

Play-Based Stimulation to Improve Coordination and Visual Movement Response of Elementary School Students

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ABSTRACT

This study aims to identify the improvement of motor coordination and visual movement response in elementary school students through physical activity-based game stimulation. The research was conducted using a quasi-experimental method, with pre-test and post-test to measure the development of students' abilities. This study uses a quasi-experimental design with a pre-test and post-test approach to measure changes in students' motor coordination and visual movement responses. The sample used was elementary school students with a total of 40 people. The results of the study showed a significant improvement in students' motor coordination ability, where 45% of students in the pre-test were in the category of excellent coordination, and increased to 85% in the post-test, showing an increase of 40%. In addition, students' visual motion response also improved significantly, with a decrease in reaction time from 300 ms in the pre-test to 150 ms in the post-test, indicating an improvement in the ability to respond to visual stimuli. Games such as throwing and touching the cone have been proven to be effective in stimulating improved motor coordination and visual response of students. This study concludes that stimulation through play has a positive impact on improving students' motor and cognitive abilities

INTRODUCTION

physical and motor development in children is a crucial factor in supporting their quality of life in the future. One aspect that contributes to physical development is gross and fine motor skills, which heavily depend on body movement abilities and the coordination between muscles, senses, and the nervous system. During elementary school years, children undergo a critical developmental stage that lays the foundation for their motor skills, which later influence other abilities, including daily activities, learning, and social interactions (Khozaimi et al., 2022).

The importance of motor stimulation at an early age has been widely recognized in numerous scientific studies, which indicate that appropriate physical activities can enhance motor responses, coordination skills, and body balance in children (Maharani et al., 2023). Research has also shown that specifically designed games can be an effective medium for stimulating motor development because they are not only enjoyable but also actively engage children in challenging situations and encourage interaction with their surroundings.

However, despite the many benefits of motor stimulation, many elementary schools have yet to integrate game-based approaches into teaching physical skills. Most existing activities remain conventional, such as sports focusing on competition or basic skills without paying attention to more specific aspects like coordination or motor responses (Munajah & Supena, 2021; Adolph, 2016). Therefore, it is essential to delve deeper into how game-based stimulation can positively impact students' motor development, particularly in terms of motor responses and coordination. This article aims to analyze the role of games as a method to enhance motor response stimulation and coordination in elementary school students and to explore how this approach can be implemented in the context of physical education. The findings from this article are expected to provide recommendations for educators, parents, and policymakers in creating more effective and enjoyable physical education programs for children (Usman et al., 2023).

The early elementary school years are a period of remarkable physical, emotional, and social growth. To stimulate this developmental potential, every child needs balanced nutrition, health protection, affection, and educational stimulation appropriate to their level of development and abilities (Tiara et al., 2016). Children aged 6-8 years experience crucial physical and psychological growth, as this period forms a fundamental stage for later life. During this time, basic physical and psychological functions mature and become ready to respond to environmental stimuli. The developmental scope of children aged 6-8 years includes social, emotional, language, cognitive, physical motor, and moral and religious values (Darihastining et al., 2020).

As children in elementary school grow, motor skills and coordination become essential elements in supporting their overall development. These abilities not only relate to physical activities but also play a role in supporting their cognitive, social, and emotional development. However, the reality shows that increasing use of technology and limited physical activity among children often lead to a decline in the quality of motor responses and coordination. This condition undoubtedly restricts students' basic motor skills, negatively impacting their physical growth and psychological development, as well as their ability to perform basic motor skills. Non-digital games or physical games without technological assistance are more effective in developing the cognitive abilities of children aged 4-9 years (Lai et al., 2018).

Moreover, school learning approaches often do not emphasize the importance of activities that encourage the development of children's motor skills. Therefore, a method is needed to optimally stimulate motor responses and coordination, such as a game-based approach.

Games have great potential because they can stimulate children's interest, keep them actively engaged, and create a fun and educational atmosphere. The application of simple games such as throw-and-catch and hopscotch using hopscotch rings can be easily developed and played, as they can be adapted to existing conditions. Developing game models to enhance the coordination of elementary school children can be implemented or applied to children of this age group (Badaru et al., 2022). One example of a modifiable and easy-to-use game suitable for environmental conditions is hopscotch modification, a traditional game similar to hopscotch. This game offers numerous benefits for children during their growth years and can support cognitive development (Nafi'ah & Mahfud, 2022).

This study aims to identify the effectiveness of game-based stimulation in improving motor response and coordination among elementary school students. Childhood is a crucial period in motor development, where motor responses and coordination play significant roles in learning activities and daily life. Movement-based games can enhance the motor response and coordination abilities of elementary school students. In this context, games are designed to actively involve students in enjoyable physical activities, allowing them to develop motor skills and faster responses.

METHOD

This study employed a quasi-experimental method with a pre-test and post-test design to measure the improvement in motor coordination skills and visual motor response among elementary school students through physical activity-based game stimulation. The study aimed to identify the effectiveness of games such as throw-and-catch and cone-touching in enhancing students' motor skills and visual response. Below are the details of the methods used:

Research Design

The study adopted a quasi-experimental design with a pre-test and post-test approach. In this design, students were assigned to a single experimental group that received game-based stimulation, without a control group. Data were collected before and after the intervention to assess changes in students' motor coordination skills and visual motor responses.

Population and Sample

The population of this study comprised elementary school students. The sample included 40 students selected through purposive sampling based on criteria such as having similar basic motor skills and not having received prior training or specific stimulation in motor coordination and visual motor response.

Research Variables

- **Independent Variable:** Physical activity-based game stimulation (e.g., throw-and-catch and cone-touching games) provided to students during the study period.
- **Dependent Variables:**
 - **Motor Coordination Skills:** Measured through physical skill tests, including agility, balance, and hand-eye coordination tasks.
 - **Visual Motor Response:** Assessed through reaction time tests to visual stimuli (e.g., observing and quickly responding to a thrown ball).

Research Instruments

- **Motor Coordination Tests:** These involved activities such as throw-and-catch games and tasks requiring quick and coordinated movements, like touching cones in a specific sequence.
- **Visual Motor Response Tests:** Reaction time tests to visual stimuli were conducted using a reaction time measurement device. Students were asked to quickly and accurately respond to visual prompts (e.g., a thrown ball or guided movement).

Data Analysis

Data collected from the pre-test and post-test were analyzed using descriptive statistics to describe data distribution and paired sample t-tests to examine significant differences between pre-test and post-test results for the dependent variables. This analysis aimed to identify whether physical activity-based game stimulation significantly impacted students' motor coordination skills and visual motor responses.

RESULTS AND DISCUSSION

The study aimed to identify the effect of motor response and coordination stimulation provided through games on the motor skills of elementary school students. The research findings are illustrated in the diagram below:

(Include a visual representation or description if required.)

Figure 1. Pre-Test Diagram

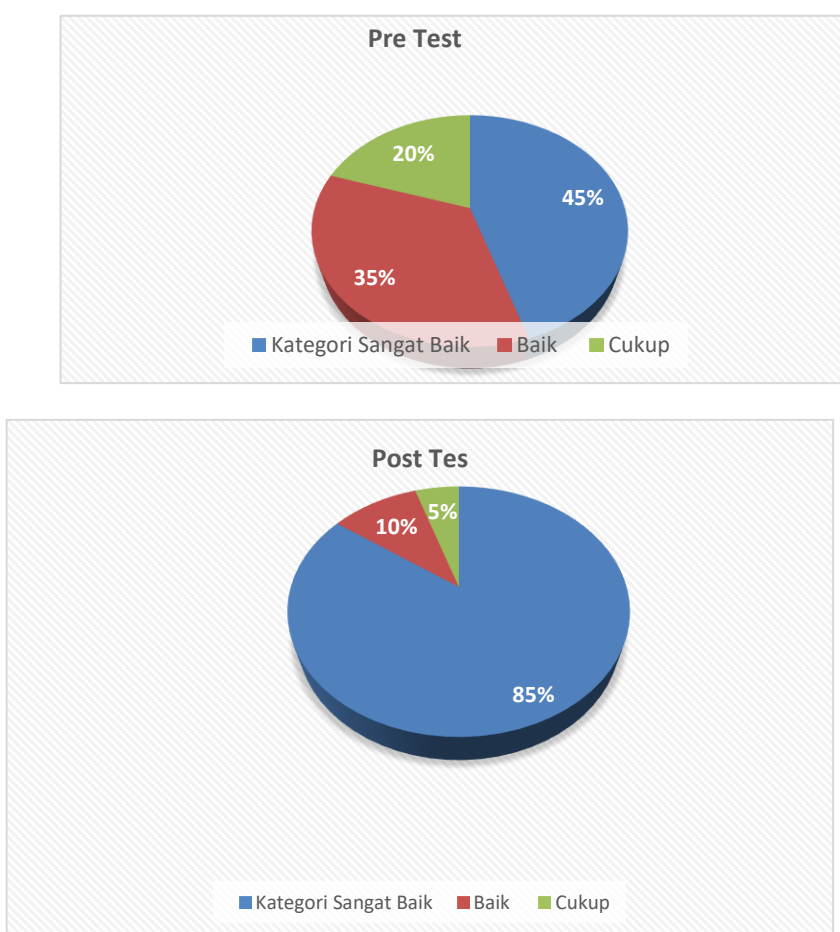


Figure 2. Diagram Post Test

Based on the diagram above, the pre-test results indicate that 45% of students fall into the "excellent coordination" category, 35% into the "good coordination" category, and 20% into the "fair coordination" category. After being stimulated with games, the post-test results show that 85% of students fall into the "excellent coordination" category, 10% into the "good coordination" category, and 5% into the "fair coordination" category. The 45% in the pre-test increased to 85% in the post-test, indicating a significant improvement of 40%. The study results reveal a significant enhancement in motor coordination abilities through stimulation with catch-throw games and hopscotch ring games.

Motor Coordination Improvement

The study shows that 40% of students experienced significant improvement in motor coordination abilities, progressing from the "good" category to the "excellent" category after being stimulated through games such as catch-throw, hopscotch, and games using hopscotch rings.

Table 1. Pre-Test and Post-Test Response Time Data

Indicator	Pre-test	Post-test	Improvement
Visual response time	300 ms	150 ms	50%

The results indicate that the average visual response time of students in the pre-test was 300 ms, which decreased to 150 ms in the post-test – a reduction of 50%. This reduction signifies an improvement in the students' ability to respond to visual stimuli more quickly, as indicated by the shorter time taken to provide physical responses to the stimuli. The study further reveals a significant improvement in response time abilities due to stimulation through catch-throw games and cone-touching games.

Improved Response Time

The reduction in visual reaction time from an average of 300 ms to 150 ms after stimulation demonstrates that the games used in this study significantly influenced the improvement of visual response times. The 50% reduction in reaction time indicates that students became faster in responding to visual stimuli. The sensorimotor system theory (Kandel, Schwartz, & Jessell, 2013) explains that the perception and response to visual stimuli involve the central and sensory nervous systems. Physical activities requiring attention and focus, such as in hopscotch or catch-throw games, can accelerate the processing of visual information, thereby enhancing students' reaction times to stimuli.

DISCUSSION

The study results indicate a significant improvement in motor coordination and visual response time abilities among students after being stimulated through physical activity-based games. The stimulation, including catch-throw games, hopscotch, and the use of hopscotch rings, effectively improved motor coordination and reaction times to visual stimuli. This discussion delves deeper into the research findings, relating them to relevant theories and suggesting practical implications (Sevtianto et al., 2024).

Coordination Ability Improvement

The data from pre-test to post-test results show a significant improvement of 40% in students' coordination abilities to the "excellent" category. Improvements in movement responses, as evidenced by the significant reduction in visual reaction times, indicate a faster response to visual stimuli. The use of games such as catch-throw, hopscotch with hopscotch rings, and cone-touching games effectively enhanced students' motor coordination and movement response abilities. This was evident in more coordinated and stable movement skills.

The findings also indicate that these games not only improve motor coordination (Rosa Damai Yanti, 2023; Hendraningrat & Fauziah, 2021) but also increase student engagement in the learning process. Utilizing enjoyable games increases students' interest and motivation to participate in physical activities. Students involved in group games like catch-throw also develop social skills, such as teamwork and communication with classmates. Playing hopscotch and other games requiring strategy and attention helps develop cognitive skills, such as concentration, decision-making, and time management.

This significant improvement indicates that games combining coordinated physical movements can help students develop their motor skills. Motor coordination, involving the body's ability to move effectively and in an organized manner, is crucial for children's physical development. According to Pangelinan (2016), good motor coordination can be improved through structured physical activities and games designed to develop these skills (Harahap et al., 2023).

Games like catch-throw and hopscotch involve various body movements requiring coordination between different body parts, such as hands and eyes. In catch-throw games, for example, students must not only coordinate body movements to throw and catch the ball but also pay attention to body position and opponent movements. These skills, when practiced regularly and in an enjoyable context, help students improve their motor coordination. Moreover, the hopscotch ring games used in this study also play a crucial role in enhancing balance and agility, two essential aspects of motor coordination.

Improved Visual Response Time

The significant reduction in students' visual reaction times is another key finding of this study. The average visual reaction time of students in the pre-test was 300 ms, which decreased to 150 ms after stimulation through games, with a reduction of 50%. This indicates that stimulation through physical activity-based games improved students' ability to respond to visual stimuli more quickly.

The significant reduction in reaction time reflects improved attention, focus, and speed in processing students' visual information. The sensorimotor system theory proposed by Kandel, Schwartz, and Jessell (2013) explains that perception and response to visual stimuli involve processing information through the central and sensory nervous systems. Activities combining quick movements and attention to visual stimuli can help accelerate this information processing (Faizin et al., 2023; Ariyati, 2015).

Practical Implications

1. Physical activity-based games involving motor coordination and attention to visual stimuli, such as catch-throw and hopscotch, can be integrated as essential components of physical education programs in elementary schools.
2. The significant improvement in visual reaction times demonstrates that games can enhance students' cognitive abilities, particularly in processing information more quickly.
3. The findings provide a foundation for developing more structured physical education curricula based on games supporting students' motor and cognitive development. Properly designed games allow educators to deliver experiences that are not only entertaining but also educational and skill-developing for students.

CONCLUSION

Based on the results of the study, it can be concluded that stimulation through physical activity-based games, such as catch-throw and cone-touching games, is effective in improving the motor coordination and visual response abilities of elementary school students. The improvement in students' motor coordination is evident from the significant increase in the percentage of students in the "excellent" category, from 45% in the pre-test to 85% in the post-test. Additionally, the 50% reduction in students' visual reaction time, from 300 ms to 150 ms, indicates an enhanced response speed to visual stimuli. This finding suggests that game-based stimulation can accelerate sensory information processing and improve students' motor skills. Therefore, enjoyable games involving physical activities can be an effective method to support the motor and cognitive development of elementary school students. The application of games in physical education at the elementary level can be an effective method to enhance the quality of physical learning while supporting students' holistic development.

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