Jurnal Pendidikan Jasmani (JPJ)
Vol. 6, No.3, April 2026
ISSN: 2723-2816 (Online)

The Effect Of Game-Based Learning Methods On The Improvement Of Students' Physical Fitness At Smp Negeri 4 Bantimurung

Fachrul Anam[1], Syahruddin[2], Juhanis[3]
[1,2,3] Physical Education and Sports, Makassar State University, Jalan Bonto Langkasa, Banta-Bantaeng, Rappocini, Banta-Bantaeng, Rappocini District, Makassar City, South Sulawesi, 90222., Indonesia

ABSTRACT
This study aimed to examine the effect of game-based learning methods on improving the physical fitness of ninth-grade students at SMP Negeri 4 Bantimurung. The background of this study was based on the low level of students' physical fitness, which was influenced by limited effective physical activity and the use of conventional learning methods that tend to be monotonous and less engaging in Physical Education (PJOK) classes. This study employed a quasi-experimental method with a two-group pretest–posttest design. The research sample consisted of 30 male students aged 14–15 years, who were divided into an experimental group and a control group. Physical fitness was measured using the Progressive Aerobic Cardiovascular Endurance Run (PACER) test. The results showed that the experimental group that received game-based learning treatment experienced a significant improvement in physical fitness, with a mean increase of 3.68. Meanwhile, the control group, which received conventional learning, also showed an improvement, but with a lower mean increase of 0.89. Statistical analysis using paired-sample t-tests and independent-sample t-tests indicated a significant difference in physical fitness improvement between the two groups ($p < 0.05$).

Keywords: *Game-Based Learning, Physical Fitness, Junior High School Students*

Correspondence author: Fachrul Anam/Syahruddin/Juhanis, Bina Guna College of Sports and Health, Indonesia.
Email: anamfachrul2@gmail.com

INTRODUCTION

Physical, cognitive, social, and affective learning are positioned as the legitimate learning outcomes of physical education (Casey et al., 2019). Education is a conscious effort made by teachers to students through guidance, learning or training. The impact that education will have is the change in mindset for human students to solve and face current and future challenges (Syahruddin, 2020).

Physical education has a strategic role in shaping healthy, active, and characterful individuals through planned and sustainable physical activity. One of the main goals of physical education in schools is to improve the physical fitness of students as an important prerequisite for health, learning readiness, and productivity of daily activities. However, in the practice of PJOK learning at the junior high school level, there is still a low level of physical fitness of students which is influenced by the lack of effective physical activity, the increase in

sedentary lifestyle, and the use of conventional learning methods that are less varied and less attractive to students.

When people don't understand the importance of physical fitness, they tend to lead a less active lifestyle and pay less attention to important aspects such as a healthy diet. This can increase the risk of chronic diseases such as heart disease, diabetes, and obesity (Irvan et al., 2024). According to Nurliana in (Burhanuddin et al., 2024) Lack of physical activity, poor eating habits, as well as a lack of understanding of the importance of balanced nutrition, are often major factors that lead to health problems such as obesity, malnutrition, and decreased academic performance. Poor physical fitness will affect the physical appearance and mind of students who are not ready or are no longer able to accept the workload in the form of learning activities, which is an obligation for students or someone every day, and still have the remaining energy that can be used to fill their free time. (Jumila et al., 2024)

According to the World Health Organization in (Hudain et al., 2025) Physical fitness is defined as a person's ability to carry out physical activities optimally without experiencing excessive fatigue. This fitness includes various aspects, such as muscle strength, cardiovascular endurance, flexibility, balance and coordination. According to OsmanİmamoğIu in (Hudain et al., 2023) Exercise is a form of physical activity that has many benefits for the body, one of which is the body being healthy and fit.

The benefits of physical fitness exercise are as follows: prevent heart disease, prevent and manage diabetes, lower high blood pressure, increase intelligence, give a lot of energy, reduce symptoms of mild depression and anxiety, lower the risk of certain cancers, protect against osteoporosis, improve self-image and confidence and make you younger. There are several factors that affect a person's physical fitness, including: adequate and nutritious food. The function of food in the body is to get energy, substances that build body cells, increase immunity, and for the smooth running of all kinds of processes that occur in the body. These functions can be fulfilled if the food consumed is sufficient in quantity to obtain energy, sufficient nutritional value and metabolic stability in the body. Regular, healthy and continuous lifestyle habits will be able to affect a person's level of physical fitness. These habits include eating, bathing regularly, washing hands before and after meals, brushing teeth, clean living habits and others, including avoiding the habit of smoking, drinking alcohol and consuming drugs. (Jamil et al., 2018)

Various studies in the past decade have shown that innovatively designed physical education learning is able to increase student engagement and have a positive impact on physical fitness. The game-based learning approach was reported to be effective in increasing

students' motivation, physical activity intensity, and enjoyment during PJOK learning (Pill & Hastie, 2016). In addition, game-based learning also contributes to improving students' cardiorespiratory fitness and social skills (Nicolosi & Ancona, 2020). Systematic studies and meta-analyses in the last ten years have also confirmed that physical activity packaged in the form of games is able to increase student participation and result in improved physical fitness compared to traditional approaches (Warburton & Bredin, 2019) (Mo et al., 2024). However, most of the research is still conducted in a general context or outside of a specific school setting, and there has not been much empirical study of its effectiveness in the context of local junior high schools.

Although game-based learning has been extensively researched, there is a research gap related to empirical evidence for its application in PJOK learning at the junior high school level, especially those that specifically measure improvement in physical fitness using standardized fitness instruments such as the PACER test. In addition, there is still limited research that directly compares the effectiveness of game-based learning with conventional learning in the context of public schools in the region. Therefore, this study has novelty in the application of structured game-based learning methods in PJOK learning and testing its effect experimentally on improving the physical fitness of junior high school students.

METHODS

This study used a quasi-experimental design with a two-group pretest–posttest design pattern. Two groups were used, namely the experimental group that was given game-based learning and the control group that received conventional learning. Physical fitness measurements were carried out before and after treatment to determine the influence of the learning methods applied.

The research was carried out at SMP Negeri 4 Bantimurung, Maros Regency, in October–November 2025. According to Sugiyono in (Sulnawir et al., 2020) Population is a generalized area consisting of: objects/subjects that have certain qualities and characteristics that are applied by researchers to be studied and then drawn conclusions. According to Creswell, John W, in (Nurdin, 2022) stating "A Population is a group of individuals who have the same characteristics". According to Sugiyono in (Nurdin, 2022), "Population is a generalized area consisting of: objects/subjects that have certain qualities and characteristics that are determined by the research to be studied and then conclusions are drawn".The population of this study is all male students in grade IX which totals 113 students. The research sample consisted of 30 male students aged 14–15 years who were selected using purposive

sampling based on the criteria of actively participating in PJOK learning and having no history of injury.

According to Rusdiana in (Saputra & Hartati, 2024) PACER *Test* is a measure of cardiovascular endurance using a back-and-forth run at a distance of 20 meters. Physical fitness was measured using the Progressive Aerobic Cardiovascular Endurance Run (PACER) test, which focuses on the cardiorespiratory endurance component. Scores are obtained from the number of levels and reversals that students achieve. Measurements are carried out at the pretest and posttest stages with the same procedure.

Data were analyzed descriptively and inferentially. Descriptive analysis is used to describe the characteristics of the data, while inferential analysis is carried out after the data meets the normality and homogeneity tests. Hypothesis testing was performed using paired t-tests to see the difference between pretest and posttest and unpaired t-tests to compare physical fitness improvements between the experimental group and the control group. All analyses were carried out at a significance level of 0.05

RESULTS AND DISCUSSION

Results

The data presented in this study is Processed Results Data, not raw data. The results of measuring students' physical fitness were obtained through tests PACER At the pretest and posttest stages, then it is analyzed statistically descriptive and inferential. A summary of the results of the students' physical fitness measurements in the experimental group and the control group is presented in the form of Table.

Table 1. Descriptive Statistics Summary

	Experiments		**Controls**	
Statistics	**Pretest**	**Posttest**	**Pretest**	**Posttest**
Number of samples	16	16	16	16
Average (Mean)	**35,06**	**38,74**	**36,19**	**37,03**
Standard deviation (SD)	**4,05**	**3,09**	**3,72**	**3,38**
Minimum score	26,4	33,2	26,4	29,1
Maximum value	40,2	42,9	41,5	41,8
Median	35,9	38,9	36,8	38,0

Descriptively, the average score of the experimental group's pretest results was **35.06**, while the average posttest score increased to **38.74**. Thus, there was an average increase of +3.68 after the application of the game-based learning method. This increase shows the development of students' cardiorespiratory endurance as a result of learning activities that emphasize elements of active play and continuous movement.

In addition, the standard deviation values in the posttest experimental group tended to be smaller than those of the pretest, indicating that the improvement in physical fitness occurred relatively evenly in most students. This shows that game-based learning methods are not only effective for certain students, but also have an overall positive impact.

Meanwhile, the control group also consisted of 16 students participating in PJOK learning using conventional methods. The results of the PACER test measurements showed that the control group also experienced an improvement in physical fitness, but the increase was relatively small compared to the experimental group.

The average pretest score of the control group was **36.19**, while the average posttest score increased to **37.03**. Thus, the average increase that occurred in the control group was only +0.84. This increase shows that PJOK activities in general still contribute to the physical fitness of students, even without the application of game-based learning methods.

Table 2. Pretest Normality Test Results (Shapiro–Wilk)

Groups	**Shapiro-Wilk Statistics**	**df**	**Sig. (p-value)**
Experiments	0,927	16	0,221
Controls	0,944	16	0,199

Based on table 2, the results of the normality test using Shapiro–Wilk show that the significance value of the experimental group is 0.221 and the control group is 0.199. Since the significance value of both groups was greater than 0.05, it can be concluded that the physical fitness pretest data in the experimental and control groups were normally distributed.

Table 3. Results of the Pretest Homogeneity Test (Levene's Test)

Levena Statistic	**df1**	**df2**	**Sig.**
0,591	1	30	0,448

Based on table 3, the results of the variance homogeneity test using Levene's Test showed a significance value of 0.448 with a degree of freedom df1 = 1 and df2 = 30. The df1 value is obtained from the number of groups minus one, while df2 is obtained from the number of all samples minus the number of groups. Since the significance value is greater than 0.05, it can be concluded that the variance of the data of the two groups is homogeneous. With the fulfillment of the assumption of data normality, the next analysis can use a parametric statistical test, namely the Paired Sample t-test.

Table 4. Results of Paired Samples t-Test

Data Pairs	Mean Difference	t	df	Sig. (2-tailed)
Posttest-Pretest	3,68	10,213	15	0,000

Based on table 4, the results of the paired t-test showed a calculated t-value of 10.213 with a degree of freedom (df) of 15 and a significance value of 0.000. Because the significance value was less than 0.05, it can be concluded that there was a significant difference between the pretest and posttest values of physical fitness in the experimental group. Thus, the treatment provided had a significant effect on improving the physical fitness of students in the experimental group.

Table 5. Paired Samples t-Test Results

Data Pairs	Mean Difference	t	df	Sig. (2-tailed)
Posttest-Pretest	0,83	3,808	15	0,002

Based on table 5, the results of the paired t-test in the control group showed a calculated t-value of 3.808 with a degree of freedom (df) of 15 and a significance value of 0.002. Because the significance value was less than 0.05, it can be concluded that there was a significant difference between the pretest and posttest values of physical fitness in the control group. Nevertheless, the improvement that occurred in the control group was smaller compared to the experimental group.

So, the results of the paired t-test in the experimental group and the control group, both experienced an improvement in physical fitness. However, the improvement in the experimental group was greater than in the control group, so it can be concluded that the treatment of the game-based learning method given had a more effective effect on improving physical fitness.

Table 6. Descriptive Statistics of Physical Fitness Difference (Gain Score)

Groups	N	Red	Std. Deviation	Minimum	Maximum
Experiments	16	3,68	1,44	1,10	6,80
Controls	16	0,89	1,04	-1,30	3,70

Based on Table 6, it is known that the average physical fitness gain score of the experimental group was 3.68 with a standard deviation of 1.44. Meanwhile, the control group had an average difference of 0.89 with a standard deviation of 1.04. This suggests that the improvement in physical fitness in the experimental group was greater than in the control group.

Table 7. Results of the Variance Homogeneity Test (Levene's Test)

Living Statistic	df1	df2	Sig.
3,582	1	30	0,068

The results of the variance homogeneity test using Levene's Test showed a significance value of 0.068. Since the significance value is greater than 0.05, it can be concluded that the variance of physical fitness difference data between the experimental group and the control group is homogeneous. Therefore, the analysis of the unpaired t-test can be continued using the assumption of the same variance.

Table 8. Independent Samples t-Test Results

Test Type	t	df2	Sig. (2-tailed)
Independent Samples t-Test	6,279	30	0,000

Based on table 8, the results of the unpaired t-test showed a calculated t-value of 6.279 with a degree of freedom (df) of 30 and a significance value of 0.000. Since the significance value was less than 0.05, it can be concluded that there was a significant difference in physical fitness improvement between the experimental group and the control group. Thus, the treatment given to the experimental group was shown to be more effective in improving physical fitness compared to the control group.

Discussion

The data presented in this study is statistical processed data, not raw data. The results of the measurement of student physical fitness obtained through the PACER test have been summarized in the form of descriptive and inferential statistical tables, which contain the average score, standard deviation, and results of the difference test between groups. The presentation of data in tabular form is intended to make it easier for readers to understand the difference in physical fitness improvement between the experimental group and the control group.

The study's key findings showed that students who participated in game-based learning experienced a higher improvement in physical fitness than students who participated in conventional learning. The increase is clearly seen from the difference between pretest and posttest scores which are statistically significant. In contrast, the control group also experienced improved physical fitness, but to a lesser extent. These findings suggest that differences in learning methods contribute to variations in students' improved physical fitness.

The greater improvement in physical fitness in the experimental group can be explained through the basic concept of physical fitness that emphasizes the importance of intensity, duration, and continuity of physical activity. Game-based learning allows students to engage in repetitive, varied, and continuous physical activity without excessive psychological stress. Game activities that involve running, changes of direction, and group work create an exercise stimulus that supports increased cardiorespiratory endurance.

The results of this study support the hypothesis that game-based learning methods are more effective than conventional learning in improving students' physical fitness. Physiologically, game activities promote increased heart and lung work through natural interval motion patterns, which are known to be effective in increasing aerobic capacity. These findings are in line with the concept of physical fitness put forward by (Warburton & Bredin, 2019) emphasizing that physical activity that is done in a fun and repetitive manner has a significant impact on improving cardiovascular fitness.

In addition to the physiological aspect, game-based learning also contributes to the psychological aspect of students. The elements of fun and healthy competition in the game increase students' intrinsic motivation to be actively involved in learning. This reinforces the assumption that student active involvement is a key factor in the success of improving physical fitness, as described in the study (Santos & Hudain, 2020) and (Kumara et al., 2024) listed in the thesis bibliography.

(Pill & Hastie, 2016) report that game-based physical education learning is able to increase the intensity of students' physical activity as well as their involvement during the learning process. Similar results were also found by (Nicolosi & Ancona, 2020) which states that game-based learning and group work have a positive impact on the physical and affective aspects of students.

(Santos & Hudain, 2020) specifically shows that the game-based learning model is effective in improving the physical fitness of junior high school students, which reinforces the results of this study in the context of physical education in Indonesia. In addition, the meta-analysis carried out (Mo et al., 2024), as cited in the thesis, confirms that game-based physical education programs significantly improve the cardiorespiratory fitness of children and adolescents. No previous research results were found in the thesis file that directly contradicted the findings of this study. The differences are more related to the variety of research subjects, the duration of treatment, and the type of game used. Thus, the results of this study are not only consistent with previous research, but also reinforce the empirical evidence that game-based

learning is an effective and relevant approach to improving the physical fitness of junior high school students.

CONCLUSION

Based on the results of research and data analysis that has been carried out, it can be concluded that the game-based learning method has a significant effect on improving the physical fitness of SMP Negeri 4 Bantimurung students. Students who follow game-based learning show a higher increase in physical fitness compared to students who follow conventional learning. In addition, the application of game-based learning has been shown to be more effective in improving physical fitness, especially in the cardiorespiratory endurance component. These findings confirm that differences in learning methods make a real contribution to the variation in improving students' physical fitness. Conceptually, the results of this study strengthen the understanding that physical education learning that integrates elements of active and structured play can be an effective learning approach in improving the physical fitness of students at the junior high school level.

THANKS

Thank you to SD Bina Guna, Medan City, for allowing us to collect data so that this research can run well.

REFERENCES

Burhanuddin, S. … Awaluddin. (2024). Peningkatan Kesadaran Kebugaran Jasmani dan Status Gizi pada Siswa Sekolah Dasar di Kota Makassar. *MALLOMO: Journal of Community Service*, *4*(2), 236–242. https://jurnal.umsrappang.ac.id/mallomo/index

Casey … A, V. (2019). Can cooperative learning achieve the four learning outcomes of physical education ? A review of literature. *National Association for Kinesiology in Higher Education (NAKHE)*, 0–35.

Hudain, M. A. … Awal, A. (2025). Perbandingan Kebugaran Jasmani dan Indeks Massa Tubuh : Analisis Dampaknya terhadap Kesehatan. *Journal of Physical Education, Sport and Recreation*, *9*(1), 82–88.

Hudain, M. A. … Hita, D. (2023). Investigation of nutritional status, VO2max, agility, speed, and strength: A cross-sectional study in basketball athletes. *Jurnal Sport Area*, *8*(2), 261–271.

Irvan … Syafruddin, M. A. (2024). LITERA ABDI : Jurnal Pengabdian Masyarakat Sosialisasi Pemahaman Masyarakat Tentang Kebugaran Jasmani Menghadapi SNBT Fakultas Ilmu Keolahragaan dan Kesehatan Universitas Negeri Makassar Info Artikel Abstrak PENDAHULUAN Seleksi Nasional Berdasarkan Tes (. *Jurnal Pengabdian Masyarakat*, *2*, 32–39. https://doi.org/https://journal.mediazayna.org/index.php/literaabdi/index

Jamil, A. H. Al … Sugihartono, T. (2018). Analisis Tingkat Kebugaran Jasmani Siswa Pendidikan Pondok Pesantren di Kota Bengkulu. *Jurnal Ilmiah Pendidikan Jasmani*, *2*(1), 118–125.

Jumila … Riyoko, E. (2024). Peningkatan Kebugaran Jasmani Melalui Modifikasi Permainan Kecil Pada Siswa SMP Paramount School. *Jurnal Ilmu Pendidikan*, *1*(3), 240–248.

Kumara, A. D. … Sanusi, A. (2024). Pengembangan Model Pembelajaran Kebugaran Jasmani Komponen Kekuatan Dan Kelenturan Berbasis Permainan "Pkk" Siswa Kelas Viii Smpn 1 Malang. *Jurnal Pedagogik Olahraga*, *10*(2), 429–436.

Mo, W. … He, Y. (2024). Effects of game - based physical education program on enjoyment in children and adolescents : a systematic review and meta - analysis. *BMC Public Health*, 1–20. https://doi.org/10.1186/s12889-024-18043-6

Nicolosi, S., & Ancona, A. (2020). Effects of Cooperative Learning Model on Early Adolescents ' Social and Affective Learning Outcomes in Physical Education. *Scientific Research Publishing*, *November*, 378–390. https://doi.org/10.4236/ape.2020.104031

Nurdin, I. (2022). *Peningkatan Kebugaran Jasmani Melalui Pendidikan Jasmani Berbasis Permainan Tradisional Untuk Mengurangi Resiko Stunting Pada Siswa Putri di SMPN 2 Labakkang Kab. Pangkep*.

Pill, S., & Hastie, P. (2016). Researching Sport Education Appreciatively Shane. *European Journal of Educational Research*, *5*(4), 189–200. https://doi.org/10.12973/eu-jer.5.4.189

Santos, H. A. Dos, & Hudain, A. (2020). Efektifitas Model Pembelajaran Berbasis Permainan Untuk Pengembangan Kebugaran Jasmani. *Jurnal Olahraga Dan Kesehatan Indonesia*, *1*(1), 46–52.

Saputra, B. R., & Hartati, S. C. Y. (2024). Penerapan Permainan Kecil dalam Pembelajaran PJOK untuk Meningkatkan Kebugaran Jasmani Siswa. *Jurnal Pendidikan Tambusai*, *8*, 27428–27435.

Sulnawir … Usman, H. A. (2020). Analisis motivasi belajar terhadap hasil belajar pendidikan jasmani di sma negeri 9 makassar. *Journal of Sport and Physical Education*, *1*(1), 78–85.

Syahruddin. (2020). *Permainan Bombardir Dalam Pembelajaran Pendidikan Jasmani*.

Warburton, D. E. R., & Bredin, S. S. D. (2019). Health Benefits of Physical Activity : A Strengths-Based Approach. *Clinical Medicine*, 1–15. https://doi.org/10.3390/jcm8122044