

Enhancing Gross Motor Skills of Early Childhood Through the Colour Ball Challenge Play Framework

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Abstract

Gross motor skills are a crucial foundation for early childhood development, yet they are frequently marginalized by early academic pressures such as reading, writing, and arithmetic. Objective: This study aims to evaluate the effectiveness of the Colour Ball Challenge Play Framework in enhancing the gross motor skills of young children. Method: Utilizing a Classroom Action Research (CAR) methodology based on the Kemmis and McTaggart model, this study involved 17 children aged 3–4 years (10 boys and 7 girls) at Al Aqsha Integrated Islamic Playgroup Ngadiluwih. Data were collected using a structured observation rubric covering four manipulative movement indicators: holding a ball, throwing to a target, positioning the support leg, and kicking to a target. The data were then analyzed using descriptive comparative analysis across pre-intervention, Cycle I, and Cycle II phases. Findings: The baseline assessment showed a low initial mean score of 8.58, with a classical mastery rate of only 23.53% (4 children). Following the implementation of the colour-based play framework in Cycle I, the mean score improved to 9.53 with a 41.18% mastery rate. After optimizing the visual cues and instructions in Cycle II, children's performance escalated sharply, achieving a mean score of 13.71 and a classical mastery rate of 88.24% (15 children), successfully surpassing the 75% success threshold. Conclusion: The integration of cognitive colour recognition within a structured physical play framework significantly accelerates children's dynamic balance, muscle memory, and focus. This framework serves as an accessible, cost-effective, and playful pedagogical model for early childhood physical education.

Keywords: early childhood, gross motor skills, play framework

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INTRODUCTION

Gross motor development is one of the most crucial foundations in early childhood growth which is often neglected in this modern era (Iverson, 2021). Gross motor skills not only involve coordinating large muscles for physical activities like running, jumping, and throwing, but also serve as a driving force for a child's cognitive and social-emotional development. When children have mature physical abilities, they tend to be more confident in exploring their surroundings and interacting with peers (Hill et al., 2024). Unfortunately, current trends indicate a shift in the focus of early childhood education, which places too much emphasis on academic skills such as reading, writing, and arithmetic from too early an age. These misguided parenting styles and environmental demands have marginalized children's physical and motor skills, even though this golden age is the optimal time to hone their physical skills.

Real-world conditions, particularly in the three to four years old age group, demonstrate a concerning gap in motor skills. Many children still struggle with basic manipulative movements such as holding the ball correctly, aiming a throw, maintaining balance when kicking, and shooting the ball at a designated target (Widiyaswati & Palupi, 2025). These physical challenges often lead to children becoming quickly frustrated, passive, and reluctant to participate in group play activities that require physical dexterity. If left untreated, these issues put children at risk of delayed development of body coordination, which can negatively impact their future health, fitness, and academic performance. Structured stimulation is essential while maintaining the essence of children's play: play in a fun way.

Several previous studies have attempted to address children's motor skills through various conventional play methods, but there is still considerable room for improvement. For example, research by (Aliriad et al., 2023) confirmed that outdoor physical activity can stimulate children's general body flexibility, while (Virianingsih et al., 2021) emphasizes the use of a two-sided maze educational game tool to train static balance in early childhood. study from (Buahana & Suparno, 2022) found that traditional games were effective in increasing running speed, then (Harahap et al., 2025) using rhythmic gymnastics methods to improve children's overall motor coordination, as well as research by (Safitri et al., 2025) demonstrated that a simple game of catch can stimulate children's arm muscle strength. While these five studies provide valuable contributions to the physical education literature, most of the interventions offered are general, poorly structured, and fail to integrate strong visual stimulation with gradual motor challenges to sustain children's interest.

Most previous research tends to separate gross motor stimulation from cognitive stimulation, as if the two aspects of development operate on separate paths. Existing games often feel monotonous for three- to four-year-olds because they lack clear stages of challenge or visual reward schemes that engage their attention. As a result, children's attention spans are very short, and the effectiveness of these physical interventions is less than optimal in the long term. There are not many activity formulas that intentionally combine elements of color recognition, physical dexterity, and varying levels of difficulty within a cohesive play ecosystem for early childhood.

From the perspective of Islamic education, the development of gross motor skills during early childhood is closely related to the concept of physical strength (*quwwah al-jasad*) as an essential component of holistic human development. Islam encourages every Muslim to maintain physical health because a healthy and strong body enables individuals to perform acts of worship, fulfill social responsibilities, and carry out daily activities effectively. Therefore, structured physical play should not be regarded solely as an educational strategy for improving motor competence but also as an effort to cultivate children's awareness that their bodies are an amanah entrusted by Allah and should be maintained responsibly. This perspective is consistent with the authentic hadith narrated by Imam Muslim in which the Prophet Muhammad Saw, stated, "The strong believer is better and more beloved to Allah than the weak believer, although there is goodness in both." Through activities that strengthen balance, coordination, muscular control, and physical endurance, children are gradually prepared to become healthy, independent, and capable of fulfilling both their religious and social responsibilities in the future.

The Islamic perspective on physical development is further reinforced by the Qur'anic emphasis on observing and reflecting upon the signs of Allah's creation. Integrating color recognition into movement-based learning activities provides children with opportunities to develop not only their cognitive and motor abilities but also their appreciation of the diversity and beauty of Allah's creation. Allah states in Surah An-Nahl verse 13:

وما ذرأ لكم في الأرض مختلفا ألوانه إن في ذلك لآية لقوم يذكرون

"And whatever He has created for you on the earth of varying colors. Indeed, in that is a sign for people who take heed."

Similarly, Allah says in Surah Fatir verse 27:

ألم تر أن الله أنزل من السماء ماء فأخرجنا به ثمرات مختلفا ألوانها ومن الجبال جدد بيض وحمر مختلف ألوانها وغرايب سود

"Do you not see that Allah sends down rain from the sky, and thereby We produce fruits of varying colors? And among the mountains are streaks white and red of varying shades, and others intensely black."

These verses emphasize that the diversity of colors found in nature represents one of Allah's signs intended to inspire reflection, gratitude, and recognition of His wisdom. Consequently, learning activities involving the identification, sorting, and matching of colorful balls extend beyond improving visual-spatial perception, eye-hand coordination, and cognitive processing. Such activities also provide meaningful opportunities for children to appreciate the harmony, order, and beauty embedded in Allah's creation from an early age. In this way, physical play becomes a holistic educational approach that integrates

motor development, cognitive growth, character formation, and the internalization of Islamic values within meaningful learning experiences.

This research introduces a novelty called the Color Ball Challenge Play Framework. The framework's novelty lies in its intervention design, which integrates cognitive aspects of color recognition with four gross motor indicators that are measured in a structured, gradual manner. Through this framework, children are not simply engaged in aimless physical activity but are instead faced with visual challenges that stimulate the brain to coordinate with the body's limbs. This approach transforms typically boring physical exercise activities into interactive visual adventures for children. This method offers a new, more holistic way of viewing and training gross motor development in early childhood.

The application of the color concept in this ball challenge is based on the psychological characteristics of three- to four-year-old children, who are highly responsive to bright visual stimulation. Contrasting colors like red, yellow, and blue serve not only as aesthetic appeal but also as concentration aids for children (Setyowulan & Aaqilah, 2025). When children are asked to pick up and manipulate balls of a specific color, their attention is focused on that object, reducing distractions from the surrounding environment. This mental process directly trains eye, hand, and foot coordination as they prepare for the next physical action. This integration of color elements is a key catalyst in accelerating children's understanding of the game instructions given by the teacher.

This play framework breaks down motor activity into more specific, clearly observable movement components. The first component is the ability to hold a ball with the correct finger position to develop a child's grip strength. The second component focuses on the ability to throw a ball toward a specific target, which trains distance estimation and arm muscle strength. The third component measures the correct placement of the supporting foot as the child prepares to kick to maintain balance. The final component is the ability to kick the ball accurately toward the target, which trains leg muscle strength and the accuracy of the child's manipulative movements.

This research is also closely related to providing practical guidance for early childhood educators and parents at home. Often, teachers in schools feel at a loss for ideas for creating educational physical games that are both affordable and easy to implement. The Color Ball Challenge Play Framework presents an applicable solution that does not require expensive or complicated equipment, but instead leverages the creativity of using colored plastic balls as a medium. By understanding the structure of this play framework, teachers can easily replicate and modify the game to suit the specific needs of their classes. This is expected to improve the quality of physical motor learning in various early childhood education institutions widely.

This study also presents scientific evidence regarding the effectiveness of using the Color Ball Challenge Play Framework in improving children's gross motor skills. Through the presentation of comprehensive quantitative data from pre-action to the final cycle, this study aims to demonstrate that appropriate stimulation can bring about very significant changes in children's physical abilities. Furthermore, this study is expected to open new perspectives in the world of international early childhood education regarding the importance of

designing physical games based on an integrated framework. This research is expected to be able to provide meaningful theoretical and practical contributions to the development of early childhood education curricula in the future.

METHOD

This study employed a Classroom Action Research model following the spiral design by Kemmis and McTaggart, which involved seventeen children aged three to four years at Al Aqsha Integrated Islamic Playgroup Ngadiluwih, Kediri Regency, across two full cycles of planning, acting, observing, and reflecting. In Cycle I, the intervention focused on introducing the basic gameplay of the Colour Ball Challenge, where children picked up plastic balls, identified primary colors (red, yellow, and blue), ran along a path, and threw or placed them into matching baskets, alongside kicking static balls toward color target zones under continuous verbal prompts and physical guidance from the teacher. To address the balance instability during kicking and scattered attention during throwing observed in Cycle I, Cycle II optimized the framework by placing bright footprint stickers on the floor right next to the balls to give children a clear visual guide for supporting foot placement before kicking, while also adding color-coded boundary lines and enlarged target baskets to aid distance estimation, while teacher verbal prompts were gradually reduced to foster movement independence. To maintain high data validity and reliability throughout the observations, a robust triangulation strategy was applied by combining quantitative observation rubrics with qualitative reflective journals and video recordings (method triangulation), cross-checking observational assessment scores between the lead teacher and a peer co-observer (source triangulation), and conducting independent scoring checks using a standardized four-point rating scale to eliminate evaluator bias (investigator triangulation).

RESULTS

Pre-Intervention Baseline Assessment

The initial or pre-action assessment is a crucial step taken by researchers to map the actual condition of children's gross motor skills before the intervention is implemented. This activity was carried out at the Al Aqsha Integrated Islamic Playgroup Ngadiluwih and involved all 17 research subjects, consisting of 10 boys and 7 girls. In-depth observations were conducted during daily physical activities to assess how the children manipulated objects such as balls in several basic movements. Through this process, researchers were able to identify the main obstacles faced by children aged three to four years in terms of physical coordination. The data collected at this stage serves as an important baseline for measuring the effectiveness of the play framework that will be tested later.

Based on the recapitulation of data obtained during the pre-cycle, it was found that the gross motor skills of most children were still in the "Not Yet Developed" (NYD) and "Beginning to Develop" (BD) categories. Cumulatively, the average gross motor performance score for children overall only reached 8.58. This low average value reflects that the physical stimulation received by children

previously did not specifically and structuredly address aspects of manipulative movement. Children appeared awkward and lacked confidence when asked to perform physical activities that require accurate hand and foot movements. This objective condition underlies the need for an update to learning methods through a more engaging and measurable game framework.

Classical learning completion in the pre-action phase also showed figures that were still far from the ideal target for class success. Of the 17 students observed, only 4 children managed to achieve the completion criteria with the categories of “Developing as Expected” (DAE) or “Developing Very Well” (DPW). When converted into a percentage, the classical completion rate in this pre-cycle only reached 23.53%. This means that approximately 76.47%, or 13 children, have not been able to master basic gross motor skills properly. This low completion rate is an alarm for educators to immediately change physical motor learning strategies in the classroom.

To provide a more detailed picture of the distribution of values and abilities of each child at the pre-action stage, the following table presents the results of the initial assessment which includes four main indicators of gross motor development.

Table 1. Recapitulation of Children's Gross Motor Assessment Scores

No	Child's Name (Initials)	Holding the Ball	Throwing at the Target	Supporting Foot Position	Kick to Target	Total Score	Category	Completeness
1	Child 1	2	2	2	1	7	BD	Not yet finished
2	Child 2	3	2	2	2	9	BD	Not yet finished
3	Child 3	2	1	2	1	6	NYD	Not yet finished
4	Child 4	3	3	3	2	11	DAE	Completed
5	Child 5	2	2	1	1	6	NYD	Not yet finished
6	Child 6	2	2	2	2	8	BD	Not yet finished
7	Child 7	3	3	2	3	11	DAE	Completed
8	Child 8	2	1	1	1	5	NYD	Not yet finished
9	Child 9	3	2	2	2	9	BD	Not yet finished
10	Child 10	2	2	2	1	7	BD	Not yet finished
11	Child 11	4	3	3	3	13	DPW	Completed
12	Child 12	2	2	2	2	8	BD	Not yet finished
13	Child 13	2	2	1	1	6	NYD	Not yet finished
14	Child 14	3	2	2	2	9	BD	Not yet finished
15	Child 15	2	2	2	1	7	BD	Not yet finished
16	Child 16	3	3	3	2	11	DAE	Completed
17	Child 17	2	2	2	1	7	BD	Not yet finished
Average		2.41	2.00	2.00	1.53	8.58	BD	23.53%

Scoring Scale Description: 1 = “Not Yet Developed” (NYD), 2 = “Beginning to Develop” (BD), 3 = “Developing as Expected” (DAE), 4 = “Developing Very Well” (DPW). A child is considered complete if they achieve a minimum total score of 11 (DAE Category).

In the pre-cycle stage, children's gross motor skills in the manipulative movement aspect are still in the Beginning to Develop category. The ball holding indicator obtained the highest average score of 2.41, which indicates that some children are able to hold the ball quite well, although the strength and stability of their grip still need to be improved. Meanwhile, the indicators for throwing the ball

towards the target and placing the supporting foot each obtained an average score of 2.00. These results indicate that children still experience difficulties in coordinating body movements, estimating the distance to the target, and maintaining balance during physical activities. A lower condition is seen in the indicator for kicking the ball towards the target with an average score of 1.53, which indicates that the child's eye-foot coordination, kicking direction accuracy, and leg muscle strength have not developed optimally.

The low achievement across all indicators is influenced by various factors, such as children's short attention spans, a lack of engaging visual media, and limited understanding of teacher instructions. As a result, children tend to lose focus easily and are unable to perform manipulative movements accurately and purposefully. Assessment results show that the classical completion rate only reached 23.53%, meaning that most children have not met the expected developmental criteria. These findings indicate a gap between children's gross motor skills and established developmental standards. More engaging, structured, and appropriate learning interventions tailored to the characteristics of early childhood are urgently needed, one of which is through the implementation of the Color Ball Challenge Play Framework to optimally improve the ability to hold, throw, support, and kick a ball.

Physical and Cognitive Adaptations in Cycle I

The implementation of the action in Cycle I was the initial stage in which the Color Ball Challenge Play Framework was officially introduced to 17 children at Al Aqsha Integrated Islamic Playgroup Ngadiluwih. This step was taken as a direct response to the low gross motor achievement of children found in the initial pre-action assessment stage. In this first cycle, the teacher's main focus was training children to adapt by combining their cognitive responses to color with directed manipulative physical movements. Children were no longer simply throwing or kicking the ball freely, but had to follow color-based challenge instructions that required higher concentration. This transition process from conventional to structured methods triggered a dynamic of adaptation that was very interesting to observe, both in terms of physical readiness and mental development of children.

Based on data collected during Cycle I, children's gross motor skills generally began to improve in a positive direction. The average gross motor skill score for children classically increased from 8.58 in the pre-cycle to 9.53. This increase in average scores demonstrates that the visual stimulation of brightly colored plastic balls successfully stimulated children's active involvement in movement. Although the increase in scores was not yet significant, the upward trend indicates that children's physical foundations are beginning to respond well to structured play interventions. This adaptation process serves as an important bridge for children to build their confidence in the play area.

In line with the increase in the average score, the children's learning completion rate in the classroom also showed an encouraging development. Of the 17 students who participated in the intervention, the number of children who successfully achieved the minimum category of Developing as Expected (DAE) increased to 7. As a percentage, the classroom completion rate in Cycle I has

reached 41.18%, a significant increase from the initial percentage of only 23.53%. This result is stated to have not met the agreed target class success indicator, which is a minimum of 75% of the total number of children. There are still around 58.82% or as many as 10 children who require more intensive guidance because they are still in the initial adaptation phase.

To provide a comprehensive quantitative data overview regarding the performance achievements of each child in this first cycle, the researcher presents a table of Cycle I assessment results as follows:

Table 2. The Results of the Cycle I Assessment

No	Child's Name (Initials)	Holding the Ball	Throwing at the Target	Supporting Foot Position	Kick to Target	Total Score	Category	Completeness
1	Child 1	3	2	2	2	9	BD	Not yet finished
2	Child 2	3	3	2	2	10	BD	Not yet finished
3	Child 3	2	2	2	1	7	BD	Not yet finished
4	Child 4	3	3	3	3	12	DAE	Completed
5	Child 5	3	2	2	1	8	BD	Not yet finished
6	Child 6	3	2	2	2	9	BD	Not yet finished
7	Child 7	3	3	3	3	12	DAE	Completed
8	Child 8	2	2	1	1	6	BB	Not yet finished
9	Child 9	3	3	2	2	10	BD	Not yet finished
10	Child 10	2	2	2	2	8	BD	Not yet finished
11	Child 11	4	4	3	3	14	BSB	Completed
12	Child 12	3	2	2	2	9	BD	Not yet finished
13	Child 13	2	2	2	1	7	BD	Not yet finished
14	Child 14	3	3	3	2	11	DAE	Completed
15	Child 15	3	2	2	2	9	BD	Not yet finished
16	Child 16	3	3	3	3	12	DAE	Completed
17	Child 17	3	2	2	2	9	BD	Not yet finished
Average		2.82	2.47	2.24	2.00	9.53	BD	41.18%

Scoring Scale Description: 1 = Not Yet Developed (NYD), 2 = "Beginning to Develop" (BD), 3 = Developing as Expected (DAE), 4 = Developing Very Well (DVW). A child is considered complete if they achieve a minimum total score of 11 (DAE Category).

In Cycle I, children's gross motor skills began to show improvement across all manipulative movement indicators. The ball-holding indicator experienced the greatest improvement, with an average score increasing from 2.41 to 2.82, indicating that children were beginning to be able to grip the ball more firmly and stably. The ability to throw the ball at the target also increased to 2.47 due to the color stimulation on the target basket, which helped children focus and direct the throw with more control. Meanwhile, the ability to position the supporting foot reached an average score of 2.24, although some children still had difficulty maintaining body balance when preparing to kick the ball. In the indicator of kicking the ball at the target, the average score increased to 2.00, but this aspect remains the biggest challenge because children's eye-foot coordination and kicking power have not yet developed optimally.

Despite improvements in all indicators, various obstacles were still encountered during the implementation of Cycle I. Some children did not fully understand the rules of the game and therefore rushed through movements

without paying attention to the color instructions given by the teacher. Children's relatively short concentration also led to errors in selecting targets and executing movements correctly. In addition, understanding of the position of the supporting foot still needed reinforcement through visual aids and more concrete demonstrations. The evaluation results showed that classical completeness only reached 41.18%, so the research success target of 75% had not been achieved. The findings in Cycle I became an important basis for making improvements in Cycle II by refining media, instructions, and learning strategies so that children's gross motor development could increase more optimally.

Optimization and Significant Growth in Cycle II

The implementation of actions in Cycle II is a crucial stage specifically designed to optimize intervention results and address various adaptation obstacles that emerged in the previous cycle. Based on the results of reflections on Cycle I, researchers and teachers made tactical modifications to the components of the Color Ball Challenge Play Framework by clarifying visual boundaries on the floor using more contrasting colors and simplifying verbal instructions to make them more easily understood by children aged three to four years. Children at Al Aqsha Integrated Islamic Playgroup Ngadiluwih are now invited to re-engage in the color ball challenge in a much more conducive and motivating play atmosphere. The focus of improvements is focused on strengthening children's dynamic body balance and increasing the accuracy of throwing and kicking directions towards the designated targets. The results of these strategic adjustments trigger an extraordinary developmental leap, both in physical motor maturity and cognitive agility in children in processing game commands.

Through intensive data collection during Cycle II, children's gross motor performance generally showed a very sharp and significant growth graph. The average classical gross motor ability score of children jumped significantly from 9.53 in Cycle I to 13.71. This drastic increase in scores is empirical evidence that modified visual instructions and repeated fun game challenges effectively build children's muscle memory. Children no longer appear awkward or hesitant in moving their limbs when manipulating colored plastic balls. This very consistent increase in average scores confirms that the optimized framework has successfully stimulated children's physical potential to the maximum.

The most encouraging leap in this second cycle was clearly visible in the level of children's learning completion in the classroom, of the 17 students who participated in the entire series of actions, the number of children who successfully reached the minimum category of Developing as Expected (DAE) jumped drastically to 15 children. When converted into a percentage, the classical completion rate in this second cycle has successfully reached 88.24%. This brilliant achievement automatically exceeded the previously set class success indicator target of 75%. With only two children remaining in the "Beginning to Develop" (BD) category, this classroom action research was officially declared successful and the intervention cycle could be stopped.

In order to present quantitative data in a complete and transparent manner regarding the extraordinary achievements of each child at the end of the second

cycle, the researcher compiled a table of the results of the Cycle II assessment as follows:

Table 3. The Results of the Cycle II Assessment

No	Child's Name (Initials)	Holding the Ball	Throwing at the Target	Supporting Foot Position	Kick to Target	Total Score	Category	Completeness
1	Child 1	4	3	4	3	14	BSB	Completed
2	Child 2	4	4	3	3	14	BSB	Completed
3	Child 3	3	3	3	2	11	DAE	Completed
4	Child 4	4	4	4	4	16	BSB	Completed
5	Child 5	3	3	3	2	11	DAE	Completed
6	Child 6	4	3	3	3	13	BSB	Completed
7	Child 7	4	4	4	4	16	BSB	Completed
8	Child 8	3	2	2	2	9	BD	Not yet finished
9	Child 9	4	4	3	3	14	BSB	Completed
10	Child 10	3	3	3	2	11	DAE	Completed
11	Child 11	4	4	4	4	16	BSB	Completed
12	Child 12	4	3	4	3	14	BSB	Completed
13	Child 13	3	3	2	2	10	BD	Not yet finished
14	Child 14	4	4	4	3	15	BSB	Completed
15	Child 15	4	3	3	3	13	BSB	Completed
16	Child 16	4	4	4	4	16	BSB	Completed
17	Child 17	4	3	3	3	13	BSB	Completed
Average		3.71	3.35	3.35	3.00	13.71	BSB	88.24%

Scoring Scale Description: 1 = Not Yet Developed (NYD), 2 = "Beginning to Develop" (BD), 3 = Developing as Expected (DAE), 4 = Developing Very Well (DVW). A child is considered complete if they achieve a minimum total score of 11 (DAE Category).

In Cycle II, children's gross motor skills experienced a very significant increase in all manipulative movement indicators. The ball holding indicator achieved the highest average score of 3.71 with the Developing Very Well category, indicating that children were able to grip the ball firmly and stably without experiencing difficulties like in the previous stage. Improvement also occurred in the indicator of throwing the ball towards the target which obtained an average score of 3.35. This success was supported by the use of clearer colored targets that helped children develop more optimal eye-hand coordination. In addition, the ability to control the power and direction of the throw improved so that children could throw the ball more precisely and consistently.

Similar developments were seen in the indicator for placing the supporting foot, which achieved an average score of 3.35, and the indicator for kicking the ball towards the target, which increased to a score of 3.00. Children have been able to maintain body balance, place the supporting foot correctly, and perform more targeted kicks thanks to the use of visual media and colorful mini goals that attract their attention. This success is supported by increased self-confidence, motivation, and understanding of the children's understanding of the rules of the Color Ball Challenge Play Framework game. Overall, classical completion reached 88.24%, indicating that most children have achieved the expected development criteria. These results prove that the Color Ball Challenge Play Framework is effective in improving gross motor skills in early childhood and is

suitable for implementation as a fun, structured learning alternative that is appropriate to children's developmental characteristics.

Comparative Analysis of Gross Motor Indicators

Comparative analysis between cycles is crucial for detailing how each manipulative movement indicator develops from the initial to the final stage of the intervention. Through this systematic comparison, researchers can identify which gross motor skills accelerate most rapidly and which require more time to adapt in children aged three to four years. The 17 children at the Al Aqsha Integrated Islamic Kindergarten Ngadiluwih showed diverse physical responses to each challenge presented in the Color Ball Challenge Play Framework. This physical development does not occur instantly or uniformly, but rather gradually according to the level of complexity of the neuromuscular coordination required by each movement. A thorough evaluation of the four key indicators holding the ball, throwing at the target, positioning the supporting foot, and kicking at the target provides a comprehensive scientific picture of the effectiveness of this color-based play framework.

All gross motor indicators experienced a very positive and consistent upward trend in each cycle of action. From a rather concerning initial pre-action condition with an average total class score of only 8.58, the score crept up to 9.53 in Cycle I, and finally exploded to 13.71 at the end of Cycle II. This growth pattern indicates that the conditioning of a structured play environment successfully stimulates children's motor functions sustainably. Each indicator supports one another in forming a complete and harmonious unity of manipulative movement in children. The success of this value transition is clear evidence that dynamic interventions based on classroom action can bring about significant changes in the physical dexterity of early childhood.

To provide comparative, transparent, and easy to understand data visualization regarding the development of each aspect of the movement from the pre-cycle to Cycle II, the researcher presents a summary table of the average scores per indicator as follows:

Table 4. Comparison of Average Gross Motor Scores from Pre-Cycle to Cycle II

No	Gross Motor Indicators	Average Pre-Cycle Score	Average Cycle I Score	Average Score of Cycle II	Total Score Increase	Final Category
1	Holding the Ball	2.41	2.82	3.71	+1.30	Developing Very Well (DVW)
2	Throwing the Ball at the Target	2.00	2.47	3.35	+1.35	Developing Very Well (DVW)
3	Positioning the Support Foot	2.00	2.24	3.35	+1.35	Developing Very Well (DVW)
4	Kicking the Ball to the Target	1.53	2.00	3.00	+1.47	Developing as Expected (DAE)
Accumulative Average		8.58	9.53	13.71	+5.13	Developing Very Well (DVW)

The assessment scale uses a range of 1 to 4 (1 = NYD, 2 = BD, 3 = DAE, 4 = DVW). The score is obtained from the average performance of 17 children at the end of each stage of the action cycle.

When analyzed comparatively, all indicators of children's gross motor skills showed significant improvement from pre-cycle to Cycle II. The indicator of holding a ball was the most consistent skill with the highest score, increasing from 2.41 in pre-cycle to 3.71 in Cycle II. This improvement occurred because the activity of holding is a skill that is familiar to children in everyday life and is therefore easier to develop through play. The indicator of throwing a ball towards a target also experienced a good improvement, from 2.00 to 3.35, especially after the use of clearer and more attractive colored targets in Cycle II. In addition, the ability to position the supporting foot increased from 2.00 to 3.35 after the addition of visual markers in the form of the sole of the foot that helps children maintain body balance while performing movements.

The greatest improvement occurred in the indicator of kicking the ball towards the target, which rose from 1.53 in the pre-cycle to 3.00 in Cycle II. Despite having a lower final score compared to other indicators, the kicking aspect showed the highest rate of development, thus proving the effectiveness of the intervention provided. Overall, the results of the study indicate a change in children's development from the category of Beginning to Develop Very Well. Children are not only able to perform movements separately, but can also integrate the skills of holding, throwing, supporting, and kicking in a series of coordinated activities. These findings confirm that the implementation of the Color Ball Challenge Play Framework is effective in improving gross motor skills in early childhood and can be an alternative learning strategy that is interesting, varied, and appropriate to the characteristics of children's development.

DISCUSSION

This study investigated how playing with colorful balls could enhance young children's physical movement skills. Over two cycles of classroom action research, a clear positive improvement was observed. At baseline, only four out of seventeen children met the mastery criterion. Following Cycle I, nearly half the participants showed improved muscular control, and by the end of Cycle II, fifteen children (88.24%) had met the assessment criteria. These findings are consistent with Safitri et al. (2025), who demonstrated that ball games significantly stimulate arm muscle strength, and with Widiyaswati and Palupi (2025), who confirmed that throwing and catching small balls enhances manipulative movement abilities. The results also corroborate Ayuni et al. (2025), who found that play-based methods increase learning interest among children aged three to five, reinforcing that structured play is a powerful vehicle for holistic development.

The gradual improvement can be explained through Piaget's preoperational stage, wherein children aged three to four learn most effectively through active movement and interaction with concrete objects (Pakpahan & Saragih, 2022). When children hold and throw brightly colored balls, cognitive processing and muscular coordination occur simultaneously, aligning with Gehlot's (2021) Zone of Proximal Development, whereby children advance from assisted to

independent performance through scaffolded interaction. The teacher initially provided clear demonstrations and gradually reduced assistance as competence increased, mirroring Hayati et al.'s (2024) finding that edutainment-based learning effectively combines enjoyment with structured guidance.

Upper-body motor skills, particularly holding and throwing, showed consistent progress. Children gain control over proximal muscles before refining distal control, a proximodistal pattern documented by Iverson (2021). Because the colorful balls were small and lightweight, daily practice progressively strengthened hand muscles, enabling greater throwing accuracy. This trajectory is supported by Safitri et al. (2025) and Utami et al. (2025), who confirmed that repetitive manipulative tasks and sociocultural-based games produce measurable gains in throwing accuracy and hand-eye coordination.

The bright colors of balls and target baskets also facilitated performance. Red, yellow, and blue maintained children's visual attention throughout sessions, and when a child focused on a colored basket, the brain automatically estimated distance and force. Mourin et al. (2024) concluded that contrasting hues serve as powerful attentional anchors, while Setyowulan and Aaqilah (2025) emphasized that vivid visual design enhances concentration and reduces distractions. The present findings extend these conclusions by demonstrating that color cues function not merely as attentional devices but also as spatial reference points guiding throwing biomechanics.

Lower-limb activities, particularly kicking, were considerably more difficult. Kicking requires balancing on one leg while swinging the other, a substantial challenge for three-year-olds whose higher center of gravity and underdeveloped core muscles limit postural stability. Virianingsih et al. (2021) noted that balance remains among the most challenging motor competencies for young children, and Harahap et al. (2025) reported that tasks requiring continuous postural adjustment demand extended practice before stable coordination emerges. Consequently, kicking received the lowest baseline score (mean = 1.53). To address this, brightly colored footprint stickers were introduced in Cycle II as visual markers for correct foot placement. By stepping on designated footprints, children maintained better postural stability. This strategy aligns with Rahmawati et al. (2025), who developed sensory-based media to stimulate multiple channels simultaneously, and with Buahana and Suparno (2022), who demonstrated that structured games with clear spatial boundaries reduce cognitive uncertainty during movement.

Although kicking was the most difficult skill, it demonstrated the greatest improvement (+1.47, from 1.53 to 3.00). Initially, children were hesitant to swing their legs forcefully due to fear of falling. Once visual footprint markers provided stable reference points, confidence increased rapidly. Aliriad et al. (2023) confirmed that progressive challenge levels effectively stimulate body flexibility and coordination, while the present results extend Widiyaswati and Palupi (2025) by showing that color-coded visual cues accelerate lower-limb skill acquisition beyond what unstructured play achieves alone.

Despite overall success, two children (Child 8 and Child 13) did not reach mastery by Cycle II, remaining in the Beginning to Develop category. Iverson (2021) argued that developmental variability is normative rather than indicative of

deficiency, and Hill et al. (2024) emphasized that motor competence develops along heterogeneous trajectories moderated by individual differences. Child 8's primary difficulty was low muscle tone and delayed motor planning, requiring sustained physical assistance throughout activities. This pattern is consistent with Rahmania et al. (2023), who reported that children with developmental barriers require individualized graded-resistance interventions, and resonates with Gehlot's (2021) assertion that children with delayed motor planning benefit most from sustained adult-mediated scaffolding. Child 13's challenge was primarily attentional; the child was easily distracted and frequently kicked randomly without focusing on targets. Mufidah and Fachrurrazi (2025) found that concentration difficulties significantly impede sequential motor task acquisition, and Mourin et al. (2024) noted that environmental overstimulation adversely affects task persistence.

For future support, Child 8 would benefit from daily light-resistance activities such as squeezing foam balls or crawling through tunnels (Rahmawati et al., 2025), while Child 13 would benefit from smaller-group settings with fewer sensory distractions and simplified sequential instructions (Mufidah & Fachrurrazi, 2025). Norlaila and Hermina (2025) emphasized that classroom action research should address individual learning needs through differentiated strategies alongside documenting collective progress.

In conclusion, playing with colorful balls represents an effective strategy for promoting gross motor development. The positive emotional experiences generated during play contribute to neural connections supporting motor control (Hill et al., 2024), while developmental progress varies across individuals (Iverson, 2021). The Colour Ball Challenge Play Framework, integrating cognitive color recognition with structured physical challenges, offers a cost-effective, accessible, and pedagogically sound model aligned with the recommendations of Aliriad et al. (2023) and Utami et al. (2025) for designing manipulative movement activities that are stimulating, inclusive, and developmentally appropriate.

CONCLUSION

The implementation of the Color Ball Challenge Play Framework has proven highly effective in significantly boosting the gross motor skills of early childhood. Empirical evidence shows a drastic increase in the level of classical mastery of children, which was initially only 23.53% in the initial pre-action assessment stage, creeping up to 41.18% in Cycle I, and finally reaching a brilliant figure of 88.24% at the end of the Cycle II assessment. This improvement in the quality of manipulative movements occurred comprehensively across the four main indicators measured, which included dexterity in holding the ball, accuracy in throwing the ball towards the target, stability in placing the supporting foot position, and strength in directing the ball kick towards the target. The mature integration between cognitive stimulation based on recognizing contrasting colors and structured physical exercise activities can extend children's attention spans, foster solid muscle memory, and transform the classroom atmosphere into an

interactive learning ecosystem centered on fulfilling children's natural instinct to play.

Based on the success of these scientific findings, several applicable recommendations are proposed for the advancement of early childhood education in the future. For early childhood educators, it is recommended to start adopting and replicating the Color Ball Challenge Play Framework model as an alternative to learning physical motor skills that is innovative, child-friendly, and affordable because it uses plastic balls that are easily found every day. For managers of early childhood education institutions or school principals, it is hoped that they can facilitate teacher creativity by providing a more varied space and visual aids to support the stimulation of children's dynamic body balance on an ongoing basis.

To ensure the practical sustainability and broader educational relevance of the Colour Ball Challenge Play Framework, two concrete implementation strategies are recommended. First, this framework can be seamlessly integrated into the early childhood Kurikulum Merdeka Belajar (Independent Learning Curriculum) as part of daily motor-sensory warming-up routines or within Proyek Penguatan Profil Pelajar Pancasila (P5) learning modules under themes such as "Aku Sayang Bumi" or "Kita Semua Bersaudara", providing teachers with a structured yet adaptable play-based physical education tool. Second, to accommodate children with special needs specifically those on the hyperactive spectrum or with Attention-Deficit/Hyperactivity Disorder (ADHD) the framework can be modified by breaking activities into short three-to-five-minute high-intensity interval play sessions, utilizing textured floor mats or weighted balls to deliver grounding tactile-proprioceptive sensory feedback, and employing simple single-step visual cue cards to prevent cognitive overload and maintain task engagement.

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