The Effect of Game-Based Training on Motor Competence, Motivation, and Physical Fitness among Junior High School Students in Makassar, Indonesia

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Abstract

Objectives: This study aimed to examine the effect of game-based training on motor competence, motivation, and physical fitness among junior high school students in Makassar, Indonesia.

Materials and Methods: This study used a quasi-experimental design with a pretest–posttest control group. A total of 64 students aged 13–15 years were randomly assigned to an experimental group that received game-based training and a control group that received conventional training. The intervention was conducted for eight weeks, with three sessions per week. Motor competence was assessed using standardized skill tests, motivation was measured using a validated questionnaire, and physical fitness was evaluated through endurance, strength, and agility tests. Data were analyzed using paired sample t-tests and independent sample t-tests.

Results: The results showed that the experimental group experienced significant improvements in motor competence, motivation, and physical fitness after the intervention. Significant differences were also found between the experimental and control groups in posttest scores, with the game-based training group showing better outcomes than the conventional training group ($p < 0.05$).

Conclusions: Game-based training is an effective approach for improving motor competence, motivation, and physical fitness among junior high school students. These findings suggest that game-based learning activities can be integrated into physical education programs to increase student engagement, support skill development, and improve physical performance.

Keywords: Game-Based Training; Motor Competence; Motivation; Physical Fitness; Junior High School Students.

Introduction

Physical education plays a critical role in promoting students' physical, cognitive, social, and affective development (Abduh et al., 2024; Abusleme-Allimant et al., 2023; Andika et al., 2024) . During adolescence, students experience rapid biological, psychological, and behavioral changes that strongly influence their movement ability, motivation, and participation in physical activity. At this stage, the development of motor competence, motivation, and physical fitness is essential because

these factors contribute to active lifestyle formation, health-related fitness, and long-term participation in physical activity.

However, physical education practice in schools still often relies on conventional teaching approaches that emphasize repetitive drills, teacher-centered instruction, and performance-oriented activities (Kuswoyo, 2017; Kuswoyo & Donggoran, 2019). Although these methods may support technical skill repetition, they do not always provide meaningful, enjoyable, and student-centered learning experiences(Abarghoueinejad et al., 2021; Oliinyk & Doroshenko, 2017). As a result, some students may show low engagement, limited motivation, and uneven development of motor skills and physical fitness. This issue is important because low motivation and poor movement competence during adolescence may reduce students' confidence and willingness to participate in physical activity.

Game-based training has emerged as an innovative instructional approach that integrates play, movement challenges, cooperation, decision-making, and skill learning within enjoyable physical activity contexts(Abdul Jabbar & Felicia, 2015; Adipat et al., 2021). Unlike conventional drill-based activities, game-based training allows students to learn movement skills through modified games, tactical situations, and active problem-solving. This approach may enhance motor competence by giving students repeated opportunities to practice movement skills in dynamic and meaningful situations (Behan, 2020; Brewer, 2017; O'Brien et al., 2023). At the same time, the playful and interactive nature of games may increase students' intrinsic motivation and enjoyment during physical education lessons.

Motor competence refers to the ability to perform various fundamental and sport-related movement skills effectively and efficiently. Students with better motor competence tend to participate more actively in physical activity because they have greater confidence in performing movement tasks (Lorås, 2020; Quitério, 2018). Motivation also plays a central role because it influences students' effort, persistence, enjoyment, and willingness to engage in learning activities. Meanwhile, physical fitness, including endurance, strength, and agility, is an important indicator of students' health, movement capacity, and readiness to participate in more complex physical activities. Therefore, these three variables are interconnected and should be developed through learning approaches that are active, meaningful, and enjoyable.

Although game-based approaches have gained increasing attention in physical education research, empirical evidence in the Indonesian school context remains limited. Most previous studies have focused on either motor skills, motivation, or fitness separately, while fewer studies have examined these variables simultaneously as integrated outcomes of physical education learning(Burton & Rodgerson, 2001; Wawrzyniak et al., 2022). In addition, research involving junior high school students in Makassar is still scarce, even though local school contexts, student characteristics, facility availability, and teaching practices may influence the effectiveness of game-based training.

The novelty of this study lies in its integrated examination of game-based training effects on motor competence, motivation, and physical fitness among junior high school students in Makassar, Indonesia. This study does not only evaluate physical outcomes, but also considers psychological engagement through motivation as an important factor in physical education success. Therefore, this research provides practical and contextual evidence for the use of game-based training as a student-centered approach to improve movement skills, physical fitness, and learning motivation in Indonesian physical education settings.

Based on this background, this study aims to investigate the effect of game-based training on motor competence, motivation, and physical fitness among junior high school students in Makassar, Indonesia.

Materials and Methods

Study Participants

This study used a quasi-experimental design with a pretest–posttest control group. The participants were 64 junior high school students aged 13–15 years in Makassar, Indonesia. Participants were selected based on their active participation in physical education classes and their physical ability to follow the intervention program.

The participants were randomly divided into two groups: an experimental group consisting of 32 students and a control group consisting of 32 students. The experimental group participated in structured game-based training activities, while the control group received conventional physical education instruction.

The inclusion criteria were students aged 13–15 years, actively enrolled in junior high school, willing to participate in all intervention sessions, and physically healthy during the study period. Students who had injuries, medical restrictions, or incomplete attendance during the intervention were excluded from the analysis.

Before the study began, students were informed about the research procedures. Permission from the school and informed consent from parents or guardians were obtained. Student participation was voluntary, and confidentiality of participant data was maintained throughout the study.

Study Organization

The intervention was conducted for eight weeks, with three sessions per week. Each session lasted 60 minutes and was carried out during scheduled physical education activities.

Before the intervention, both groups completed pretests for motor competence, motivation, and physical fitness. The experimental group then received game-based training designed to improve fundamental movement skills, cooperation, decision-making, and active participation. The training activities included modified games involving running, jumping, throwing, catching, agility movements, and group-based movement challenges.

The control group received conventional physical education instruction, which mainly consisted of teacher explanation, technical drills, repetition of movements, and standard physical activities. Both groups were taught by physical education teachers under similar school conditions.

After eight weeks, both groups completed posttests using the same instruments as the pretest. The pretest and posttest results were then compared to determine the effect of game-based training on motor competence, motivation, and physical fitness.

Research Instruments

Motor competence was measured using a fundamental movement skill test that assessed running, jumping, throwing, and coordination. These components were selected because they represent basic movement abilities needed in physical education and sport activities.

Motivation was measured using a motivation questionnaire adapted from validated intrinsic motivation scales. The questionnaire assessed students' interest, enjoyment, effort, and willingness to participate in physical education activities.

Physical fitness was measured using three fitness components. Endurance was assessed using the beep test, upper-body strength was assessed using the push-up test, and agility was assessed using the shuttle run test. These tests were selected because they are practical, appropriate for school-aged students, and commonly used in physical education settings.

Statistical Analysis

Data were analyzed using descriptive and inferential statistics. Descriptive statistics, including mean and standard deviation, were used to describe the pretest and posttest scores of each variable. A paired sample t-test was used to examine differences between pretest and posttest scores within each group. An independent sample t-test was used to compare posttest differences between the experimental and control groups. The level of statistical significance was set at $p < 0.05$.

Results

The findings showed that the game-based training program produced positive effects on motor competence, motivation, and physical fitness among junior high school students. The experimental group demonstrated greater improvements from pretest to posttest compared with the control group. Significant differences were found in motor competence, motivation, endurance, strength, and agility after the 8-week intervention period.

Motor Competence

The experimental group showed a significant improvement in motor competence after participating in game-based training. The mean score increased from **62.45 ± 6.18** at pretest to **78.30 ± 5.74** at posttest. In the control group, the score increased slightly from **61.80 ± 6.05** to **67.25 ± 5.92**. The posttest comparison showed that the experimental group achieved significantly higher motor competence than the control group **($p < 0.05$)**.

Motivation

Students in the game-based training group demonstrated higher motivation after the intervention. The mean motivation score increased from **65.20 ± 7.10** to **82.15 ± 6.35**, indicating greater enjoyment, engagement, and willingness to participate in physical education activities. The control group showed a smaller increase from **64.75 ± 6.88** to **70.40 ± 6.50**.

Physical Fitness

Significant improvements were also observed in physical fitness components. The experimental group showed better posttest results in endurance, strength, and agility compared with the control group. These findings indicate that game-based training was effective not only in improving movement skills and motivation, but also in enhancing students' physical fitness.

Table 1. Pretest and Posttest Results of Motor Competence, Motivation, and Physical Fitness

Variable	Group	Pretest Mean ± SD	Posttest Mean ± SD	Improvement	p-value
Motor competence	Experimental	62.45 ± 6.18	78.30 ± 5.74	15.85	0.001
Motor competence	Control	61.80 ± 6.05	67.25 ± 5.92	5.45	0.034
Motivation	Experimental	65.20 ± 7.10	82.15 ± 6.35	16.95	0.001
Motivation	Control	64.75 ± 6.88	70.40 ± 6.50	5.65	0.041
Endurance	Experimental	35.60 ± 4.25	43.80 ± 4.10	8.20	0.001
Endurance	Control	35.15 ± 4.40	38.20 ± 4.05	3.05	0.047
Strength	Experimental	18.30 ± 3.15	25.40 ± 3.50	7.10	0.001
Strength	Control	18.10 ± 3.05	20.85 ± 3.20	2.75	0.039
Agility	Experimental	14.85 ± 1.20	12.70 ± 1.05	2.15	0.001
Agility	Control	14.90 ± 1.25	13.95 ± 1.18	0.95	0.046

Note: For agility, a lower score indicates better performance because the test is measured in time.

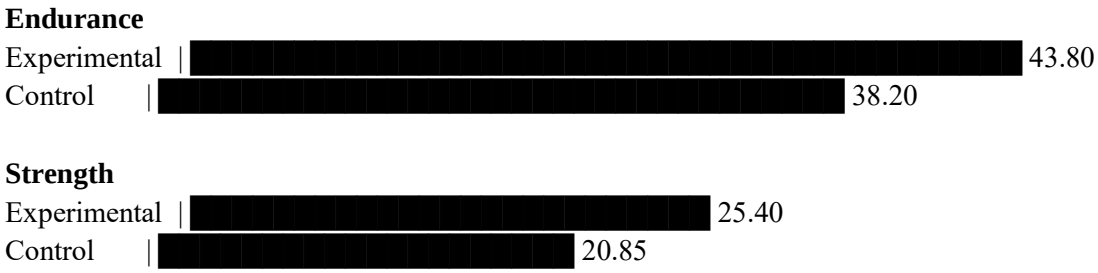
Table 2. Posttest Comparison Between Experimental and Control Groups

Variable	Experimental Group Mean ± SD	Control Group Mean ± SD	Mean Difference	p-value
Motor competence	78.30 ± 5.74	67.25 ± 5.92	11.05	0.001
Motivation	82.15 ± 6.35	70.40 ± 6.50	11.75	0.001
Endurance	43.80 ± 4.10	38.20 ± 4.05	5.60	0.002
Strength	25.40 ± 3.50	20.85 ± 3.20	4.55	0.003
Agility	12.70 ± 1.05	13.95 ± 1.18	-1.25	0.004

Figure 1. Posttest Comparison of Motor Competence and Motivation



Figure 2. Posttest Comparison of Physical Fitness Components



Agility

Experimental | [redacted] 12.70
Control | [redacted] 13.95

Note: In the agility test, a lower score reflects better performance.

The results of this study revealed significant improvements in all measured variables in the experimental group after the 8-week game-based training intervention. Motor competence increased from 62.45 ± 6.18 to 78.30 ± 5.74, while the control group showed a smaller improvement from 61.80 ± 6.05 to 67.25 ± 5.92. The posttest comparison confirmed that the experimental group achieved significantly higher motor competence than the control group ($p = 0.001$).

Motivation also improved significantly in the experimental group, increasing from 65.20 ± 7.10 to 82.15 ± 6.35. This result indicates that game-based training increased students' engagement, enjoyment, and willingness to participate in physical education activities. In contrast, the control group showed only a moderate increase in motivation.

In terms of physical fitness, the experimental group demonstrated greater improvements in endurance, strength, and agility. Endurance increased from 35.60 ± 4.25 to 43.80 ± 4.10, strength improved from 18.30 ± 3.15 to 25.40 ± 3.50, and agility performance improved from 14.85 ± 1.20 to 12.70 ± 1.05. Compared with the control group, the experimental group achieved significantly better posttest scores across all physical fitness components ($p < 0.05$).

Overall, these findings indicate that game-based training was more effective than conventional physical education instruction in improving motor competence, motivation, and physical fitness among junior high school students.

Discussion

The results of this study show that game-based training is an effective strategy for improving motor competence, motivation, and physical fitness among junior high school students. The experimental group demonstrated greater improvements than the control group, indicating that learning activities designed through games can provide a more active, enjoyable, and meaningful physical education experience. This finding supports the idea that students learn movement skills more effectively when training is not only based on repetition, but also involves play, interaction, decision-making, and problem-solving.

The improvement in motor competence may be explained by the dynamic movement patterns contained in game-based activities. Through modified games, students repeatedly performed running, jumping, throwing, catching, changing direction, and coordination tasks in situations that resembled real movement contexts. This type of practice allows students to develop movement control, timing, spatial awareness, and adaptability. Compared with conventional drills, game-based training provides more varied movement experiences, which can help students acquire and apply motor skills more effectively.

The increase in students' motivation also indicates that game-based training can create a more positive learning atmosphere. Games provide elements of enjoyment, challenge, cooperation, and competition, which may increase students' interest and willingness to participate. From the perspective of self-determination theory, game-based training may support students' autonomy,

competence, and relatedness. Students feel more autonomous because they are actively involved in movement decisions, more competent because they experience success in modified activities, and more socially connected because they interact with peers during games. These conditions can strengthen intrinsic motivation in physical education.

The improvement in physical fitness, including endurance, strength, and agility, may be related to the active and continuous movement demands of game-based training. During game activities, students are required to move repeatedly, accelerate, decelerate, change direction, jump, and respond quickly to game situations. These movement patterns increase cardiovascular effort, muscular involvement, and neuromuscular coordination. Therefore, game-based training can improve fitness not only through physical intensity, but also through enjoyable participation that encourages students to remain active throughout the session.

These findings suggest that game-based training has practical value for physical education teachers. In school settings, teachers often face challenges related to low student motivation, limited participation, and differences in students' movement abilities. Game-based training can be used as an alternative instructional strategy because it combines skill development, fitness improvement, and psychological engagement in one learning process. This approach is also suitable for junior high school students because it matches their developmental needs for movement exploration, social interaction, and enjoyable learning.

However, this study has several limitations. The intervention period was relatively short, so the long-term effects of game-based training on motor competence, motivation, and physical fitness could not be fully examined. The sample was also limited to junior high school students in Makassar, which may restrict the generalizability of the findings to other regions or age groups. In addition, this study focused on selected fitness components, namely endurance, strength, and agility, while other variables such as balance, flexibility, coordination, and psychological well-being were not examined in detail.

Future research should use longer intervention periods, larger samples, and more diverse school contexts. Further studies are also recommended to compare different types of game-based models, such as small-sided games, cooperative games, traditional games, and sport-specific modified games. In addition, future research should examine how game-based training affects long-term physical activity habits, enjoyment, social skills, and students' confidence in participating in physical education. Overall, the findings of this study indicate that game-based training can be an effective and student-centered approach to improving physical and psychological outcomes in school physical education.

Conclusion

Game-based training significantly improves motor competence, motivation, and physical fitness among junior high school students in Makassar, Indonesia. This approach offers an effective alternative to conventional physical education because it combines enjoyable learning activities with movement skill development and fitness improvement.

Therefore, physical education teachers are encouraged to integrate game-based strategies into learning programs to increase student engagement, active participation, and overall physical performance.

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