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Improving Aspects of Early Childhood Cognitive Development through Play based Learning in Indonesia: A Systematic Literature Review

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Abstract
Play is one of the ways in which children learn and stimulate various aspects of their development. This study aims to examine how play can enhance children's cognitive development. The research method used was a systematic literature review following the PRISMA-P protocol, with nine journal articles serving as primary data sources. The findings indicate that structured play-based learning has a significant impact on children's cognitive abilities, such as problem-solving, logical thinking, and symbolic thinking with educators and play materials serving as fundamental factors in optimizing developmental stimulation. For policymakers, the implications include ensuring equitable access to play resources, developing structured modules, providing professional training, and integrating play-based approaches into early childhood teacher education programs. For educators, practical recommendations include utilizing traditional games and natural materials as accessible play resources, while fostering meaningful collaboration between teachers and parents. Further research is recommended to examine the impact of free play on enhancing children's cognitive development.

Keywords: *Play-Based Learning*, *Cognitive Development*, *Early Childhood*

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1. INTRODUCTION

The concept of play-based learning has been around for a long time. Ogunyemi and Ragpot (2016) also note that Froebel was among the first to formally incorporate play-based education in the 1890s. In 1997, the NAEYC (National Association for the Education of Young Children) stated that play is the primary tool for children to learn, and around the year 2000, this concept was introduced in the UK under the term play-based learning. Regarding the play-based learning process, Barblet (2010) notes that play activities in play-based learning are process-oriented rather than outcome-oriented. Meanwhile, Taylor & Boyer (2020) state that play-based learning is recognized as an effective pedagogical approach for enhancing early childhood development. Through their research, Keung & Fung (2020) explain that children experience play within the learning process when they are not restricted by technical activities such as writing with pencils and erasers; they add that children perceive learning as enjoyable when they interact with materials and collaborate with others. In line

with this, Marlina et al., (2020) note that play is a moment when children can explore all their potential. The Indonesian government has also introduced policies for early childhood education programs, such as the implementation of the "Merdeka" curriculum in early childhood education (PAUD), which is closely tied to a fun learning process designed to provide stimulation that supports growth and development in line with children's developmental milestones.

In line with this, theoretically, there is a relationship between play in early childhood stage and cognitive development, as explained through Piaget's preoperational stage concept, where play serves as a means for children to develop literacy and build cognitive structures (Aida et al., 2024; Kurniasari, 2020). Fitriyani et al., (2025) add that concrete activities such as play serve as the primary means for children to think during this phase. Marinda (2020) notes that during this stage, there is an increase in symbolic thinking. Thus, children begin to learn and think using their imagination, such as employing symbols in the form of words, images, or objects; even when those objects are not directly visible or tangible. Furthermore, Retraningrum & Umam (2021) state that children's cognitive development is a brain-based thinking process involving recognition, knowledge, understanding, and reasoning, enabling children to grasp lessons easily, possess a broad vocabulary, and demonstrate sharp reasoning (logical and critical thinking, understanding cause-and-effect relationships, and quickly identifying errors), as well as acquiring knowledge and adapting to new environments to solve problems. Therefore, play-based learning is not merely a recreational activity but an approach that can support children's cognitive development in accordance with age-specific characteristics and developmental theories.

However, in reality, there are some early childhood education institutions in Indonesia that have not optimized the learning process through meaningful and enjoyable play-based approaches, thereby hindering children's cognitive development. Several studies conducted at the early childhood in Indonesia indicate that learning still lacks exploratory activities that can foster children's motivation to learn; learning is still teacher-dominated; and many institutions still face limitations in access to diverse educational play materials, resulting in a reliance on books, pencils, and worksheets. On the other hand, in a study by Permatasari et al. (2025), there is data from Baruga Subdistrict, Sulawesi, revealed that the majority of early childhood education teachers expressed a lack of confidence in designing play-based learning that aligns with cognitive development indicators. Based on this, there is a gap between the theory of play which is proven to stimulate children's developmental aspects, particularly cognitive development and the implementation in early childhood education institutions. Therefore, this study is expected to provide recommendations for early childhood educators and policymakers in designing enjoyable learning approaches through play-based methods that align with children's developmental characteristics.

Based on prior literature, there are at least four journals in the past ten years that have conducted similar research on a enhance children's cognitive development through play. Three of these studies used early childhood children as research subjects, such as in Veronica (2018); Astuti et al., (2024); and Laila & Kamaliah (2025), while Aminah et al., (2022) used elementary school children (ages 6–11) as research subjects. This journal is expected to contribute to research innovation by employing the PRISMA-P framework for the literature review (this method not used in the four previous studies) and to address the research gap left by prior studies, which only discussed the overall development of children's cognitive abilities through play. Through this research journal, the researcher aims to understand how play can enhance aspects of children's cognitive development by narrowing the discussion to three key areas highlighted in the Ministry of Education and Culture Regulation on National Standards for Early Childhood Education (PAUD) regarding the scope of children's cognitive development within the Early Childhood Development Achievement Standards (STTPA), namely: 1) problem-solving, 2) logical thinking, and 3) symbolic thinking, thereby enabling a more in-depth exploration of the research topic.

2. METHODS

The researchers used a qualitative research method, specifically a systematic literature review, with the aim of broadly examining various research publications in Indonesia that explore how play in the early childhood learning process can enhance children's cognitive development. The data, consisting of articles or journals included in this study, were obtained through a literature search of

electronic databases, namely Google Scholar and Garuda, using purposive sampling with the criteria listed in Table 1. To analyze the selection of literature to be used as primary data, the researcher used the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) flowchart shown in Figure 1.

Table 1. Inclusion and Exclusion Criteria

Criteria	Description
Inclusion	1. Data published between 2023 and 2025 in both national and international academic journals, with Indonesia as the location of the research study 2. The data consists of journals accredited at a minimum of Sinta 4 and Arjuna (national journal accreditation) that are openly accessible and feature research designs other than literature reviews 3. The data indicates that play-based methods can enhance cognitive development in children aged 4–6 years or those enrolled in early childhood education programs
Exclusion	1. The data focuses on the development of play media or play tools that can stimulate children's cognitive development 2. The data does not show how the process of play in learning impacts the improvement of children's cognitive development 3. Data from research samples other than children aged 4–6 years or children in early childhood education programs

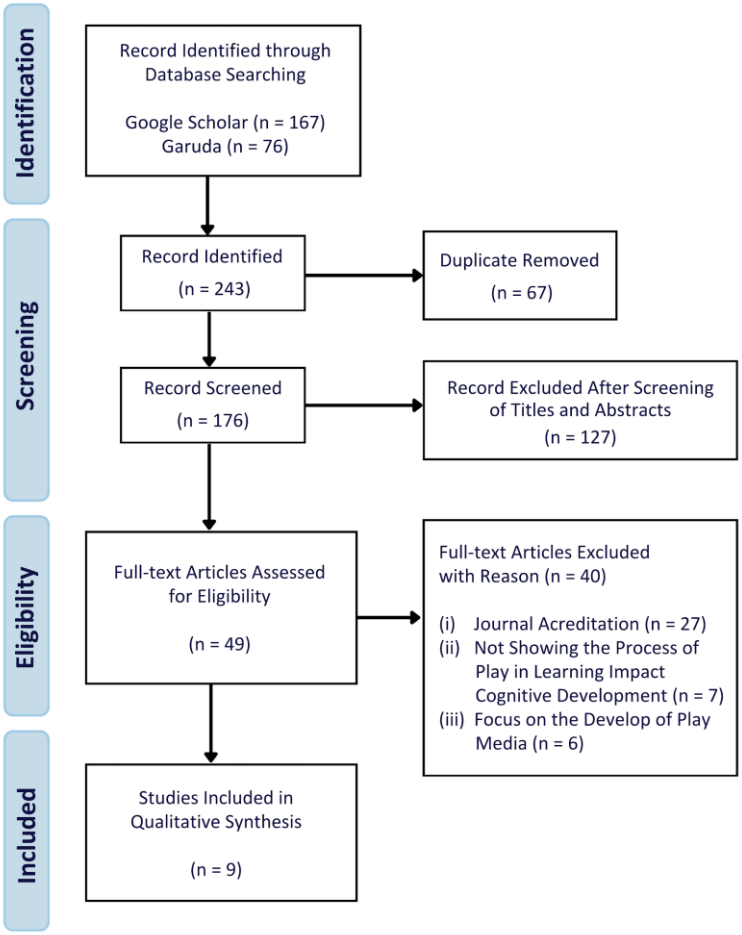

Figure 1. PRISMA Diagram Improving Aspect of Early Childhood Cognitive Development through Play Based Learning in Indonesia.

3. RESULT AND DISCUSSION

The researchers identified 243 journals as a result of an initial screening based on publication year, research location, and the keywords “Play and Children’s Cognition,” “Play and Problem Solving,”

"Play and Logical Thinking," and "Play and Symbolic Thinking." After reviewing the abstracts, 49 relevant research journals were selected for full-text reading, followed by data abstraction based on inclusion and exclusion criteria, resulting in 9 selected articles for further analysis. Most of the research articles that served as the primary data sources were qualitative studies (67%), and the remainder were quantitative (33%). A summary of the findings from the selected journals for further analysis is presented in Table 2.

Table 2. Summary of Research Findings

Author (Year)	Research Method	Findings
Ramlah, F., Mukminin, A., & Jannah, S. R. (2023)	Quantitative (pre-experimental design of one group pre-test and post-test)	This article shows that there is an improvement in symbolic thinking skills through playing with cards, as indicated by the T-test (partial test), which shows that tcount (6.269) is greater (>) than ttable (2.020) and the significance level of 0.000 is smaller (<) than 0.05, so Ho is rejected and Ha is accepted. The researcher created the card media and adjusted the themes and materials in the learning process, as well as various activities
Royani, I., & Suryana, D. (2023	Classroom Action Research	The research results in this article show that one aspect of children's cognitive development, namely symbolic thinking skills in recognizing numerical concepts, can be improved through play. The average pre-cycle score of 36.11% in the not yet developed category, then cycle 1 with a score of 50.18% in the category of beginning to develop, and cycle 2 with a score of 76.1% in the very well developed category. In addition, children's numeracy skills, such as addition, can be trained indirectly through the learning process while playing which has been implemented.
Armanila, A., & Lubis, M. (2023)	Qualitative	The results of the study show that there is an increase in children's cognitive development in water play activities. From the study of 16 children, 12 were categorized as developing very well, and the other four were developing as expected. This journal also states that educators play an important role implementing the learning process while playing so that even though they use learning media that can be easily found such as natural materials (for example, water), stimulation can still be optimal.
Isro'atin, L., & Fitri, R. (2023)	Classroom Action Research	This article shows that playing can stimulate aspects of cognitive development, particularly symbolic thinking in children. The research has shown an increase in each indicator set by the researchers, such as in the indicator of filling in empty patterns, which increased by 93.75%, continuing patterns by 81.25%, and creating independent patterns by 81.25%.
Kadir, A., Thaba, A., & Nursaadah, S. (2024)	Classroom Action Research	The research results in this article show that playing in science learning allows children to explore nature and surrounding objects through direct interaction. In addition, children will also become accustomed to using measuring instruments, so their cognitive abilities, especially logical thinking skills, will develop gradually.
Aida, N., Muzakki, M., & Saudah, S. (2024)	Classroom Action Research	The results of the study show that there is a correlation between learning activities carried out through play and improving children's cognitive development, especially symbolic thinking skills such as recognizing patterns, symbols, and being able to write letters. In addition, the process of playing in learning also fosters enjoyment and satisfaction in children. This is also supported by the surrounding environment, including educators and even classmates.
Rabbani, A. Z., Amelia, S., & Rachmi, T. (2025)	Classroom Action Research	This article shows that there is improvement in children's symbolic thinking abilities through constructive play methods when children are able to use simple objects to symbolize more abstract concepts. Fun and interesting activities not only actively engage children but also strengthen their problem-solving abilities and stimulate logical thinking skills, such as classifying objects made from constructive play media.
Aulia, D. H. P., & Ilhami, A. (2025)	Quantitative (pre-experimental design of one group pre-test and post-test)	The results of the research in this article indicate that there is a significant difference between before and after the learning process through play, as shown by the increase in children's scores from the pretest score of 62,36 to 85,21 with the category of very good development on the posttest. This is marked by the children's logical thinking skills, which can be stimulated well. This is marked by the children's ability to distinguish colors, numbers, and symbols more carefully.
Fitriyani, L. F., Palenewen, E., & Satriana, M. (2025)	Quantitative (pre-experimental design of one group pre-test and post-test)	The results showed that the use of geometric puzzle games had a positive motivational impact to make children actively engage in the learning process without pressure and improve their cognitive abilities (as seen in the N-Gain Score test results of 0.5287 or 53%).

Optimizing Play Methods to Develop Children's Cognitive Aspects

The issue of the suboptimal application of enjoyable learning activities, which hinders children's cognitive development, was raised in the initial observations of 6 of the 9 journals studied. As explained by Rabbani, et al., (2025), most children show a lack of motivation in developing symbolic thinking skills (one aspect of cognitive development) because there is no stimulation involving exploratory activities, teachers dominate learning, give assignments in every lesson, and even in class, most of the time is spent on worksheets. Regarding worksheets, this narrative is similar to the problems identified by Isro'atin & Fitri (2023) and Royani & Suryana (2023) regarding the use of paper worksheets, which are more often used in the learning process, making children less interested in the learning process and even easily bored. Ramlah, et al., (2023) stated that, in addition to the limitations in using various educational media, so that learning is focused on books and pencils, there is also a lack of an active atmosphere in learning and a focus on the teacher. Aulia & Ilhami (2025) stated that in the initial observation process of the research, cognitive stimulation through play had not been optimally implemented, and educators had not made efforts to create a pleasant learning environment. The critical problems in the learning process that caused the suboptimal development of children's cognition were the uninteresting learning methods and the lack of variety in the media used, which made children bored in teaching and learning activities (Armanila & Lubis, 2023).

Through these problems, the researchers used the play method in the learning process to develop cognitive development aspects, which are one of the six aspects of early childhood development in the Regulation of the Minister of Education and Culture of the Republic of Indonesia No. 137 of 2014. Three points highlighted in the terms of the scope of children's cognitive development in the Early Childhood Development Achievement Level Standards (STPPA) in Indonesia are explained in **Figure 2.**

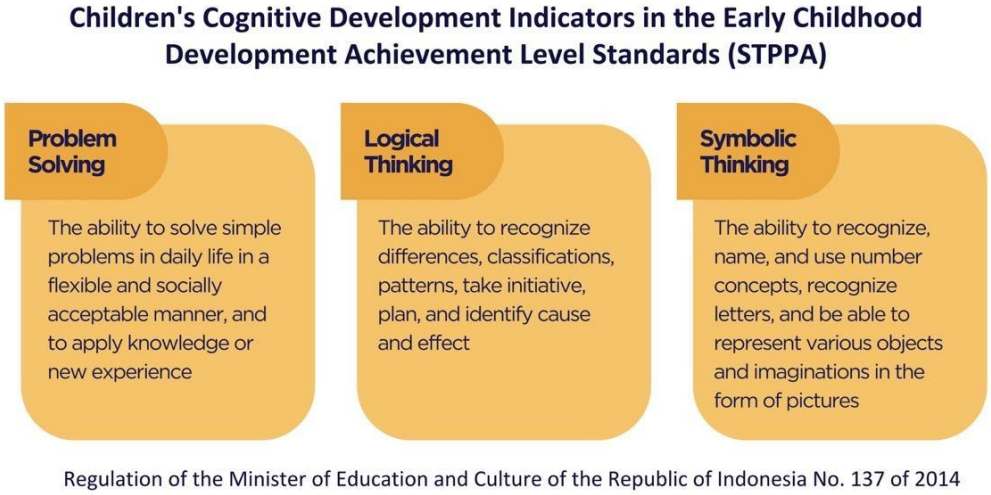

Figure 2. Indicators of Cognitive Development

The literature review shows that play-based learning can develop the problem solving aspect of children's cognitive development. In a study conducted by Rabbani, et al., (2025) related to constructive play activities carried out in the learning process, it was found that these activities can stimulate children's spatial problem-solving abilities when they face challenges in arranging and building structures from constructive play media, such as blocks and plasticine. Previous research also suggests that spatial abilities trained through play can support children's problem-solving skills (Clements & Sarama, 2009). In addition, research by Fitriyani, et al., (2025) on the process of playing in learning using geometric puzzles also states that in this activity, children not only recognize shapes but are also involved in interactive activities that can stimulate problem solving. Armanila & Lubis (2023) even stated in their research on learning through water play that improvements in children's cognitive development are expected to equip them with the skills to think and solve everyday problems. This expectation is in line with the statement by Hopper, et al., (2020) that the better the

cognitive development of children, the better their ability to solve new problems in their daily environment.

Playing in learning activities can also stimulate and improve children's logical thinking skills. Among the signs of improved logical thinking skills are the ability to recognize differences, understand rules, predict cause and effect, and even group based on numbers, colors, and symbols in Uno Stacko play activities that have been integrated into the learning process (Aulia & Ilahmi, 2025). In addition, logical thinking skills in classifying objects created in constructive play activities were also developed in the research conducted by Rabbani et al. (2025). On the other hand, there is an increase in the classification abilities of early childhood in the research by Fitriyani, et al., (2025), which can be seen when children can match or group various geometric shapes with different sizes and colors. Through this, children also use their perceptual abilities. Research conducted by Isroatin & Fitri (2023) also states that through pattern bag board games, children's logical thinking skills can be improved, as seen from their ability to fill in empty patterns, continue patterns, and create patterns independently. In addition, the science game conducted in the study by Kadir et al. (2024) stated that during play, all parts of the body, especially the five senses, are involved, and children's logical thinking skills also improve. The reasons for this are the use of measuring instruments and the process of observing cause and effect in science games.

The aspect of symbolic thinking cognitive development can also develop, as shown in the study by Rabbani et al. (2025), which is demonstrated by children's ability to use simple objects in play to symbolize more abstract concepts, for example, the use of constructive play media such as blocks and plasticine to represent animals or vehicles. In the study by Ramlah, et al (2023), children's symbolic thinking abilities improved, such as recognizing and naming number symbols, counting, adding, and matching, as well as identifying letter symbols and their sounds, and upper and lower case letters. Even through the snake and ladder game studied by Royani & Suryana (2023), children's counting skills, such as addition, can be trained indirectly. The first roll of the dice determines the position where they will stop jumping. The second and subsequent rolls lead children to understand the final result of an addition. For example, when a child rolls the dice for the first time and gets a three, the child will jump to the number three. Then, on the second roll, a four appears. The child must jump from the number three four times. When they stop, the child will arrive at the number seven. Through a traditional game from Kalimantan called tembak tutus, Aida, et al. (2024) varied the play activities so that they could improve children's symbolic thinking skills, such as recognizing patterns and symbols, as well as being able to rewrite the letters they see.

The Role of Educators in Implementing Play-based Learning

Based on the results of research on the implementation of play-based methods in early childhood education, the role of educators in the teaching and learning process cannot be separated. Mwariko & Kurniati (2024) also stated the importance of educators in play-based learning activities that can develop the skills and attitudes that lifelong learners must have in the 21st century. In fact, when viewed in the research process, it becomes one of the primary keys to the success of the learning process while playing. Educators play a role even long before the play activities are carried out, starting from the design of play activities such as choosing themes and activities to be carried out (Isro'atin & Fitri 2023). In addition, educators also have a role in preparing learning designs and achievement targets in the learning process through play, even to the extent of choosing the play media to be used in the learning process.

Educators also have a role in accompanying children before the game begins, such as providing examples, giving children the opportunity to observe first before the educator explains the cause and effect so that children can be trained to receive information and process it independently (Armanila & Lubis, 2023). In structured play activities with specific steps, the role of the teacher in the delivery process needs to be considered because, in a study conducted by Isroatin & Fitri (2023), the way educators delivered the steps became a subject for improvement in cycle 1. Brophy (2010) also states that clear instructions that are appropriate for children's development, such as using simple language, consistent routines, and positive expressions, tend to engage children and make them follow directions.

When play activities are carried out, educators also have a role in providing opportunities, support, guidance, and even use varied learning techniques and strategies so that children do not get bored easily (Royani & Suryana, 2023). In the process of learning through play, attention should be given to each child individually because each child has different characteristics and abilities (Armanila & Lubis, 2023). With regard to the attention given to individual children, it is also related to the relationship between educators and children. Hamre & Pianta (2001) state that there is a strong correlation between a warm and responsive relationship and increased child involvement in learning activities. In addition, one of the roles of educators during activities is to maintain a conducive classroom atmosphere (Rabbani et al., 2025). This is also one of the things that educators need to pay attention to because a fun learning process makes children more interested in participating actively.

When the core play activities in the learning process are complete, educators can use simple questions to assess the extent of children's knowledge, and children can also obtain information from their peers. Educators can also provide explanations using simple sentences so that children can recall information from the activities that have been carried out (Armanila & Lubis, 2023). This activity is also known as the 'recalling' process, or an activity that encourages children to remember information, activities, concepts, and experiences that they have previously experienced or learned. In the recalling process at the end of play-based learning in the study by Kadir et al. (2024), educators gave rewards to children who were able to answer the questions asked and asked the children to recount the activities that had been carried out. There are various types of rewards for children, including rewards in the form of achievement stamps (Maulida & Afrianingsih, 2024) or star boards (Alfirdaus & Wahyuni, 2023) that are concrete for early childhood, or verbal rewards in the form of praise or even non-verbal rewards such as body movements and facial expressions (Sidiq & Rohma, 2024). This is also in line with the research by Rabbani, et al., (2025) on physical or non-verbal rewards, which are demonstrated by the satisfied expressions of educators.

Play Media and Play Activities as Learning Tools for Children

Play media are devices or materials used to explore concepts, develop skills, and understand experiences through meaningful play activities (Charlesworth, 2014). Various studies show that the integration of play media in early childhood learning processes is essential to stimulate children's development, especially cognitive aspects. In a study by Aulia & Ilhami (2025), Uno Stacko media was integrated with a focus on symbolic thinking aspects such as recognizing differences, understanding rules, predicting cause and effect, and even grouping based on numbers, colors, and symbols. In other studies, Rabbani et al., 2025; Zosh et al., 2022 integrated construction play media such as blocks, plasticine, or Lego. Puzzle play media has also been proven effective in play-based learning (Fitriyani et al., 2025; Amini et al., 2023). In addition, the use of loose parts media such as beads, buttons, or stones can also help in introducing number concepts to children by grouping, sorting, counting, and connecting patterns (Suraya et al., 2024; Karyadi & Rosa, 2023). Picture flashcards are also an alternative used in learning (Ramlah et al., 2023; Utami 2023). Thus, as long as the media used meets the criteria of being safe, appropriate for the child's development, interesting, and able to facilitate exploration and interaction, it can be adapted and integrated into early childhood learning.

However, not all schools have the same and adequate facilities. Some institutions have limitations in terms of play media or educational toys, as found in research (Ramlah, et al., 2023). This condition can certainly be a focus for policy makers to improve the equitable distribution of play facilities. On the other hand, the use of educational media is not limited to media that must be purchased and made specifically. Mwariko & Kurniati (2024) emphasize that educators can choose various play media such as natural materials found in the environment, recycled materials, blocks, art supplies, digital devices, and even books related to children's interests. Research by Zahro et al. (2025) even provides training to improve the competence of early childhood teachers in developing educational play media based on natural materials such as dry leaves, grains, bamboo, pebbles, and fruit peels. The utilization of these materials is also diverse, including leaf puzzles, dolls made from grains, number toys made from stones and wood, and sensory games made from fruit peels. This approach allows educators to design educational, safe, inexpensive, and environmentally-based play media that still supports a fun learning process despite the limitations of educational play tools.

In addition to play media, play activities can also be integrated into the learning process. Starting from water games studied by Armanila & Lubis (2023) or constructive games studied by Rabbani et al. (2025) to traditional games such as tembak tutus from Central Kalimantan, which are integrated with activities that can stimulate cognitive development and are in line with children's learning characteristics in the study by Aida, et al. (2024). In relation to traditional games, there are around 2,600 types of traditional games in Indonesia, and around 40% are at risk of extinction (Susanti & Nurtania, 2017). Therefore, the integration of traditional games is not only beneficial for stimulating various aspects of development but can also support cultural preservation. In a study conducted by Syaikhu & Napis (2020), they researched traditional Betawi games, which are indigenous to the city of Jakarta and its surroundings. Nasution, et al., (2024) researched the traditional game of Tapo' Pipit (a traditional hide and seek game originating from West Kalimantan), while Pertiwi, et al., (2018) researched the traditional game of engklek, and Susilawati et al., (2021) modified the traditional game of congklak that could improve children's cognitive development. Based on the numerous studies examining the integration of traditional games in stimulating children's cognitive development, it is possible that all games, even traditional games from various regions, can be developed and created into games that sharpen children's development, especially cognitive development, as long as educators have development goals they want to achieve.

4. CONCLUSION

Based on a systematic literature review, children's cognitive development can be stimulated effectively and develop optimally through play-based learning. One of the important keys in the process of learning through play, which is an educational and enjoyable activity, is the role of early childhood educators who can organize and accompany activities so that they are meaningful and stimulate children optimally, especially in terms of their cognitive development. In addition, the use of play media in the learning process and the content of play activity, both modern and traditional, can be modified in accordance with the material or developmental aspects that are to be focused on. The implications that can be implemented by education policymakers are to reinforce that play is the main way of learning in the independent early childhood education curriculum through national campaigns related to play, equal distribution of educational play facilities through central government funds or local government support, the development of play-based learning modules and training for educators, and the inclusion of learning through play material in early childhood teacher education programs. In addition, practical recommendations for teachers include designing play activities and environments that are rich in stimulation, using traditional games and natural materials as play tools, collaborating with other teachers to discuss activity ideas and evaluate the effectiveness of play activities, and involving parents in play activities by providing simple play guidelines that can be done together with their children. Through the research that has been conducted, various literature states that structured play-based learning has a significant impact on children's cognitive development. Therefore, the recommendation for further research is to examine the development of children's cognitive development through free play.

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