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Article

Efforts to Improve Hand-Eye Coordination in Children Aged 4–5 through Sensorimotor Games at PAUD Anak Bangsa Palembang

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*Saniyyah Oktarina, Windi Dwi Andika[ab]
[12]Universitas Sriwijaya, Indonesia
Corresponding Author: windiandika@fkip.unsri.ac.id

ABSTRACT

This study aims to improve hand-eye coordination in 4–5-year-old children through sensorimotor games at PAUD Anak Bangsa Palembang. Using Classroom Action Research (CAR) in two cycles, the first cycle applied meronce and the second used puzzles. The subjects were 12 Group A children. Data were gathered through observation, interviews, and documentation. Results showed improved hand-eye coordination across cycles, with significant progress during puzzle activities. In the first cycle, improvements were visible but still in the early stages. In contrast, the second cycle showed more optimal development. Thus, sensorimotor games like bead-stringing and puzzles effectively enhance hand-eye coordination in early childhood learning activities.

Keywords: *Hand-eye coordination, sensorimotor games, early childhood, meronce, puzzle.*

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INTRODUCTION

Early childhood is a golden period for developing self-potential and various other aspects of development. This period is considered the most critical phase, often referred to as the golden age. It is a crucial time during which a child requires proper stimulation to achieve optimal maturity (Aniyawati, 2024). Hand-eye coordination is one of the key aspects of motor development in early childhood. It involves the ability to synchronize visual movements (eyes) with motor movements (hands) to perform purposeful and targeted activities (Ardini et al., 2023). This skill plays an important role in children's daily lives, such as writing, drawing, and manipulating objects in their surroundings. Good coordination supports cognitive and fine motor development, as well as the child's ability to adapt to their physical and social environments. Therefore, hand-eye coordination should be properly developed and stimulated, especially during early or golden age development (Kamil, 2023). Developing this ability from an early age is an important step in optimizing a child's growth and development.

Motor development, especially hand-eye coordination, is a critical indicator of a child's overall development. It forms the foundation for more complex motor skills and affects a child's success in both academic and non-academic activities. Children aged 4–5 are at a very significant developmental stage, where they begin to engage in more precise activities such as arranging objects, drawing patterns, and learning to write. This period, also referred to as the golden age, requires appropriate stimulation to ensure optimal development.

However, in reality, many young children still experience delays in hand-eye coordination. Some struggle to respond to visual stimuli, fail to properly hold writing tools, and show

uncoordinated movements during fine motor tasks. Based on observations conducted by the researcher at PAUD Anak Bangsa Palembang, it was found that out of 12 children in Class A, several exhibited delays related to hand-eye coordination. This affected their learning concentration and their ability to complete even simple activities.

Given these conditions, a concrete solution is needed to help children improve their coordination skills. According to Asari et al. (2023), early childhood learners tend to think through concrete objects around them, making it easier for them to recall and process the information they receive. One effective method is through sensorimotor games—play-based activities that combine sensory functions (such as vision and hearing) with motor functions (body and muscle movement) (Musyafa'ah & Salim, 2024). Sensorimotor games are believed to effectively stimulate children's motor abilities in a fun and natural way. Children do not feel burdened by structured tasks, but instead actively engage physically and mentally through play. Additionally, these games can help improve a child's focus on specific objects or activities.

Sensorimotor games, including tactile and proprioceptive activities, allow children to sharpen hand-eye coordination through activities involving visual engagement and object manipulation. This approach enables children to more easily absorb information, develop focus, and improve flexibility and movement balance. Therefore, this study aims to explore the extent to which sensorimotor games can be an effective solution in enhancing hand-eye coordination for children aged 4–5 at PAUD Anak Bangsa Palembang and support the optimal development of fine motor skills.

Method

This study used the Classroom Action Research (CAR) model developed by Kemmis and McTaggart, which consists of four stages in each cycle: planning, action, observation, and reflection. CAR helps bridge the gap between theory and practice because it is conducted directly by the teacher in their own classroom, involving their own students and collaborators (Ramadhan & Nadhira, 2022). The research was conducted in two cycles, aiming to improve the hand-eye coordination skills of children through sensorimotor games. The subjects of this research were 12 children aged 4–5 years in Group A at PAUD Anak Bangsa Palembang.

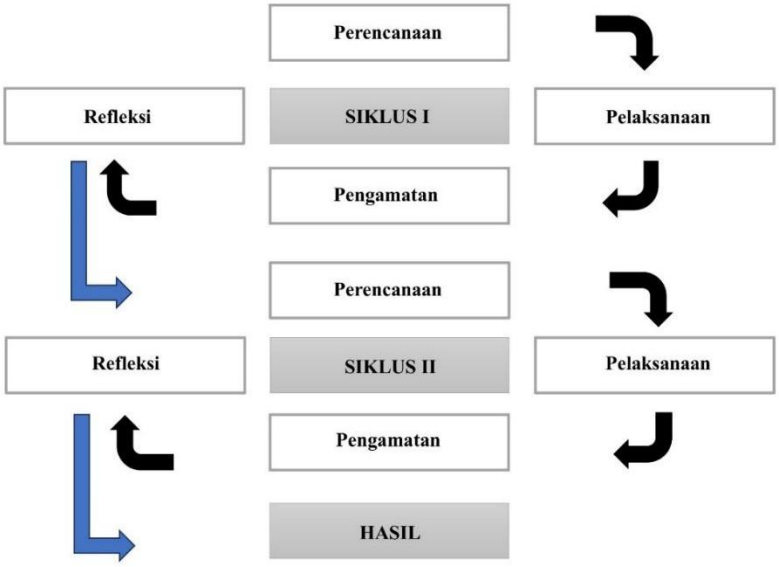

Figure 1 Research Procedure Chart

The types of sensorimotor games used were beading games in cycle I and puzzle games in cycle II. These two games were chosen based on their characteristics, which directly train

coordination between sight and hand movement, while also stimulating sensory and motor functions in an integrated way. To collect data, the researcher employed three techniques: observation to assess each child's activity, interviews to gather needed information, and documentation as supporting evidence for the research (Utomo et al., 2024). The collected data were analyzed using both qualitative and quantitative descriptive methods. Qualitative analysis was used to describe the improvement process in children's hand-eye coordination based on observations, interviews, and field notes. Meanwhile, quantitative analysis was used to compare observation scores between cycles to evaluate the effectiveness of the implemented actions.

FINDINGS AND DISCUSSION

Result

PAUD Anak Bangsa, which served as the research site, can be described as follows: This educational institution is located at Jalan Kadir TKR No. 680 Rt20/Rw06, Kelurahan 36 Ilir, Gandus District, Palembang. The institution has been operating since 2011. The number of actively enrolled students is approximately 55 children, with 6 classroom teachers and 3 classes: Class A (ages 4–5), Class B (ages 5–6), and Class C (ages 5–6). The school also has two playgrounds—one in the front yard and one in the backyard—which are often used for children's morning routines, such as circle time.

Initial Condition (Pre-Cycle)

Based on observations conducted on January 10, 2025, in Class A along with the classroom teachers, Ms. Lela and Ms. Widia, the pre-cycle data for this research was obtained. The findings from observing children's learning and play activities in class showed that their hand-eye coordination skills were still relatively low or underdeveloped. Based on these findings, the researcher decided to conduct classroom action research (CAR) aimed at improving hand-eye coordination skills through sensorimotor games, which are expected to help develop these abilities.

The total number of children who participated as research subjects was 12. The following graph presents the results of the pre-cycle observation of the children's hand-eye coordination.

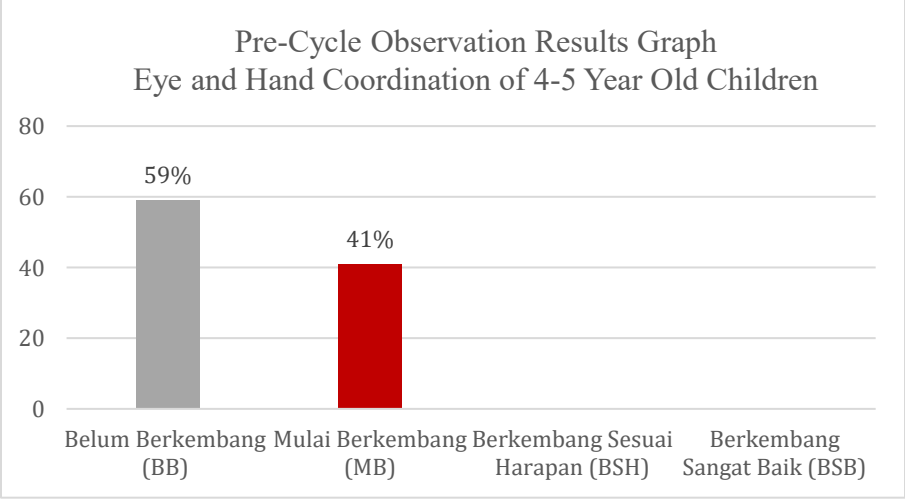

Figure 2. Pre-Cycle Observation Results

Cycle I Results

Planning Phase

Determining the research theme
Preparing the daily learning implementation plan (RPPH)
Providing learning media
Preparing observation sheets
Preparing documentation tools

Implementation Phase

Cycle I – Meeting 1

This meeting was conducted on Monday, January 20, 2025. The activities conducted in this session were as follows:

Opening Activity:

The session began with the children lining up, singing, and praying together under the guidance of the teacher. After entering the classroom, the children prayed again, were greeted by the teacher, and listened to an explanation about the objectives and theme of the lesson. The teacher also read a story related to the theme.

Main Activity:

The children were introduced to beading activities using colorful beads. They were instructed to create animal shapes according to patterns set by the teacher, classify the beads by size, and then bead freely based on their own imagination.

Closing Activity:

At the end of the session, the children were asked to show and submit their beadwork. The teacher documented their work and asked about their feelings and any difficulties they experienced during the beading activity.

Cycle I – Meeting 2

This session was held on Tuesday, January 21, 2025. The activities conducted were as follows:

Opening Activity:

After all the children entered the classroom, the teacher invited them to form a circle, pray together, and then watch an educational video about two-legged animals using a laptop and speakers. The teacher asked the children to sit nicely and focus. After the video, the teacher asked simple questions, which the children enthusiastically answered before starting the main activity.

Main Activity:

The teacher explained the theme and rules of the beading game, this time using beads with pictures of two-legged animals. The children were asked to bead only using beads with such images. Some children were focused and followed instructions well, while others still needed help from the teacher or researcher.

Closing Activity:

The teacher checked each child's beadwork, gave praise in the form of applause, and asked about their feelings after participating. After that, the children sat quietly, prayed together, and got ready to go home.

Cycle I – Meeting 3

This session took place on Wednesday, January 22, 2025. The activities were as follows:

Opening Activity:

The teacher greeted the children, led a prayer, sang an animal-themed song while moving, and then showed animal pictures while discussing their habitats. The children were told that they would do beading of animals according to their habitats.

Main Activity:

The children were observed sample beadwork, then began beading animal images using string. During the activity, the teacher assisted and held light discussions about animal habitats to help train hand-eye coordination and concept understanding.

Closing Activity:

The children showed their beadwork and mentioned the name and habitat of the animal. The teacher conducted a short reflection, and the session ended with a song, prayer, and farewell greeting.

Cycle I – Meeting 4
This session was held on Thursday, January 23, 2025. The activities were as follows:
Opening Activity:

The teacher began by greeting the children and leading a prayer. Then the children sang an animal-themed song while imitating movements. The teacher showed pictures of animals, asked the children to name them and describe their habitats, and then explained that they would be beading animal images according to their habitats.

Main Activity:

The children examined pictures of animals with holes for beading. The teacher demonstrated how to bead, and the children were then given materials to bead independently while having light discussions about the animals' habitats. This activity trained hand-eye coordination and understanding of animal environments.

Closing Activity:

The children showed their beadwork and stated the names and habitats of the animals they made. The teacher encouraged reflection through simple questions, then closed the activity with an animal-themed song, prayer, and farewell.

Cycle I – Meeting 5

This session was held on Friday, January 24, 2025. The activities conducted were as follows:

Opening Activity:

The teacher greeted the children, led a prayer, and created a cheerful atmosphere through singing and a light discussion about pets. The children mentioned their favorite animals, and the teacher showed pictures and related them to the day's activity.

Main Activity:

The children beaded their favorite animal pictures that had been pre-punched, using strings and beads. The teacher gave an example, guided them, and engaged in a light dialogue to enhance hand-eye coordination and build the children's confidence.

Closing Activity:

The children showed their beadwork and said the names of the animals they created. The teacher praised them, conducted a simple reflection, and ended the activity with a prayer, song, and a request to tidy up before going home.

Observation Phase

The researcher conducted observations during the sensorimotor play activities aimed at improving the hand-eye coordination of Class A students. The researcher observed and recorded each child's development using several techniques, such as checklists and documentation. Observations during Cycle I were conducted over five meetings, from Meeting 1 to Meeting 5.

Based on the observations, there was an improvement from the pre-observation stage in the children's hand-eye coordination. The results of Cycle I showed:

4 children (33.3%) were in the "Not Yet Developed" (BB) category.
6 children (50%) were in the "Beginning to Develop" (MB) category.
2 children (16.6%) were in the "Developing as Expected" (BSH) category.
0 children were in the "Very Well Developed" (BSB) category.

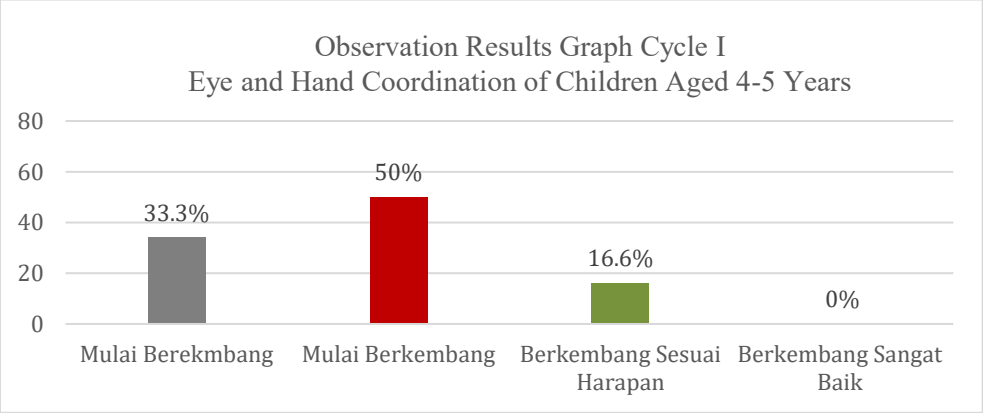

Figure 3. Results of Cycle I Observations

Reflection

During the implementation of Cycle I, several challenges were still identified, such as children having difficulty in coordinating their eye and hand movements in a balanced manner. The children required more attention, precision, and time to complete tasks. In addition, the use of only one type of game repeatedly made the children quickly bored and less interested in learning. To overcome these obstacles, in Cycle II, the researcher planned to use a different and more varied sensorimotor game to maintain the children's enthusiasm and prevent boredom. The chosen game was a puzzle, due to its attractive shapes and colors, which were expected to increase the children's interest and excitement during the activity.

Cycle II Results

Planning Phase

In the planning phase of Cycle II, the researcher developed daily learning activity plans to be implemented from Meeting 1 to Meeting 5. The planning procedures remained the same as those used in Cycle I.

Implementation Phase

Cycle II – Meeting 1

Held on Thursday, January 30, 2025.

Opening Activity:

The teacher introduced the animal theme by showing various animal pictures to the children. The teacher then engaged the children in a brief storytelling session and discussion about different types of animals.

Main Activity:

The teacher immediately invited the children to play with animal-themed puzzles (such as lions, fish, birds, etc.). The children were asked to complete the puzzles by reconstructing incomplete images into full animal pictures of their choice.

Closing Activity:

After the puzzle activity, the teacher asked the children to reflect on what they had done and then concluded the session by summarizing the activity and giving small appreciation rewards to the children.

Cycle II – Meeting 2

Held on Friday, January 31, 2025.

Opening Activity:

The teacher invited the children to watch a video about aquatic animals.

Main Activity:

The teacher prepared puzzles shaped like water-dwelling animals and distributed them to the children, who were then asked to reconstruct the images.

Closing Activity:

The teacher asked the children to identify which aquatic animals they had assembled and praised them for completing the puzzle.

Cycle II – Meeting 3
Held on Monday, February 3, 2025.
Opening Activity:
The teacher prepared puzzle images of flying animals and introduced each animal to the children. The teacher asked the children one by one if they recognized the animal names.
Main Activity:
The children were given various puzzle pieces featuring flying animals. They were invited to choose their favorite animals to assemble. The teacher then asked the children to demonstrate how the animal flies.
Closing Activity:
The teacher posed reflection questions about how the children felt while assembling and mimicking the flying animals. The children were then appreciated with thumbs-up gestures and applause.

Cycle II – Meeting 4
Held on Tuesday, February 4, 2025.
Opening Activity:
The teacher explained the difference between herbivores (plant-eaters) and carnivores (meat-eaters). The teacher then provided animal puzzles categorized by type.
Main Activity:
The children were given several puzzle pairs consisting of various herbivores and carnivores (e.g., rabbits, cows, lions, elephants, tigers). After assembling the puzzles, the children were asked to classify the animals as herbivores or carnivores.
Closing Activity:
The teacher led a short discussion about the differences between these two types of animals and conducted a brief recall session to reinforce the children's understanding. The teacher then gave positive reinforcement to the children.

Cycle II – Meeting 5
Held on Wednesday, February 5, 2025.
Opening Activity:
The teacher invited the children to watch a video about land-dwelling animals. Then, the teacher briefly described their diets and habitats.
Main Activity:
The teacher distributed puzzles with images of land animals (e.g., chickens, cats, rabbits, ants). The children were asked to assemble the puzzles and then imitate the movement or walking styles of the animals together.
Closing Activity:
The teacher gave praise to the children for completing the task well.

Observation Phase

The researcher conducted observations during the sensorimotor play activities aimed at improving the hand-eye coordination of Class A students. The observations involved

documenting each child's development using techniques such as checklists, documentation, and others. Observations in Cycle II were carried out across five sessions, from Meeting 1 to Meeting 5.

The results showed a significant improvement in hand-eye coordination from the pre-observation stage through Cycle II. At the end of Cycle II:

There were no children in the "Not Yet Developed" (BB) or "Beginning to Develop" (MB) categories (0%).
Five children (41.6%) were in the "Developing as Expected" (BSH) category.
Seven children (58.3%) were in the "Very Well Developed" (BSB) category.

The following chart illustrates the data results from Cycle II:

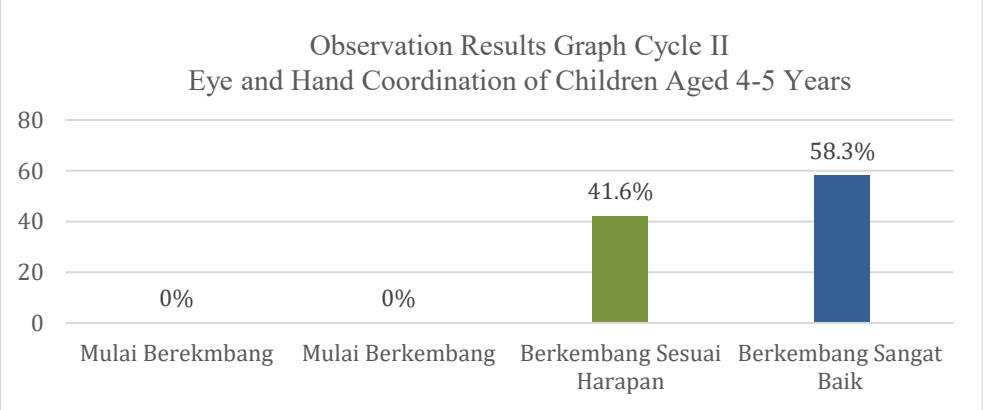

Figure 4. Results of Cycle II Observations

Reflection

After cycle II has been carried out starting from the 1st meeting to the 5th meeting, the researcher made reflection 2 which aims to see how the process of improving eye and hand coordination of class A children. In cycle I and cycle II based on the results obtained in cycle II, efforts to improve eye and hand coordination of class A children experienced a very large increase compared to the first cycle. Most class A children experienced a significant increase in cycle II with eye and hand coordination of 41.6% or 5 children in the category of Developing According to Expectations (BSH) and 58.3% or 7 children in the category of Developing Very Well (BSB). After seeing the results of the research that has been carried out in cycle I and cycle II with improving eye and hand coordination of children through sensorimotor games in class A, it can be seen and has reached a score or indicator of success of at least 80% or 12 children have received the highest score. Seeing the results of the comparison of cycle I and cycle II which showed very rapid results for improving eye and hand coordination of children, this research does not have to be continued.

Table 1. Cycle I Data Results

No	Name	Indicator																Score	%
		Children are able to insert thread or rope into the hole of the bead.				Children are able to quickly and effectively adjust their hand movements when faced with changes or new challenges while stringing.				Children are able to do activities such as stringing beads with the correct pattern.				Children are able to maintain gaze at the object or target consistently while moving their hands, such as inserting thread into a bead hole without losing focus on the object.					
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4		
1	TM		✓			✓						✓			✓			8	50%
2	DN		✓			✓				✓				✓				5	31.25%
3	CA		✓				✓				✓			✓				7	43.75%
4	M			✓			✓				✓				✓			9	56.25%
5	GN	✓				✓					✓				✓			6	37.5%
6	ZK	✓				✓				✓				✓				4	25%
7	ZN	✓				✓				✓								3	18.75%
8	NN		✓				✓				✓					✓		9	56.25%
9	ND		✓			✓				✓				✓				5	31.25%
10	YS		✓			✓						✓			✓			8	50%
11	ZY		✓			✓					✓				✓			7	43.75%
12	AM	✓				✓				✓				✓				4	25%

Based on the results of the observation of the action in cycle I which used the beading game as a learning medium to improve eye and hand coordination in children aged 4-5 years, the results showed that the children's eye and hand coordination ability was still relatively low. Of the 12 children observed, 4 children (33.3%) were in the "Not Developing" (BB) category with an achievement percentage of less than 25%, and 6 children (50%) were in the "Starting to Develop" (MB) category with an achievement percentage between 26% to less than 50%, 2 children (16.6%) were in the "Developing According to Expectations" category with an achievement percentage of less than 75% and 0 children were in the "Developing Very Well" (BSB) category. This shows that most children are just starting to show eye and hand coordination abilities, but have not been able to do so consistently. The obstacles that appear include the lack of accuracy in inserting the thread into the bead hole, not being able to adjust hand movements when facing challenges, and not being able to maintain focus on objects when doing beading activities. Therefore, it is necessary to improve strategies in the next cycle so that child development can be more optimal.

Table 2. Cycle II data results

No	Name	Indicator																Score	%
		Children are able to put puzzle pieces into empty puzzle containers				Children are able to change or switch movements, such as holding one puzzle piece and then holding another puzzle piece.				Children are able to carry out activities and reach objects or targets accurately without missing.				Children are able to maintain their gaze on an object or target consistently while moving their hands, such as when fitting puzzle pieces together, without losing focus or being distracted by the surrounding environment.					
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4		
1	TM				✓			✓				✓				✓		13	81.25%
2	DN				✓				✓				✓		✓			14	87.5%
3	CA			✓				✓				✓				✓		12	75%
4	M				✓			✓					✓		✓			13	81.25%
5	GN			✓					✓			✓			✓			12	75%
6	ZK			✓				✓				✓			✓			11	68.75%
7	ZN			✓				✓					✓			✓		13	81.25%
8	NN				✓		✓					✓				✓		12	75%
9	ND				✓		✓					✓					✓	13	81.25%
10	YS			✓				✓					✓				✓	14	87.5%
11	ZY			✓			✓					✓				✓		11	68.75%
12	AM			✓					✓			✓				✓		13	81.25%

Cycle 2 Results

After corrective actions were taken in cycle II through puzzle games, there was a very significant increase in the development of children's eye and hand coordination. From the observation results, all children experienced a striking increase, with 7 children (58.3%) reaching the "Very Well Developed" (BSB) category with a percentage of ≥ 80%., and 5 children (41.6%) reaching the "Developing According to Expectations" (BSH) category with a percentage between 60% and less than 80%. There were no children who were still in the "Not Yet Developed" (BB) or "Starting to Develop" (MB) categories. Children appeared to be more able to adjust hand movements when faced with changes, showed accuracy in fitting puzzle pieces into place, and were able to maintain focus consistently during the activity. These results indicate that the use of sensorimotor games in the form of puzzles is very effective in improving eye and hand coordination in early childhood.

Overall Results of Cycle I and Cycle II

Table 3. Recap of Students' Overall Scores in Cycle I and Cycle II

No	Child's Name	Cycle I			Cycle II		
		Score	Percentage	Category	Score	Percentage	Category
1	TM	8	50%	MB	13	81.25%	BSB
2	DN	5	31.25%	BB	14	87.5%	BSB
3	CA	7	43.75%	MB	12	75%	BSH
4	M	9	56.25%	MB	13	81.25%	BSB
5	GN	6	37.5%	MB	12	75%	BSH
6	ZK	4	25%	BB	11	68.75%	BSH
7	ZN	3	18.75%	BB	13	81.25%	BSB
8	NN	9	56.25%	MB	12	75%	BSH
9	ND	5	31.25%	BB	13	81.25%	BSB
10	YS	8	50%	MB	14	87.5%	BSB
11	ZY	7	43.75%	MB	11	68.75%	BSH
12	AM	4	25%	BB	13	81.25%	BSB

From the results of the recapitulation of cycle I and cycle II above, it can be concluded that in the research in cycle I obtained results with the category of children at the undeveloped stage (BB) which is 4 children (33.3%), at the beginning of development stage (MB) which is 6 children (50%), at the stage of developing according to expectations (BSH) which is 2 children (16.6%) and developing very well (BSB) which is 0 children (0%). While in cycle II the results obtained were at the stage of children developing very well (BSB) as many as 7 children (58.3%), at the stage of developing according to expectations (BSH) as many as 5 children (41.6%), and at the stage of starting to develop (MB) and not yet developing (BB) which is 0 children (0%). So it can be concluded that, in the application of sensorimotor games, namely beading and puzzle games in an effort to improve eye and hand coordination of children aged 4-5 years at PAUD Anak Bangsa Palembang, it is very effective, this can be seen from the increase in each cycle carried out, in cycle I the child is still at the stage of Not Developing (BB) and Starting to Develop (MB) while in cycle II there is a significant increase, namely the results obtained are that the child is already at the stage of Developing according to Expectations (BSH) and Developing Very Well (BSB).

CONCLUSION

Sensorimotor games have proven effective in improving the eye and hand coordination abilities of children aged 4-5 years at PAUD Anak Bangsa Palembang. In the initial conditions (pre-cycle), most children have difficulty in coordinating eye and hand movements optimally. Through the implementation of the beading game in cycle I, there was an initial increase although it was still limited, namely only 2 children (16.6%) reached the category of Developing According to Expectations (BSH), while the rest were still at the Not Developing (BB) and Starting to Develop (MB) stages. After reflection and improvement of learning strategies, in cycle II a more interesting and challenging puzzle game was implemented. The results showed a very significant increase, where all children (100%) achieved the success indicators with details of 5 children (41.6%) in the BSH category and 7 children (58.3%) achieving Very Good Development (BSB). The increase from cycle I to cycle II reached 83.4%. Thus, the use of sensorimotor games such as beading and puzzles in learning has been proven to be able to develop children's eye and hand coordination optimally and can be used as an alternative learning strategy that is fun, applicable, and appropriate for the developmental stages of early childhood.

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