



Improvement of Gross Motor Skills Through Large Ball Games students at Elementary School

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Abstract

Gross motor development is important in physical education, but learning often still focuses on separate technical exercises. Therefore, large ball games can be a more effective strategy for improving students' motor skills. This study aims to determine the effectiveness of ball games in improving the gross motor skills of sixth-grade students at Sadeng 03 Elementary School in Gunungpati District, Semarang City. The research method used a quantitative approach with a one-group pretest-posttest design. The research subjects consisted of 29 students selected through purposive sampling. Data on gross motor skills were collected through motor agility tests, including shuttle runs, ball throwing and catching, stork stands, and 30-metre sprints, as well as measurements of basic football and volleyball techniques. Data analysis was performed using the Shapiro-Wilk normality test, Paired t-Test, and N-Gain calculation. The results showed that the data were normally distributed ($p = 0.137$). The Paired t-Test showed a significant difference between the pretest and posttest scores ($p = 0.000$), indicating a significant improvement in motor skills after the intervention, which was reinforced by the N-Gain results showing that 96.5% of students experienced moderate to high improvement. These findings indicate that learning through ball games effectively improves students' agility, coordination, balance, and speed. Improvements were also seen in motor tests without balls, such as shuttle runs, stork stands, 30-metre sprints, and ball throwing and catching, making them relevant and effective for optimising the gross motor skills of primary school students.

How to Cite

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INTRODUCTION

Motor skills are essentially a person's ability to move their body in a coordinated manner through the cooperation of nerves, muscles, and senses. Motor skills are divided into two types: gross motor skills, which involve large muscle movements such as walking, running, or jumping, and fine motor skills, which use small muscles such as when writing, drawing, or beading. Motor skills are not only physical, but also related to a child's cognitive, social, and emotional development. Recent research also shows that good motor development can improve a child's readiness to learn, concentration, and involvement in the learning process (Ramadhani et al., 2024). In addition, motor skills are variable in nature because they are influenced by internal factors such as genetics, and external factors such as the environment, opportunities to play, and stimulation from teachers and parents. Targeted stimulation through physical activities, educational games, and creative learning media can accelerate the development of motor skills in accordance with the child's age (Dewi Riyani & Dwi Nurcahyani, 2024). Conversely, if children rarely receive stimulation or are less active, their motor development may be delayed, impacting their readiness to participate in learning activities and social interactions. Therefore, motor skills are considered an important foundation in child development that needs to be optimised through educational interventions appropriate to the child's age and context.

Motor skills are divided into two important areas, namely gross motor skills and fine motor skills, each of which plays a role in children's motor development (Tangse & Dimyati, 2021). Gross motor skills encompass various movements that involve large muscles, such as walking, running, jumping, throwing, and catching. These skills are very important for supporting mobility, participating in games or sports activities, and helping with the development of coordination and balance (As Sidiq & Sumantri, 2025). Various field studies in national journals also show that the use of structured games such as obstacle courses, relay races, and ball games has been proven effective in improving gross motor skills such as agility, balance, and coordination in school-age and pre-school children. Therefore, gross motor skills are considered an aspect of development that is highly responsive to stimulation from learning activities (Utari et al., 2022). Fine motor skills involve the use of small muscles, especially those in the hands and fingers, as well as hand-eye

coordination for precision tasks such as writing, drawing, cutting, and painting. Recent national research confirms that focused stimulation (art activities) can accelerate fine motor development and consequently academic readiness (writing skills) and independent activity abilities. Furthermore, studies in the context of early childhood education emphasise the importance of integrating fine and gross motor activities into the curriculum to ensure balanced motor development that supports children's cognitive and social aspects (Syifa Rasyidah et al., 2024).

Motor skills or movement are abilities that a person commonly uses to improve their quality of life. Motor skills are divided into three categories, as follows (Yusuf, 2022). (1) Locomotor movements are motor components related to the ability to move the body from one place to another. This movement involves large muscles to produce mobility and movement, such as walking, running, jumping, leaping, and hopping. According to (Masrurroh & Aulina, 2024), locomotor skills are fundamental to children's physical activity because they support the agility, speed, and endurance required in games and sports. Stimulation through games that emphasise movement has been proven to improve children's gross motor development and physical fitness. (2) Non-locomotor movements are motor skills that are performed without movement, but emphasise stability, balance, and body posture control. Examples of these movements include bending, stretching, stooping, turning, balancing, and swinging. (Dewi Riyani & Dwi Nurcahyani, 2024) emphasise that non-locomotor abilities play an important role in children's body control, especially in maintaining posture, concentration, and readiness to perform advanced movements. Non-locomotor exercises such as standing on one leg or performing simple yoga help children develop stable body control. (3) Manipulative movements are motor skills that involve interaction with objects or things outside the body, such as throwing, catching, kicking, hitting, dribbling, and rolling a ball. This component requires good hand-eye and foot-eye coordination. (Ambarwati, 2024) explains that manipulative movements are very important for building skills in sports because they support children's ability to control objects accurately and efficiently. Activities such as playing with large balls, traditional games, and the use of object-based learning media have been proven to improve manipulative aspects while training coordination.

Large ball games (football and volleyball)

are one learning approach that has great potential for developing gross motor skills in primary school children (Apriani et al., 2025). The movements involved in large ball games, such as passing, dribbling, shooting, serving, and underhand passing, directly train various motor aspects: hand-eye/foot coordination, balance, speed, agility, and gross motor control. In addition, collective games also foster social elements such as teamwork, communication, and emotional regulation, which in turn can increase children's motivation and participation during the learning process (Izzu & Wiguno, 2025). Several studies on the development of large ball game learning models in Indonesia show that a structured game-based approach can improve the psychomotor, cognitive, and affective aspects of students when applied with age-appropriate designs and school contexts.

Sadeng 03 State Elementary School, located in Gunungpati District, Semarang City, has its own characteristics that are relevant to this study. (Sanzali & Fahmi Abdulaziz, 2025) Geographical conditions, school facilities and infrastructure, children's outdoor activity patterns, and physical education learning practices at the primary school level, which tend to focus solely on technical training, have created a need to explore alternative learning methods that are more participatory and experience-centred. Initial observations at schools indicate that learning practices often focus on technical instruction and drills, thereby limiting opportunities for movement exploration in the context of play. Under these circumstances, the implementation of large ball games designed for basic levels can be an effective strategy to enrich students' movement experiences while continuously improving their gross motor skills.

Although previous studies have demonstrated the effectiveness of ball games in improving gross motor skills, most research has generally focused on a single type of game, specific motor components, or broader samples without detailed measurements of object and non-object control motor skills simultaneously. The uniqueness of this study lies in the integration of basic football and volleyball techniques into a structured learning programme combined with comprehensive motor agility measurements (shuttle run, stork stand, sprint, and ball throw-catch test) in a single integrated intervention model. Additionally, this research specifically observed sixth-grade students in a contextual primary school setting using a single-group pretest-posttest design reinforced with

N-Gain analysis to determine the magnitude of improvement. Therefore, this study not only reconfirms the effectiveness of large ball games but also provides a more integrated, measurable, and context-based empirical model to optimise gross motor development in primary school physical education.

METHOD

This study utilised a quantitative approach as it aimed to improve students' gross motor skills through the implementation of large ball games. The quantitative approach enabled the collection of numerical data, which was then analysed statistically to test the formulated hypotheses.

This study used purposive sampling, which is the deliberate selection of samples based on specific considerations. The researcher chose Sadeng 03 Elementary School because he had previously conducted observations for approximately three weeks in the Lantip programme. Through these activities, the researcher gained first-hand knowledge of the conditions of the students and the school, which were deemed suitable for use as the research location. The sample size in this study was 29 sixth-grade students who met the research criteria. The inclusion criteria used in this study were sixth-grade pupils at Sadeng 03 Elementary School, Gunung Pati District, Semarang City, in the 2025/2026 academic year. Aged 11-12 years old, in good physical health and without a history of chronic illness that could affect physical fitness.

Data collection is an important step in obtaining valid and accurate data. Data was collected at Sadeng 03 Primary School, Gunungpati District, Semarang City, using a gross motor agility test to objectively measure students' agility, coordination, balance, and speed of movement, both in activities without a ball and in the context of games. The data collection techniques used were as follows;

Motor Agility Test

This test is used to measure students' motor skills using an instrument developed by (Widodo & Sumarno, 2021) consisting of:

1. 4 x 10 metre shuttle run test, Purpose: To measure agility
2. 1 metre ball throw and catch test against a wall, Purpose: To measure eye-hand coordination
3. Stork Stand Positional Balance test, Purpose: To measure body balance
4. 30 metre sprint test, Purpose: To measure speed

Volleyball

(As Sidiq & Sumantri, 2025) (underhand passing, underhand serve) The purpose of using basic volleyball techniques is to:

- Measure arm muscle strength and movement coordination when performing an underhand serve
- To measure the coordination of the lower body with the arm and the accuracy of the ball's direction

Football (passing, dribbling, shooting), Objectives: (1) To measure the accuracy of students in passing the ball to the target, (2) To measure the agility and skill of students in dribbling the ball, (3) To measure leg muscle strength and the accuracy of kicking the ball into the goal.

These technical measurements for volleyball and football help teachers understand students' basic abilities in the game, while also serving as a reference for determining appropriate training strategies to improve strength, accuracy, and movement coordination.

This study used a quantitative approach, in which numerical data was collected from a series of motor agility tests. The data was processed using Microsoft Excel to group the scores and initial classifications. Next, data analysis was performed using SPSS version 27 through the following stages. The normality test is used to see whether the data is normally distributed or not. I used the Shapiro-Wilk test because the sample size in this study was 29 students. The Paired Samples t-Test is used if the data is normally distributed, which is used to compare results. N-Gain shows how much improvement each student has achieved after receiving treatment.

RESULTS AND DISCUSSION

Based on the Shapiro-Wilk normality test, the table presents the results of examining the distribution of data on gross motor skill improvement. This information is used to determine the appropriate type of statistical test for the next stage of analysis.

Table 1. Result of the Normality Test for Pretest dan Posttest Data

Difference between pretest and posttest scores	Shapiro-Wilk		
	Statistic	df	Sig.
	0,945	29.000	0.137

Based on the results of the **Table 1.** Shapi-

ro Wilk normality test on the difference variable (pre-test-post-test), the following significance values were obtained; Shapiro-Wilk: $p = 0.137$.

The Shapiro Wilk test gave a p-value of 0.137 (> 0.05), indicating that the difference data was normally distributed.

Table 2. Result of the Paired Sample t-test

t	df	Sig(2-tailed)
-13.832	28	0.000

Based on the results of the analysis using the **Table 2.** Paired Samples t-Test, the table above shows a comparison of pretest and posttest scores on the variable of students' gross motor skills. The test results show that the difference between the pretest and posttest scores has an average of -29.138 with a standard deviation of 11.344 . The 95% confidence interval is in the range of -33.453 to -24.823 , which is entirely negative, indicating a consistent increase in scores after treatment.

Table 3. Result of the N-Gain

Pre-test score	Post-test score	Value Difference	N-Gain	Classification of N-Gain Values
30	80	50	0.71	High
60	85	25	0.63	Medium
30	75	45	0.64	Medium
50	85	35	0.70	High
45	80	35	0.64	Medium
65	85	20	0.57	Medium
60	95	35	0.88	High
50	75	25	0.50	Medium
65	80	15	0.43	Medium
60	75	15	0.38	Medium
55	90	35	0.78	High
50	85	35	0.70	High
40	85	45	0.75	High
55	70	15	0.33	Medium
50	80	30	0.60	Medium
55	75	20	0.44	Medium
55	70	15	0.33	Medium
45	80	35	0.64	Medium
55	90	35	0.78	Medium
60	85	25	0.63	Medium
50	80	30	0.60	Medium
65	75	10	0.29	Low
50	75	25	0.50	Medium
60	90	30	0.75	High
50	80	30	0.60	Medium

40	80	40	0.67	Medium
45	80	35	0.64	Medium
50	70	20	0.40	Medium
40	75	35	0.58	Medium

Based on the **Table 3**. Normalised Gain (N-Gain) calculations for 29 students, it can be seen that learning through large ball games provides varying improvements in ability for each individual. The N-Gain values in the table show that the improvements that occurred were in three categories, namely High, Medium, and Low;

1. High category: 7 students ($N\text{-Gain} \geq 0.70$)
2. Medium category: 21 students ($0.30 \leq N\text{-Gain} < 0.70$)
3. Low category: 1 student ($N\text{-Gain} < 0.30$)

The overall N-Gain score shows that the learning programme through large ball games has succeeded in providing a significant improvement in the gross motor skills of Year 6 students. With 96.5% of students falling into the Moderate and High categories, this learning method can be declared effective as a method of improving motor skills in primary school physical education.

The results of this study indicate that the implementation of large ball games has a significant effect on improving the gross motor skills of sixth-grade students at Sadeng 03 Elementary School, Gunungpati District. This finding is evidenced by the results of the Paired Samples t-Test, which shows a significant difference between the pretest and posttest scores ($p = 0.000 < 0.05$). In addition, the N-Gain calculation results show that 96.5% of students are in the moderate to high improvement category. These data indicate that ball game-based learning is effective in improving students' gross motor skills quantitatively and consistently. These findings illustrate that movement stimuli provided through game activities can optimise agility, coordination, speed, and balance. The improvement in gross motor skills can be explained by the characteristics of ball games, which involve various forms of basic movements in an integrated manner. Activities such as dribbling, passing, and shooting in football, as well as underhand passing and underhand serving in volleyball, require the simultaneous involvement of locomotor, non-locomotor, and manipulative movements. According to (Utari et al., 2022), games that combine various basic movement patterns can provide more optimal motor stimulation compared to monotonous physical activities. This is in line with the results of this study, where students showed improvements in

agility, balance, coordination, and speed.

Additionally, the dominance of N-Gain values in the moderate to high categories indicates that ball games are capable of accommodating differences in students' initial abilities. Students with low motor skills still show meaningful progress because game activities provide opportunities for movement repetition without performance pressure. These results support the findings of (Naufaldi, 2025) and (Prasetyo et al., 2025), which state that game-based learning approaches are inclusive and effective for classes with physical ability heterogeneity. From a child development perspective, large ball games serve as a means of motor stimulation that is appropriate for primary school children, who are still in the exploratory phase. Children aged 10–12 years have high movement needs and tend to be more responsive to activities that are competitive yet enjoyable. Research (Verawati et al., 2022) and (Maisyaroh & Nadiyah, 2024) confirms that physical education lessons that accommodate children's need to play can improve the quality of student engagement while accelerating gross motor development, particularly in terms of agility and balance.

The findings of this study also confirm that improvements in gross motor skills through large ball games do not occur instantly, but rather through a process of repeated and meaningful movement adaptation. Large ball games provide a learning situation that requires students to respond quickly to stimuli, make simple decisions, and adjust their body movements to the dynamics of the game. This is in line with the results of studies by (Widodo & Sumarno, 2021) and (Rahmawati et al., 2025), which state that dynamic play activities can significantly improve the quality of neuromuscular coordination in primary school students compared to static technical training. In addition to physical aspects, learning based on large ball games also has a positive impact on student motivation and engagement in the physical education learning process. A pleasant learning atmosphere makes students more enthusiastic about participating in learning activities and encourages them to explore their motor skills. (Masruroh & Aulina, 2024) emphasise that a fun games-based learning approach can increase student participation because the activities are carried out without pressure, encouraging children to move naturally. This supports the results of research showing an improvement in motor skills in almost all students. Additionally, (Denatara & Arfah, 2025) report that the use of football and handball games in physical education lessons significantly improves primary school students'

gross motor skills, particularly in terms of quick movement responses and accuracy in performing motor tasks, which are important components in ball games such as football and volleyball.

From a pedagogical perspective, ball games not only train psychomotor aspects, but also contribute to the development of students' social and affective aspects. Group game activities require cooperation, communication, sportsmanship, and emotional control during the game. (Engels & Freund, 2020) and (Ika Pra Sauma et al., 2024) explain that learning large ball games has a positive impact on the physical fitness and social attitudes of primary school students. Thus, the integration of large ball games in physical education learning can support the achievement of holistic physical education goals. This study is relevant to the context of physical education learning at Elementary School Sadeng 03, which previously tended to focus on conventional basic technique training. The shift towards game-based learning provides students with a richer and more contextual movement experience. (Sanzali & Fahmi Abdulaziz, 2025) emphasise that game-based learning and contextual activities can improve the quality of movement and student participation in physical education, especially in primary schools.

Thus, big ball game-based learning not only serves as a medium for practising motor skills, but also as a pedagogical approach that supports the integrated motor, social, and affective development of students. These findings reinforce the position of big ball games as a relevant, applicable, and sustainable PE learning strategy in improving the quality of physical education in primary schools. Overall, the results of this study reinforce national empirical evidence that ball games are an effective PE learning strategy for improving the gross motor skills of primary school students. The integration of ball games is not only relevant to children's physical development needs but also supports the formation of positive attitudes towards physical activity and sport from an early age. Therefore, ball games are recommended as one of the main approaches to PE learning in primary schools.

CONCLUSION

This study concluded that the implementation of large ball games proved effective in improving the gross motor skills of sixth-grade students at Sadeng 03 Elementary School, Gunungpati District. This was evident from the statistical test results, which showed a significant increase be-

ween the pretest and posttest scores and was reinforced by the N-Gain calculation results, most of which were in the moderate to high category. Activities such as passing, dribbling, shooting, underhand passing, and underhand serving provide comprehensive movement stimuli that consistently develop students' agility, balance, coordination, and speed. Game-based learning also encourages motivation, cooperation, and active student involvement during the physical education learning process. Thus, ball games can be used as an effective alternative learning strategy to improve the gross motor skills of primary school students. Schools and physical education teachers are encouraged to integrate structured game models into learning activities so that students' physical development can be optimised and positive physical activity habits can be supported from an early age.

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