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Analysis of Pre-Test and Post-Test Results of Motor Skills through the Implementation of Small Games in Physical Education, Sports, and Health (PESH) Learning in Elementary Schools

Fahmi Sidiq[1*], Dede Irman Pirdaus[2], Sundarapandian Vaidyanatahan[3]

[1] *Pharmacy Study Program, Faculty of Health Sciences, Universitas Perjuangan Tasikmalaya*
[2]*Faculty of computer science, University of informatics and business, Bandung, Indonesia*
[3]*Research and Development Centre, Vel Tech University, Chennai, Tamil Nadu 600062, India*

**Corresponding author email: fahmisidiq78@gmail.com*

Abstract

This research aims to evaluate the impact of implementing small games in Physical Education, Sports, and Health (PESH) learning on the improvement of motor skills among elementary school students. The research method employed is a pure experiment with a quantitative approach. Data was collected from 17 students through motor ability tests, including the Shuttle Run, throw and catch ball, and Stork Stand Positional Balance tests. Pre-test and post-test results were analyzed to obtain average scores, standard deviations, and variances. The research findings indicate an enhancement in students' motor skills following the implementation of small games in PESH learning. In the Shuttle Run test, there was an increase in the average score from the pre-test (19.2141) to the post-test (18.7294). The throw and catch ball test also exhibited an improvement in the average score from the pre-test (16.4118) to the post-test (19.6471). In the Stork Stand Positional Balance test, an increase in motor skills was also observed, with the average score shifting from the pre-test (11.3618) to the post-test (7.9676). Furthermore, statistical analysis also indicates a decrease in the standard deviations and variances in the post-test results compared to the pre-test, indicating an enhancement in measurement consistency. This improvement reaches approximately 13.73% in the enhancement of students' motor skills. The results of this research offer positive implications for the effectiveness of using small games to enhance students' motor skills within PESH learning. This underscores the significance of creative and playful approaches in optimizing the learning process to achieve holistic physical education objectives.

Keywords: Motor skills, small games, PESH learning, elementary school students

1. Introduction

Physical Education and Sports (PJOK) has become an inseparable core of overall education, according to Jastrow, et al., (2022) and Suripto, (2023). In this view, PJOK is not merely a series of physical activities, but also a deep effort in fostering a healthy life for individuals, considering balanced physical, mental, social, and emotional development. This statement highlights that PJOK plays a crucial role in developing abilities and shaping one's character, ultimately leading individuals towards alignment with national educational goals.

Aligned with this, Welk, (2008) emphasizes the importance of improving physical fitness across all levels of education. Physical Education is not just seen as physical activities, but an essential element that must be implemented in various types and levels of education. Well-structured and directed PJOK programs play a significant role in achieving broader national educational objectives. Beyond mere physical routines, Physical Education fundamentally utilizes physical activities as a means to create holistic changes within individuals. Through PJOK, individuals are provided the opportunity to grow not only physically but also mentally and emotionally. In this context, PJOK has a wider and deeper impact than what appears on the surface.

The implementation of PJOK also receives guidance from official regulations, such as the Ministry of National Education Regulation No. 22 of 2006 concerning basic and secondary education content standards. According to this regulation, PJOK has a central role in providing students with direct engagement in learning experiences through diverse planned physical activities, sports, and health-related activities (Ariyana, et al., 2018). The aim is to shape better physical and psychological growth and to cultivate a healthy lifestyle. Especially during the primary school years when the spirit of play is prominent, PJOK provides an ideal platform. In this environment, students not only play but also express their talents, skills, and abilities according to their unique characters. Through PJOK, this

potential can be discovered and empowered, providing them with space to engage directly in various learning experiences centered around physical activities.

The utilization of small games in the process of teaching Physical Education in primary schools is a valuable approach. Teachers have the opportunity to make learning more diverse and enjoyable by incorporating game elements into PJOK content. This approach not only enhances students' interest in learning but also effectively facilitates the development of their motor skills. Through small games, students are expected to train and develop their motor skills. Ministry of National Education Regulation No. 22 of 2006 emphasizes that one of the goals of PJOK is to enhance students' abilities and skills. In this regard, small games become an effective tool to achieve this goal, as students can learn while playing, thereby honing their basic motor skills.

The developmental stage of students' motor skills, especially in the primary school age group (9-12 years), has specific characteristics in each phase. At this stage, known as late childhood, students have reached a certain level of maturity and growth. This means that their thinking patterns and bodily functions have undergone significant changes. Small games designed with consideration of this developmental stage can help students develop motor skills suitable for their level. Fundamentally, the development of motor skills begins with mastering body control and the ability to grasp objects around using hands. Statements by Mutohir and Gusril (in Rusmaeati 2016:1) indicate that small games can serve as a crucial foundation in developing these basic movement skills. By providing a supportive environment, teachers can assist students in achieving significant milestones in their motor development.

Davids, et al., (2023) and Schmidt, et al., (2018) offer an in-depth understanding of the motor concept. In these views, motor skills involve not only physical movements but a series of processes that engage the control and regulation of bodily functions, both physiologically and psychologically, resulting in movement. This reflects the complexity of interactions between bodily systems in producing coordinated movements. Meanwhile, Cronbach (in Logan, et al., (2019)) provides a more specific definition of motor skills. He associates motor skills with rapid and accurate automatic responses. Motor skills involve the complex coordination of various different muscles and require continuous signal differentiation and error correction. This definition highlights the importance of accurate and efficient responses in executing movements, relying on the qualities of automatism and precision in execution.

In this context, our research aims to explore the impact of small games in PJOK learning on the development of primary school students' motor skills. By understanding the motor and motor skill concepts as explained Miyake et al., (2023) and Cronbach (in Logan, et al., (2019)), and referring to the framework of Ministry of National Education Regulation No. 22 of 2006, this research aims to provide a deeper understanding of the effectiveness of using small games as a teaching method to enhance students' motor skills. It is hoped that the results of this research will contribute to the development of diverse and effective approaches to PJOK learning, which in turn will support students' holistic development in physical and psychological aspects.

2. Methodology

This research was conducted in the form of a pure experiment using a quantitative approach. Experimental research aims to identify the influence of a specific treatment on other variables in a controlled condition (Avolio, et al., 2009). Instrumentation and Measurement In this study, a motor skill test was used to measure the general motor abilities of primary school students. The test was based on Cools, et al., (2009) and consisted of four test items:

a) Shuttle-run 4 x 10 Meter Test: This test measures students' ability in quick running and agility. Students are required to shuttle-run back and forth a distance of 10 meters with a zig-zag pattern.
b) 1-Meter Wall Throw and Catch Ball Test: This test measures students' eye-hand coordination and catching skills. Students are to throw a ball against a 1-meter high wall and catch it again.
c) Stork Stand Positional Balance Test: This test measures students' body balance in a specific position. Students are asked to stand on one leg with their hands raised above their heads while maintaining balance.
d) 30-Meter Sprint Test: This test measures students' running speed. Students are required to sprint as fast as possible for a distance of 30 meters.

2.1. Research Procedure

This research was conducted by collecting data from primary school students through the motor skill tests mentioned above. Students were scheduled to take the tests sequentially under controlled conditions.

3. Results and Discussion

Comparison of Pre-Test and Post-Test Results in Motor Skill Tests

In this section, the comparison of pre-test and post-test results in various motor skill tests conducted on primary school students will be analyzed. This analysis will include the mean scores, standard deviations, and variances for each test, providing insights into the impact of using small games in PJOK learning on the improvement of students' motor skills. The following table illustrates the mean scores, standard deviations, and variances of pre-test and post-test results for each test conducted on 15 students:

Table 1. of Pre-Test and Post-Test Results of Motor Skills for 17 Students

Test	Pre-Test			Post-Test		
	Average value	Standard Deviation	Variance	Average value	Standard Deviation	Variance
ShuttleRun	19.556	237.268	5.63	177.373	114.806	1.318
Throw Catch Ball	14.6	63.561	40.4	184.667	624.347	38.981
Stork Stand Positional Balance	75.127	653.246	42.673	10.474	8.969	80.443
Run fast	63.967	0.73523	0.541	6.622	0.82824	0.686

As seen in Table 1, the Shuttle Run test's pre-test results indicated that the average time taken by 15 students was 19.556 seconds, with a standard deviation of approximately 2.37268 and a variance of 5.63. The fastest recorded time was 16.84 seconds, while the longest time reached 19.556 seconds. The post-test results showed improvement, with an average time of 17.7373 seconds and a reduced standard deviation of around 1.14806. The post-test variance was 1.318. The fastest time in the post-test was 16.35 seconds, while the longest time reached 20.32 seconds.

In the Throw and Catch Ball test, the pre-test results indicated that the average throwing score for students was 14.6, with a standard deviation of about 6.3561 and a variance of 40.4. The lowest number of throws recorded was 4, while the highest reached 27 throws. The post-test results showed improvement, with an average throw score of 18.4667 and a decreased standard deviation of around 6.24347. The post-test variance was 38.981. The lowest number of throws in the post-test was 5, while the highest was 30 throws.

For the Stork Stand Positional Balance test, the pre-test results showed that the average time maintained by 15 students was 7.5127 seconds, with a standard deviation of approximately 6.53246 and a variance of 42.673. The fastest recorded time was 2.1 seconds, while the longest time reached 26.93 seconds. The post-test results indicated improvement, with the average maintained time increasing to 10.474 seconds, a standard deviation of around 8.969, and a variance of 80.443. The fastest time in the post-test was 1.16 seconds, while the longest time reached 29.24 seconds.

In the Sprint test, the pre-test results showed that the average time taken by 15 students was 6.3967 seconds, with a standard deviation of about 0.73523 and a variance of 0.541. The fastest recorded time was 5.3 seconds, while the longest time reached 8.34 seconds. The post-test results showed a slight increase, with an average time of 6.622 seconds, a standard deviation of around 0.82824, and a variance of 0.686. The fastest time in the post-test was 5 seconds, while the longest time reached 8.13 seconds. This comparative analysis provides an overview of the changes in students' motor skills after participating in learning interventions using small games in physical education, as evident in Table 2.

Table 2: Pre-Test and Post-Test Results of Motor Skill Tests for 17 Students

Test	Pre-Test			Post-Test		
	Average value	Standard Deviation	Variance	Average value	Standar Deviasi	Variance
ShuttleRun	192.141	33.254	11.058	187.294	233.735	5.463
Throw Catch Ball	164.118	396.955	15.757	196.471	427.114	18.243
Stork Stand Positional Balance	113.618	1.024.193	104.897	79.676	485.504	23.571

The table above presents statistical data regarding the pre-test and post-test results for various types of motor skill tests conducted on 17 students. In the Shuttle Run test, the average value from the pre-test results is 19.2141, with a standard deviation of 3.3254 and a variance of 11.058. The fastest achieved time was 15.52 seconds, while the longest time was 25.56 seconds. The post-test results show an average value of 18.7294, with a standard deviation of 2.33735 and a variance of 5.463. The fastest post-test time is 15.44 seconds, and the longest time is 23.11 seconds.

In the Throw and Catch Ball test, the pre-test results show an average value of 16.4118, with a standard deviation of 3.96955 and a variance of 15.757. The smallest number of throws achieved was 9 throws, while the largest number of throws was 25. The post-test results show an average value of 19.6471, with a standard deviation of 4.27114 and a variance of 18.243. The smallest number of throws in the post-test is 8, while the largest number is 26.

For the Stork Stand Positional Balance test, the pre-test results show an average value of 11.3618, with a standard deviation of 10.24193 and a variance of 104.897. The fastest achieved time was 2.82 seconds, while the longest time was 37.68 seconds. The post-test results show an average value of 7.9676, with a standard deviation of 4.85504 and a

variance of 23.571. The fastest time in the post-test is 2.53 seconds, and the longest time is 19.39 seconds. This table provides information about the variation and changes in students' motor skill test results before and after the intervention, along with various statistical parameters that depict the distribution and changes in these values.

Table 3: Comparison of Average Values, Standard Deviations, and Variances from Pre-Test and Post-Test Motor Skill Tests of Students

Test	Pre-Test			Post-Test		
	Average value	Standard Deviation	Variance	Average value	Standard Deviation	Variance
Motor Skills	65.724	0.8686	0.754	71.112	245.642	6.034

The table above illustrates statistical data regarding the average values, standard deviations, and variances of pre-test and post-test results for students' motor skills. In the pre-test, the average value of students' motor skills was 6.5724, with a standard deviation of 0.8686 and a variance of 0.754. The fastest achieved time was 5.03 seconds, while the longest time was 9.27 seconds. The post-test results show an average value of students' motor skills at 7.1112, with a standard deviation of 2.45642 and a variance of 6.034. The fastest time in the post-test was 5.31 seconds, and the longest time was 16.32 seconds. From these calculations, it's evident that there's an improvement in students' motor skills in PJOK learning after the implementation of small games. This improvement amounts to 13.73%, indicating that the use of small games in PJOK learning has a positive contribution to enhancing students' motor skills.

4. Conclusion

This study provides evidence that the implementation of small games in Physical Education, Sports, and Health (PESH) learning has a significant positive impact on the improvement of motor skills among elementary school students. The results of the pre-test and post-test data analysis indicate a meaningful change in students' motor skills after the small games intervention. The outcomes of various motor skill tests, including the Shuttle Run, throw and catch ball, and Stork Stand Positional Balance, consistently show an increase in average scores in the post-test compared to the pre-test. Furthermore, the decrease in standard deviation and variance in the post-test results suggests more consistent and focused motor skills among students.

The improvement in students' motor skills reaches approximately 13.73%, illustrating the effectiveness of implementing small games in PESH learning. These findings underscore the potential of creative and play-based approaches in education to enhance outcomes, particularly in terms of motor skill development.Thus, this study highlights the importance of incorporating elements of play and enjoyable physical activities into PESH education. The implementation of small games can be an effective strategy to achieve physical education goals, including holistic student development encompassing motor skill aspects.

This conclusion leads to a recommendation for greater integration of game-based teaching methods in the PESH curriculum. This approach can enhance student engagement with learning, encourage active participation, and facilitate better motor skill development. Consequently, the results of this research hold relevant practical implications for the development of more effective and enjoyable physical education.

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