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The Effectiveness of Motion Exploration Learning Media in Training Basic Locomotor Movements of Elementary School Students

Rahma Dewi[1*], Indra Kasih[2], Efrida Eriani Hasibuan[3], Muhammad Reza Destya[4], Bessy Sitorus Pane[5]

[1,2,3,4,5]Universitas Negeri Medan, Fakultas Ilmu Keolahragaan, Jl. Williem Iskandar Pasar IV, Sumatera Utara, 20371, Indonesia

e-mail: rahmadewi@unimed.ac.id, indrakasih@unimed.ac.id, efridaerianihsb@gmail.com, mrezadestya1@unimed.ac.id, bessyfik@unimed.ac.id

Abstract

This study was motivated by the low level of fundamental locomotor skills among elementary school students, which was influenced by the limited variation and innovation in physical education learning media. The study aimed to examine the effectiveness of movement exploration learning media in improving students' locomotor skills. A quantitative experimental method with a pretest and posttest control group design was employed. The participants consisted of 30 elementary school students who were divided into an experimental group and a control group. The instrument used was a locomotor skill test covering walking, running, jumping, and hopping. Data were analyzed using statistical tests to compare improvements between groups. The results showed a significant increase in locomotor skills in both groups, with the experimental group demonstrating higher improvement than the control group. The findings indicated that movement exploration learning media effectively enhanced students' active participation and improved learning outcomes in physical education. The novelty of this study lies in the application of exploration based learning media that provides contextual and enjoyable movement experiences for elementary school students.

Keywords: learning media, movement exploration, locomotor skills, physical education, elementary school

corresponding author: rahmadewi@unimed.ac.id

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A. Introduction

Physical education in elementary schools plays a strategic role in building the foundation for students' motor, cognitive, and affective development through structured and meaningful physical activity. One essential component of physical education learning is mastery of basic locomotor movements, such as walking, running, jumping, and hopping, which form the foundation for the development of more complex motor skills [1], [2]. During elementary school, these skills are at a crucial stage of development, so appropriate learning interventions will significantly determine the quality of students' motor development in the future [3].

However, various phenomena in the field indicate that elementary school students' basic locomotor skills have not yet developed optimally [4], [5], [6], [7]. This low achievement is inseparable from learning practices that are still dominated by conventional approaches, which tend to be instructional, lack variety, and minimize active student involvement. This condition indicates a mismatch between the learning characteristics applied and children's developmental needs, which essentially require active, exploratory, and enjoyable learning experiences. As a result, the learning process is less effective in stimulating the optimal development of students' basic motor skills [8], [9], [10], [11].

In the context of 21st-century education, learning is required to be more innovative, student-centered, and capable of creating meaningful learning experiences. Learning media plays a crucial role in bridging these needs, particularly in physical education, which emphasizes physical activity as the core of learning. Appropriately designed learning media serves not only as a tool but also as a means to increase student motivation, engagement, and the quality of interaction in the learning process. Therefore, innovative learning media are needed that can integrate elements of physical activity, movement exploration, and contextual learning experiences [12], [13], [14], [15].

One approach that has the potential to address these needs is movement exploration learning media, which is an exploratory activity-based medium designed to encourage students to move actively, creatively, and interactively. This approach allows students to learn through direct experience, thus optimizing motor skill development while increasing engagement in learning [16], [17], [18]. However, empirical studies specifically testing the effectiveness of movement exploration-based learning media in improving basic locomotor skills are still very limited [19], [20], [21].

Most previous research has focused on the application of general learning models or strategies, such as cooperative or game-based learning, without specifically developing and testing learning media oriented toward movement exploration. Furthermore, research examining the effectiveness of learning media in the context of physical education is still dominated by the use of visual or technology-based media, while contextual and applicable physical activity-based media have not received much in-depth study [22], [23], [24], [25]. This situation indicates a significant research gap between the learning needs in the field and the development of innovative learning media based on movement activities.

Based on the above description, this research is important to fill the existing gap by developing and testing the effectiveness of movement exploration learning media in improving basic locomotor skills of elementary school students. This research not only offers innovation in the form of movement exploration-based learning

media, but also provides a strong empirical contribution through a controlled experimental approach. Thus, the results of this study are expected to enrich the scientific treasure of physical education and serve as a basis for developing more effective, innovative, and student-centered learning practices at the elementary school level.

B. Methods

Research Design

This study used a quantitative approach with an experimental method and a pretest-posttest control group design. This design allowed researchers to compare changes in locomotor skill performance before and after the intervention, as well as differences between the experimental and control groups [26]. The independent variable was the movement exploration learning media, while the dependent variable was the students' basic locomotor skills.

Participants

The sample in this study was determined using a purposive sampling technique, which involves selecting participants based on specific criteria relevant to the research objectives. This technique was chosen to ensure that the selected participants had characteristics that support the implementation of the intervention and the measurement of locomotor skills.

The inclusion criteria for participants are as follows

1. Students are enrolled in elementary school and actively participate in physical education classes.
2. Students are in a similar age range to ensure comparable stages of motor development.
3. Students are physically able to perform basic locomotor movements such as walking, running, jumping, and tiptoeing.

Based on these criteria, 30 students were selected as study participants. This sample size was deemed adequate for experimental comparisons in a controlled classroom environment.

After the sample was determined, participants were divided into two groups: an experimental group and a control group, each consisting of 15 students. Group assignment was based on equivalence in initial locomotor abilities using pre-test scores. This step was taken to minimize bias and ensure that both groups had relatively similar baseline characteristics before the intervention.

The students were divided into two groups:

1. Experimental group (n = 15), which received treatment using movement exploration learning media
2. The control group (n = 15), which received conventional physical education instruction

Research Procedures

This study was conducted over eight sessions, consisting of one pre-test session, six treatment sessions, and one post-test session. The experimental group received movement exploration-based learning, while the control group received conventional instruction. Data were analyzed using t-tests to determine the effectiveness of the intervention.

Intervention

The experimental group received instruction using movement exploration learning media, which consisted of structured activity stations designed to stimulate locomotor movements such as walking, running, jumping, and tiptoeing through exploratory and play-based tasks. These activities encouraged active engagement, creativity, and interaction with the learning environment.

The control group was taught using conventional teaching methods, primarily based on direct instruction and repetitive practice without the use of structured exploration media.

Instrument Study

The instrument used in this study was a locomotor skills performance test, which

assesses four main components: Walking, Running, Jumping, Skipping.

Each component was evaluated using a performance rubric covering movement coordination, balance, rhythm, and accuracy. The instrument was validated by experts in physical education and tested for reliability prior to data collection.

The following is table 1. Research Instruments

Table 1. Research Instruments

No	Motion Components	Assessment Indicators	Criteria Description	Score
1	Walk	Movement Coordination	Coordinated movements of hands and feet	1-4
		Balance	Body stable when walking	1-4
		Step rhythm	Orderly and consistent steps	1-4
		Motion accuracy	Movement according to instructions	1-4
2	Running	Coordination of movement	Hand swings and foot steps in sync	1-4
		Balance	The body is not easily shaken	1-4
		Speed and rhythm	Steady and rhythmic running	1-4
		Motion accuracy	Proper running technique	1-4
3	Jumping	Coordination of movement	Initial movement, push-off, and precise landing	1-4
		Balance	Stable on landing	1-4
		Speed and rhythm	Optimal jump	1-4
		Motion accuracy	Movement according to instructions	1-4
4	Jump	Coordination of movement	Coordinated single leg movements	1-4
		Balance	Stable when jumping	1-4
		Speed and rhythm	Consistent repetitive movements	1-4
		Motion accuracy	Technique according to instructions	1-4

Table 2. Rating Scale

Score	Category	Description
4	Very good	The movements are very precise, stable and consistent.
3	Good	The movement is quite precise and stable
2	Enough	Movement is less stable and less precise
1	Not enough	Inappropriate and unstable movements

Data Analysis

Data were analyzed using descriptive and inferential statistics. Normality and homogeneity tests confirmed that the data met parametric assumptions. A paired-sample t-test showed significant improvement in both groups, while an independent-sample t-test revealed a significant difference between the experimental and control groups ($p < 0.05$). Effect size analysis showed a large intervention effect ($d = 1.20$), confirming the effectiveness of the movement exploration learning media.

C. Result and Discussion

The analysis results showed that both groups experienced an increase in basic locomotor movement abilities. However, the increase in the experimental group was higher than the control group. The paired t-test showed a significant increase in both

groups, while the independent t-test showed a significant difference between the experimental and control groups in the posttest results. The large effect size value indicates that the use of motion exploration learning media has a strong influence on improving students' basic locomotor movement abilities.

Table 3. Description of Pretest and Posttest Results

Group	N	Pretest (Mean ± SD)	Posttest (Mean ± SD	Gain Score
Experiment	15	45.20 ± 5.10	60.40 ± 4.80	15.20
Control	15	44.80 ± 5.25	52.10 ± 5.00	7.30

Table 4. Results of Normality and Homogeneity Tests

Variable	Normality Test (Sig.)	Information	Homogeneity Test (Sig.)	Information
Pretest	0.200	Normal	0.312	Homogeneous
Posttest	0.200	Normal	0.287	Homogeneous

The results of the normality test showed that the significance value for the pretest and posttest data was 0.200, which is greater than 0.05. Thus, the data in this study were normally distributed. Furthermore, the results of the homogeneity test showed a significance value of 0.312 for the pretest and 0.287 for the posttest, which is also greater than 0.05. This indicates that the variances of both groups are homogeneous. Based on these results, it can be concluded that the data met the requirements for parametric statistical analysis.

Table 5. Paired Sample T-Test Results (Within Groups)

Variable	Mean Difference	t-value	Mr. (p)	Information
Experiment	15.20	9.45	0.000	Significant
Control	7.30	4.12	0.001	Significant

Test results *paired sample t-test* Table 3 shows that both groups experienced an increase in basic locomotor movement abilities after treatment. In the experimental group, the obtained values mean *difference* of 15.20 with a value of 9.45 and a significance of 0.000 ($p < 0.05$). This indicates that there was a significant increase between the pretest and posttest results in the experimental group after being given treatment in the form of motion exploration learning media.

Meanwhile, in the control group, the value obtained was a mean *difference* of 7.30 with a value of 4.12 and a significance of 0.001 ($p < 0.05$). These results also indicate a significant increase between the pretest and posttest, although the increase was lower than that of the experimental group.

Thus, it can be concluded that both learning methods significantly improved students' basic locomotor skills. However, the improvement in the experimental group was greater, indicating that the use of movement exploration learning media was more effective than conventional learning.

Table 6. Results of the Independent Sample t-Test (Between Groups)

Variable	Experimental Mean	Mean Control	t-value	Mr. (p)	Information
Posttest	60.40	52.10	4.87	0.000	Significant

Table 7. Effect Size (Cohen's d)

Comparison	Nile d	Category
Experiment vs Control	1.20	Big

The analysis results showed that both groups experienced an increase in basic locomotor movement abilities. However, the increase in the experimental group was higher than the control group. The paired t-test showed a significant increase in both groups, while the independent t-test showed a significant difference between the experimental and control groups in the posttest results. The large effect size value indicates that the use of motion exploration learning media has a strong influence on improving students' basic locomotor movement abilities.

Discussion

The results of the study showed that the use of exploration learning media significantly improved elementary school students' basic locomotor skills. Descriptively, both groups experienced an increase in scores from pretest to posttest, but the increase in the experimental group was higher than in the control group. This indicates that interventions delivered through exploration learning media are more effective than conventional learning [27], [28].

The results of statistical tests strengthen these findings. *paired sample t-test* The results showed that both the experimental and control groups experienced significant improvement. However, the improvement value in the experimental group was greater, indicating that the use of movement exploration-based learning media was able to provide a more optimal impact on the development of locomotor skills. Furthermore, the test results independent *sample t-test shows* a significant difference between the two groups, which confirms that motion exploration media has advantages over conventional learning methods.

These findings can be explained through a motor learning theory approach that emphasizes the importance of hands-on practice and movement experiences in the learning process. Exploratory movement learning media provides students with opportunities to actively engage in various activities that stimulate coordination, balance, and motor control. Exploratory and game-based activities also increase student motivation, resulting in greater enthusiasm and engagement in the learning process.

Furthermore, the results of this study align with the constructivist approach, which states that knowledge and skills are built through direct experience. In this context, students not only receive instructions but also actively explore movement through various activities designed within the movement exploration medium. This enables students to understand and master locomotor skills more effectively and meaningfully.

Compared to conventional learning, which tends to be teacher-centered and repetitive, the motion exploration media provides a richer and more interactive variety of activities. This not only improves the quality of learning but also helps students develop motor skills more naturally [29], [30], [31]. The results of this study are further strengthened by the large effect size, indicating that the influence of the motion exploration media is not only statistically significant but also practically robust.

Thus, this study provides empirical evidence that exploration learning media is an effective innovation in improving elementary school students' basic locomotor skills. The implication of these findings is the importance of physical education teachers developing and using

exploration-based learning media to create more engaging, active, and meaningful learning.

D. Conclusion

Based on the research results and data analysis, it can be concluded that the exploration of movement learning media is effective in improving the basic locomotor skills of elementary school students. This is indicated by a significant increase in student learning outcomes in both the experimental and control groups, but the increase in the experimental group was higher than in the control group.

The statistical test results showed a significant difference between the two groups, indicating that the use of mobile exploration learning media had a better impact than conventional learning. Furthermore, the large effect size indicates that the effect was not only statistically significant but also practically robust.

Thus, exploration-based learning media can be used as an innovative alternative in physical education to improve students' basic locomotor skills. Using this media can also increase students' active involvement and motivation, making learning more effective, enjoyable, and meaningful.

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F. Conflict of Interest

This research does not have conflict interests, both during data collection and sample determination.

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