policies that promote the dissemination and internationalization of scientific knowledge.

The limited presence of Ecuador within international scientific production coincided with what was stated in the introduction of the study, where a lack of systematization of bibliometric research related to fine motor skills was identified. Although in recent years there have been advances in the incorporation of innovative pedagogical strategies within early childhood education, the indexed evidence continues to be limited compared to other Latin American and European countries (Machay et al., 2026; Mamani-Jilaja et al., 2024). From the interpretative perspective of this study, this situation does not necessarily reflect an absence of successful educational experiences, but rather limitations associated with scientific publication, the internationalization of research, and the visibility of Ecuadorian academic production. Similar situations have been reported in other developing countries, where educational research is frequently conducted at the local level but is not always published in internationally indexed journals, limiting its visibility and impact within the global scientific community.

The results also allowed us to recognize that recent research increasingly incorporated technological resources to promote the development of fine motor skills. The use of virtual reality, three-dimensional educational games, augmented reality, and digital tools emerged as an emerging line within the research field, showing favorable results in strengthening motor coordination and children's manipulative skills (Delyana et al., 2025; Kurniawan et al., 2019). Similarly, other studies indicated that teacher training in the pedagogical use of technologies significantly contributed to improving the quality of motor experiences developed in early childhood education (Marinšek et al., 2026). This convergence allowed us to interpret that technological innovation began to consolidate as a relevant component within current research on motor development.

The analyzed evidence also identified a growing orientation toward comprehensive approaches where movement was understood as a means to enhance multiple dimensions of child development. Various studies acknowledged that motor activities simultaneously strengthened autonomy, creativity, and more inclusive and meaningful problem-solving (Li et al., 2024). In this sense, the bibliometric results supported the need to promote educational policies that integrated fine motor skills within the curricula from a transversal perspective and based on scientific evidence.

The identified scientific production allowed us to conclude that the study of fine motor skills has experienced a progressive consolidation in recent years, characterized by constant growth in publications, marked interdisciplinarity, and greater participation from countries that have strengthened educational research through sustained scientific policies. At the same time, the analysis revealed the existence of research gaps in contexts like Ecuador, where it is still necessary to increase indexed production, strengthen international collaboration networks, and develop bibliometric studies that guide future lines of research. The triangulation between the scientific background, the results obtained, and the interpretation carried out allowed us to demonstrate that fine motor skills continue to position themselves as an essential component for understanding holistic child development and guiding pedagogical innovation within early childhood education.

4. CONCLUSIONS AND SUGGESTIONS

This bibliometric study provides a comprehensive overview of the scientific landscape on fine motor skills in early childhood education during the period 2021–2026. From a theoretical perspective, the study contributes to the existing literature by synthesizing current scientific evidence, identifying the main research trends, and highlighting the multidisciplinary nature of fine motor skills, integrating educational, developmental, psychological, and health-related perspectives. Furthermore, the incorporation of bibliometric analyses, including co-authorship and keyword co-occurrence networks, provides a broader understanding of collaboration patterns and emerging research themes in this field.

From a practical perspective, the findings emphasize the importance of promoting evidence-based educational strategies that strengthen fine motor skills during early childhood, supporting children's cognitive, social, and academic development. The results may assist teachers, curriculum designers, researchers, and educational policymakers in designing and implementing interventions that foster comprehensive child development. In addition, the study identifies opportunities to strengthen international collaboration and increase scientific production in underrepresented countries, particularly Ecuador, thereby contributing to the advancement of research and educational practice in this area.

Based on the findings, it is recommended to strengthen teacher training in playful, inclusive, and planned strategies for the development of fine motor skills in early childhood education. It is also important to promote research projects in Ecuadorian universities, establish collaboration networks among universities, early childhood education centers, and researchers, and increase the publication of Ecuadorian studies in recognized scientific journals. Likewise, fine motor skills should be integrated transversally into pedagogical planning through activities related to language, art, play, autonomy, creativity, and problem-solving. Future research could expand bibliometric studies to other databases, time periods, and languages, as well as develop longitudinal and intervention studies on the effects of motor strategies on children's holistic development.

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