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The effect of play-based methods on students' physical fitness

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ABSTRACT

Physical fitness is an important aspect of students' health and ability to engage in physical activity. It can be developed through regular physical activity, including play-based activities. The playing method is considered an effective and enjoyable approach to improving physical fitness because it involves dynamic physical activity, social interaction, and intrinsic motivation. This experimental study was conducted over 16 sessions, during which participants received treatment in the form of games. The study included 36 male students aged 13–15 years who were selected using a stratified random sampling technique. The Indonesian Physical Fitness Test (Tes Kebugaran Jasmani Indonesia [TKJI]) was used as the assessment instrument. The results showed that the calculated t-value (9.375) was greater than the critical t-value (1.691), indicating a statistically significant difference between the pre-test and post-test physical fitness scores. These findings suggest that play-based activities may be a useful and enjoyable strategy for improving students' physical fitness. By integrating physical, cognitive, and social elements, play-based activities can contribute to the development of physical fitness components such as cardiorespiratory endurance, muscular strength, and agility.

KEYWORDS

Learning Methods; Games; Physical Fitness; Students

1. INTRODUCTION

Physical fitness is an important aspect of daily life because it relates to the body's ability to perform physical activities without experiencing excessive fatigue. Physical fitness is a necessary element for a person to carry out activities. Physical fitness is a person's tolerance for physical activity without feeling fatigued during physical activity (Mardepi et al., 2024; Putro et al., 2018; Sepriadi, S., & Eldawaty, 2019; Sepriadi et al., 2023). Good physical fitness not only supports health but also improves productivity, quality of life, and cognitive abilities. However, in today's modern era, a sedentary lifestyle has become a serious problem, especially in children and adolescents who spend more time with gadgets and less time involved in physical activity.

Play-based learning has been recognized as an effective strategy for improving physical fitness, especially in elementary school children and adolescents (Cocca et al., 2020). Play-based learning is a fun and effective learning approach for improving physical fitness because it involves dynamic physical activity, collaboration, and high motivation. Unlike conventional training, which tends to be monotonous, play-based learning offers a fun, interactive, and engaging approach. Physical activity through play can increase students' motivation, engagement, and concentration during exercise.

The use of play-based methods in physical education has a significant positive effect on improving students' physical fitness. These methods are highly effective because they actively engage students, make learning enjoyable, and increase motivation to participate in physical activities. Game-based and play-centered approaches, including traditional games and modified sports, consistently produce significant improvements in students' physical fitness compared to traditional training methods. Traditional games and modified sports are highly effective because they are designed to suit students' developmental stages and basic movement skills, making them accessible and engaging (Astuti et al., 2023; Iswanto et al., 2024; Zulnadila, 2025).

Game-based physical education effectively increases students' motivation to participate in physical culture and sports, improves agility, flexibility, and endurance, while ensuring appropriate intensity for students with impaired health (Ovsyannikova et al., 2021). Game-based physical education is effective for students with varying levels of fitness and health, as it can be tailored to individual needs and encourages inclusive participation (Arefieva & Pliushchakova, 2023; Ovsyannikova et al., 2021). Improvements were seen in various fitness components, including agility, flexibility, endurance, and overall physical activity levels. In summary, incorporating game-

based physical education is a highly effective strategy for improving students' physical fitness. These methods make physical activity enjoyable, increase motivation, and are adaptable to a wide range of ages and abilities, resulting in improved health and learning outcomes for students.

However, there is still debate about the extent to which play-based methods are truly effective in improving physical fitness components such as cardiovascular endurance, muscle strength, flexibility, and speed. Furthermore, research results (Cocca et al., 2020) found that play-based physical education programs improve physical fitness in elementary school children, but not cardiorespiratory fitness. Meanwhile, research (Kurnaz et al., 2024) found that a 10-week play-based after-school program improved coordination and physical fitness in 12-year-old children. Therefore, in this study, the goal is to examine students' physical fitness across all aspects of physical fitness using play-based methods.

2. METHODS

This research was an experimental study by providing treatment in the form of playing methods using tools including the lion's hole game, the fire circle game, the hola-holaha game, the cloud-penetrating game, the ring toss game, the stick-moving game, the cardinal points game, and the royal palace game (Sutra Dianda, 2018). The sampling technique used was purposive sampling with the criteria of male students aged 13-15 years who actively participate in physical education classes and do not have medical conditions that limit physical activity. Based on these criteria, 36 male students were selected as study participants.

The games were chosen because they involve various components of physical fitness, such as speed, agility, strength, and endurance. The treatment was given for 16 meetings in PJOK lessons, with each session designed for 60 minutes, which included warm-up, core (games), and cool-down. The physical fitness test instruments used included, 50-meter sprint (speed), hanging body lift (arm strength), sit-up (abdominal muscle endurance), vertical jump (leg muscle explosive power), and 1000-meter run (cardiovascular endurance) (Arsil & Despita, 2024). Data were analyzed using a paired sample t-test to compare the pre-test and post-test results, to determine the effect of the play method on students' physical fitness.

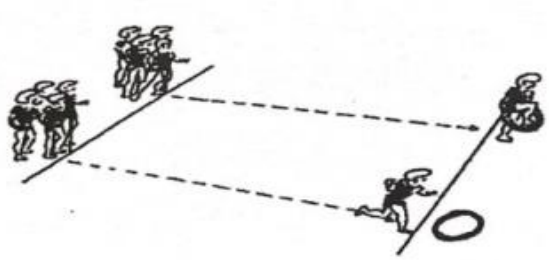

Figure 1. Lion's Den Game

The Lion Pit game is a group game where players run to avoid guards and pass through the pit's safety zone. The fitness components trained include speed, agility, and reaction time. This game can improve speed (50-meter dash) and coordination through dynamic evasive movements.

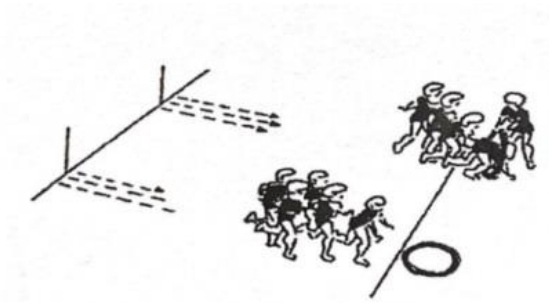

Figure 2. Ring of Fire Game

This game involves players walking or running around a circle while avoiding obstacles (ropes or cones). The fitness components trained include cardiovascular endurance and balance. This game can improve endurance (1000-meter run) through repeated aerobic activity.

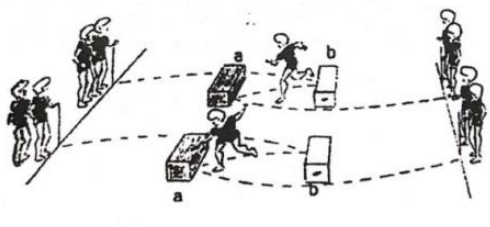

Figure 3. Royal Palace Game

This game is a team strategy game that combines short-distance running and "castle capture" tactics. The fitness components trained include speed, explosive power (vertical jump), and

teamwork. The explosive movements involved in capturing the "castle" can develop leg muscle power.

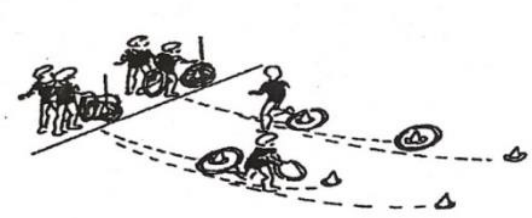

Figure 4. Ring Toss Game

The game involves throwing rings at targets (poles or cones) from a distance of 7 meters for the first time and 2 meters for the second time. The fitness components trained include accuracy, hand-eye coordination, and arm strength. This game focuses on shoulder muscle strength (hanging and lifting) and motor control.

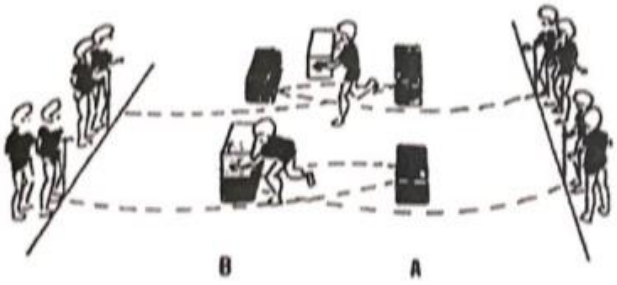

Figure 5. Stick Move Game

Players run while moving sticks to cones within a set time. The fitness components trained are agility and reaction time. The game was chosen because it trains agility related to rapid changes of direction.

Figure 6. Wind Eye Game

The game is played by players moving in the direction of the blue eyes (uata-south-east-west) according to instructions. The physical fitness components trained are coordination and cognitive processing speed. This game was chosen because it can improve reaction time and spatial orientation, and support overall fitness.

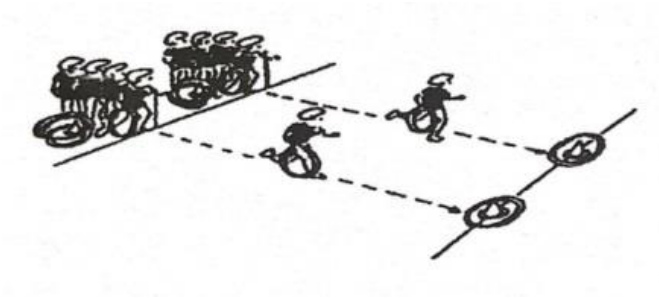

Figure 7. Hola-Holaha game

A traditional game using a hula hoop as a guide. Participants run toward the hula hoop and circle it over a 7-meter track. The fitness component trained is speed (50-meter dash). This game is used because it can improve running speed.

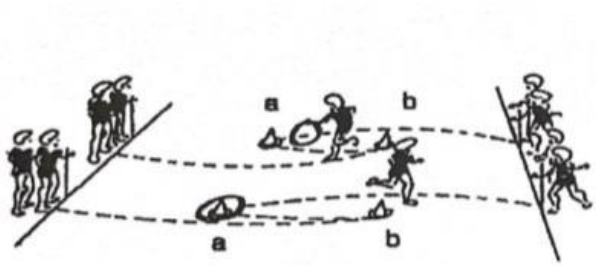

Figure 8. Cloud Breaking Game

Source: (Sutra Dianda, 2018)

This game is played by teams taking turns running with hula hoops and placing them on cones 7 meters apart. The fitness components trained include agility and teamwork. This game was chosen because it involves pushing and running, which strengthens the arm and leg muscles.

3. RESULTS AND DISCUSSION

Table 1 shows the distribution of participants according to their pre-test physical fitness levels.

Table 1. Pre-test classification of physical fitness level

Physical Fitness Values	Amount	Percentage (%)	Classification
22 – 25	0	0	Very well
18 -21	0	0	Good
14 – 17	19	52,78	Currently
10 – 13	15	41,67	Not enough
5 – 9	2	5,56	Less than once
Amount	36	100	

The table above shows that the pre-test value of students' physical fitness is classified as moderate at 52.78%, lacking at 41.67%, and very lacking at 5.56%, with an average of students' physical fitness being lacking. Table 2 shows the distribution of participants according to their post-test physical fitness levels.

Table 2. Post-test classification of physical fitness level

Physical Fitness Values	Amount	Percentage (%)	Classification
22 – 25	0	0	Very well
18 -21	10	27,78	Good
14 – 17	21	58,33	Currently
10 – 13	3	8,33	Not enough
5 – 9	2	5,56	Less than once
Amount	36	100	

From the table above, the post-test value of students' physical fitness was obtained with a good classification of 27.78%, moderate 58.33%, lacking 8.33%, and very lacking 5.56%, with an average of moderate student physical fitness.

From the comparison of the pre-test and post-test results obtained, there was a substantial increase in students' physical fitness in the good category, as many as 27.78% of students who were previously not in the good category managed to improve to this level. In the moderate category, there was a 5.55% increase from the pre-test, while in the poor category, the percentage decreased by 33.34% to 8.33%. So overall, 61.11% of students (22 of 36) experienced an increase in classification.

The results of this study, the play method has been proven effective in improving fitness, especially for students. This study also proves the alignment of research results conducted by several researchers, such as (Cocca et al., 2020; Kurnaz et al., 2024)**.** In the following, Table 3 shows the comparison of physical fitness scores before and after the intervention using a t-test.

Table 3. T-test results

	Pree-Test	**Post-Test**	**T-Count**	**T-Table**
Average	13	16	9,375	1,691
Standard deviation	2,01	2,79		

Based on the T-test results above, the T count was 9.375 > T table 1.691, which means that there is a significant influence of the playing method on students' physical fitness. It can be seen that the average during the pre-test was 13, with a poor category, and increased during the post-test, with an average of 16, with a moderate category. This study proves that the playing method can improve students' physical fitness. The significant difference between the pre-test and post-test scores strengthens the evidence that the playing method intervention has a real impact in increasing students' physical fitness capacity in a relatively short time. This increase shows that the playing method is not only effective in stimulating students' physical activity but also able to create a fun learning environment so that students' motivation to exercise is higher. Game variations such as the lion's hole and moving the stick provide multidimensional stimuli that are in accordance with the principle of variability of practice (Schmidt & Lee, 2019). This explains the 23% increase in fitness scores, especially in the speed and agility components.

Physical fitness is an important aspect in maintaining health and improving the quality of life. Physical fitness is a key factor in maintaining health and significantly improving quality of life. Regular physical activity and exercise contribute to better physical, mental, and social well-being, reduce the risk of disease, and support healthy aging. Regular exercise helps prevent chronic diseases such as cardiovascular disease, type 2 diabetes, and obesity. Exercise also supports immune function, metabolic health, and reduces the risk of age-related diseases (Abdullah, 2023; Karina Nur Safitri et al., 2024; Qiu et al., 2023; Suresh & K, 2024).

Integrating fun physical activities such as traditional games or game-based sports into exercise routines is an effective way to increase motivation and participation in physical activity. Making exercise fun helps individuals, especially students, engage more consistently and enthusiastically. Fun is a key motivator for participating in physical activity. Activities that are fun,

enjoyable, or game-like make people more likely to start and continue exercising (Ávalos-Ramos et al., 2024; Raimondi et al., 2021).

One method that is considered effective in improving physical fitness is the play method. This game-based learning method has been proven effective in improving physical fitness among students (Doe-Asinyo & Smits-Engelsman, 2021; Kurnaz et al., 2024; Wako et al., 2025). This approach makes physical activity more interesting, increases motivation, and encourages active participation (Kurnaz et al., 2024; Ladwig et al., 2021). This play method integrates fun physical activities, such as traditional games or game-based sports (Valentini et al., 2023; Volk et al., 2021), so that it can increase individual motivation and participation in sports.

The research results indicate that play-based methods are effective in improving students' physical fitness, with an average score increase of 23%. This finding aligns with previous research showing that game-based approaches, such as small-sided games (SSGs) and traditional games, significantly improve cardiorespiratory capacity (VO2max), muscle strength, and agility (Gómez-Álvarez et al., 2024; Jastrzębski et al., 2024). However, the mechanisms behind these improvements require further analysis.

First, motivation is a key factor. A study by (Olejua et al., 2025) explained that game-based physical activity triggers dopamine release, which increases long-term engagement compared to conventional exercise. This explains why students in this study demonstrated more consistent participation. However, it should be noted that intrinsic motivation can vary depending on game design and social context (Kent et al., 2022). For example, competitive games may be less effective for students with high levels of anxiety (Raimondi et al., 2021).

Second, the physiological adaptations of the play method need to be compared with other approaches. Although SSG improves cardiorespiratory fitness, several studies have shown that high-intensity interval training is more effective for increasing VO2max in a short time (Jastrzębski et al., 2024). However, the advantage of the play method lies in its sustainability, due to the minimal perception of fatigue (Valentini et al., 2023).

The use of game methods in physical education has a significant positive effect on improving students' physical fitness (Astuti et al., 2023; Dewangga & Maliki, 2024; Nugraha et al., 2024; Petrušič et al., 2022; Silva et al., 2023; Yan et al., 2023). This method makes learning more interesting and encourages active participation, leading to measurable improvements in various fitness indicators. The play method, or game-based learning, has been shown to have a positive effect

on improving physical fitness in school-age children. This method is effective in improving various aspects of physical fitness, such as muscle strength, endurance, and agility, and can be applied efficiently in the school environment.

Physical fitness among junior high school students is an important aspect of their health, academic achievement, and overall well-being. Research (Takia Oktavia Dewi et al., 2024) highlights the importance of physical activity, healthy lifestyle habits, and supportive environments in promoting and maintaining good physical fitness in this age group. Thus, this study provides practical recommendations for teachers and coaches to further integrate play approaches into fitness programs to achieve optimal outcomes.

A limitation of this study is the relatively short duration of the intervention, so long-term effects cannot be measured. The game variations in this study did not control for the type of game (cooperative vs. competitive), which could have had different effects. Furthermore, group participation may have influenced the results, particularly in adolescents who tend to be motivated by peer interaction.

4. CONCLUSIONS

The play method has proven to be an effective and enjoyable approach to improving students' physical fitness. By integrating physical, cognitive, and social elements, this method not only improves fitness components such as cardiorespiratory endurance, muscle strength, and agility but also increases participants' adherence to physical activity in the long term. Several limitations of the study, such as the relatively short duration, the variety of game types, environmental factors, and students' lifestyle habits, may influence the results.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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