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Enhancing motor skills and physical activity in students with ADHD through an inclusive physical literacy model using video modeling

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ABSTRACT

Background: Children with attention deficit hyperactivity disorder (ADHD) often experience delays in motor development and exhibit unstructured physical activity, which may hinder the acquisition of controlled motor skills. These limitations can negatively affect their overall physical health and quality of life. Although inclusive physical education has shown promise, limited research explores the impact of structured video modeling on this population. **Research Objective:** This study aimed to examine the effectiveness of an inclusive physical literacy model based on video modeling in improving motor skills and physical activity among students with ADHD. **Method:** An experimental design with a randomized control group pretest-posttest approach was used. The participants were 20 inclusive students diagnosed with ADHD. Motor skills were assessed using selected subtests from the test of gross motor development (TGMD), including horizontal jumping, hopping, and sprinting. Physical activity levels were measured using the physical activity questionnaire for children (PAQ-C). **Finding/Results:** Independent t-test analysis revealed a significant improvement in the intervention group compared to the control group. The posttest results showed significant differences in motor skills ($p = 0.046$) and physical activity levels ($p = 0.001$). **Conclusion:** The findings indicate that an inclusive physical literacy model incorporating video modeling can effectively enhance both motor skills and physical activity in students with ADHD. This approach supports not only physical development but also fosters better psychological and social outcomes. Future studies are encouraged to implement this model on a larger and more diverse scale.

Keywords: Attention deficit hyperactivity disorder; motor skills; physical activity; physical literacy

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INTRODUCTION

Lifestyle changes in the 5.0 era are changing day by day, this is triggered by changes in globalization and traditional lifestyles from life style to sedentary lifestyle, this lifestyle is caused by a lack of physical activity followed by excessive food intake, such as high carbohydrate, protein, fat and low fiber intake (Pluta-Zaremba & Szelagowska, 2021). An irregular diet that is not balanced with physical activity will be at risk of obesity, (Solikah

& Nurwijayanti, 2023; Mena et al., 2021; Xue et al., 2021).

Physical activity and physical condition are important aspects that need to be maintained and improved so that a person can carry out daily activities optimally (Allsabah & Putra, 2023; Darmawan et al., 2024). Physical activity can be defined as a person's ability to move their limbs and skeletal muscles (Karim et al., 2018), with the aim of improving body system function, physical health, mental health, and motor skills (Mashuri et al., 2019; Riyanto & Mudian, 2019). The level of physical activity and physical condition are important aspects that must be maintained and improved so that a person can carry out daily activities well (Sari & Wirjatmadi, 2016). High physical activity plays a major role as a factor influencing the quality of physical health (Dewi, 2018). In addition, physical activity also contributes to a person's weight status, especially in children aged 5–17 years (Banjarnahor et al., 2022). According to WHO recommendations, moderate to high intensity physical activity needs to be done for 60 minutes every day, involving skeletal muscle strengthening exercises, as well as aerobic exercise at least three times a week (Chaput et al., 2020). However, as many as 81% of adolescents aged 11–17 years worldwide are still classified as physically inactive, with significant differences by gender, region and country (Guthold et al., 2018). This lack of physical activity is a serious threat to public health and well-being, so policies and programs are needed that are proven to be effective in increasing physical activity levels in the population, including children and adolescents (Ekelund et al., 2019; Guthold et al., 2020).

ADHD is a developmental disorder in children who have low concentration, are active but still do not have a sense of direction and purpose, and like to run but tend to be impulsive (Yusriyyah et al., 2023). ADHD children have limitations in the development of motor activity so that increased activity is not directed and tends to be uncontrolled (Jacob & Watini, 2022). The importance of physical activity and motor skills for children with ADHD is currently experiencing quite serious problems, it is very necessary in developing motor activity and a healthy lifestyle in children (Martín-Rodríguez et al., 2025), therefore physical education at least has a contribution in carrying out the role of physical literacy (Apriliyanto et al., 2025). The concept of physical literacy can be interpreted as the ability to move the body during physical activity (Cornish et al., 2020; Sugiarto et al., 2024), choose a healthy lifestyle, and train various skills, in addition physical literacy is a learning concept that integrates health that is obtained and applied in the context of movement and physical activity (Carl et al., 2024).

Physical literacy reflects ongoing changes that integrate physical, psychological, cognitive, and social abilities (Keegan et al., 2019; Rudd et al., 2020; Santos et al., 2022; Scott et al., 2021). Something similar is explained by Melby et al. (2022) Physical literacy plays an important role in developing students' affective, physical, and cognitive domains. In addition, physical literacy emphasizes an active and healthy lifestyle by doing various physical activities and improving one's motor skills (Castelli et al., 2015).

Physical literacy has 5 interrelated domains, including physical activity behavior, active attitudes and lifestyles, exercise motivation, exercise knowledge, and motivation (Holler et al., 2019). Based on the various explanations above, it can be concluded that physical literacy is a program that has a mutually binding relationship with the aim of improving or facilitating health, developing affective, physical, and cognitive by developing motor skills and planned physical activity. The development of physical literacy is one of the active and healthy lifestyle programs that has benefits in maintaining health in children, adolescents, and adults (Alipour-Anbarani et al., 2022).

With the video modeling method, children can learn how to perform positive behavior by observing other individuals who understand the behavior better. Through video

modeling, children can learn appropriate behaviors by observing others who demonstrate them effectively (Aldi et al., 2016). This method has also been widely applied to support various activities for children with special needs, such as autism (Alzyoudi et al., 2015). Video modeling is rooted in social learning theory, particularly observational learning, which states that without a model, a child may struggle to imitate behaviors effectively (Velic, 2021). Observational learning allows individuals to acquire new skills without direct experience, as learning can occur through modeling experience (Bandura, 2021). However, despite the extensive research on video modeling and its effectiveness in promoting social and behavioral skills, its application in developing physical literacy and motor skills among children with ADHD remains underexplored. Most studies have focused on autism (Gandhi et al., 2024; Kurt et al., 2024; Pan et al., 2024), while children with ADHD who often experience low physical activity levels and impaired motor skills have not been the primary focus of intervention strategies utilizing video modeling. This presents a research gap that needs to be addressed. The novelty of this study lies in integrating video modeling with physical literacy as an innovative approach to enhancing motor skills in children with ADHD. By leveraging observational learning principles, this research aims to provide an effective and structured intervention that fosters motor skill development, ultimately contributing to a healthier and more active lifestyle for children with ADHD.

METHOD

Method in this study used a randomized control group pretest-posttest design experimental research design, this experimental study was conducted on a group with a control or comparison group. Research instruments used in this study consisted of skill tests and questionnaires. In the skill test, the researcher used a gross motor test (TGMD) consisting of (1) horizontal jump, (2) hopping, (3) galloping/slides, while to measure physical activity in children, the researcher distributed a questionnaire (PAQ-C). Both tests were used and conducted on ADHD children to obtain motor skill results before and after treatment was given.

Participants

The sampling technique in this study used proportional random sampling technique, with the subjects in this study consisting of inclusion students who have children with attention deficit hyperactivity disorder, who are in the Malang city area, with the number of subjects in this study as many as 20 students, the characteristics of the research sample consisted of 10 male students and 10 female students aged 9, 10, 11 and 12 years who were in elementary school grades 3, 4, 5 and 6.

Data Collection

Experimental research in this study used the O1 pretest and O2 posttest to determine the effectiveness of X treatment on the results of administration before the pretest and after the posttest. The following is a design that can be described:

Table 1. Randomized Control Group Pretest-Posttest

Variables	Pretest	Treatment	Posttest
Intervention	O1	X	O2
Control	O1	-	O2

Description:
X : Treatment or treatment on research subjects
O1 : Pretest before treatment
O2 : Posttest after treatment
- : No treatment or treatment was given to research subjects

Data collection in this study was divided into 14 days, on the first day the researcher conducted a pretest on all research subjects, on the second to thirteenth day the researcher conducted an intervention on ADHD children and on the fourteenth day the researcher conducted a posttest. The intervention was carried out using an inclusive physical literacy model integrated with video modeling, the treatment given to ADHD children was 1-15 times, each treatment was given a duration of 1-10 minutes for 1 movement skill, the following is a detailed explanation of the intervention carried out.

Table 2. Motor Skills and Physical Activity Interventions

Motor Skills	Duration	Repetition	Day
Jumping over a hula hoop with both feet	5 minute	10	2-7
Jumping over a hula hoop with one foot	6 minute	8	
Throwing a ball with a target	10 minute	15	
Catching a ball	10 minute	15	
Running sideways	8 minute	5	
Kicking a ball with a target	10 minute	15	
Plank	1 minute	1	
Walking, jumping over a hula hoop with both feet, catching the ball, throwing the ball at the target, running sideways, and running by kicking the ball with a target	5 minute	2	
Plank, jumping over a hula hoop with one foot, jumping over a hula hoop with both feet, catching the ball, throwing the ball at the target, running sideways, and running by kicking the ball with a target.	5 minute	2	
Throwing a ball with a target	10 minute	15	8-13
Catching a ball	10 minute	15	
Jumping over a hula hoop with both feet	5 minute	10	
Jumping over a hula hoop with one foot	6 minute	8	
Plank	1 minute	1	
Kicking a ball with a target	10 minute	15	
Running sideways	8 minute	5	
Plank, jumping over a hula hoop with one foot, jumping over a hula hoop with both feet, catching the ball, throwing the ball at the target, running sideways, and running by kicking the ball with a target.	5 minute	2	
Walking, jumping over a hula hoop with both feet, catching a ball, throwing a ball at a target, running sideways, and running while kicking a ball at a target.	5 minute	2	

Data Analyses

Data analysis conducted in this study was to reduce the assessment results of motor skills (TGMD) and physical activity (PAQ-C) which were then analyzed using SPSS with group statistical calculations and independent sample T-Test tests, so that the final value was obtained to determine the results of the influence of the inclusive physical literacy model based on video modeling on movement skills and physical activity of children with attention deficit hyperactivity disorder.

RESULTS AND DISCUSSION

Results of the effectiveness test conducted on 20 elementary school inclusion students in malang city, Indonesia with the ADHD category, obtained pretest and posttest data on motor skills and physical activity, in its implementation the researcher conducted a motor skills test (TGMD) with horizontal jump, hoping, and slides components, in the implementation students were given 3 opportunities to do the TGMD test, while in physical activity the researcher distributed a questionnaire (PAQ-C). The results that

have been obtained based on the calculation of the independent sample t-test are as follows:

Table 3. Group Statistics

Group Statistics					
	Class	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
Motor Skills	Experiment	10	11.40	2.221	.702
	Control	10	9.30	2.163	.684
Physical Activity	Experiment	10	82.60	19.138	6.052
	Control	10	54.50	9.675	3.060

This graph allows researchers and readers to observe pretest and posttest test patterns, identify changes in subject responses, and interpret the data effectively. Figure 1 displays the results of the visual analysis.

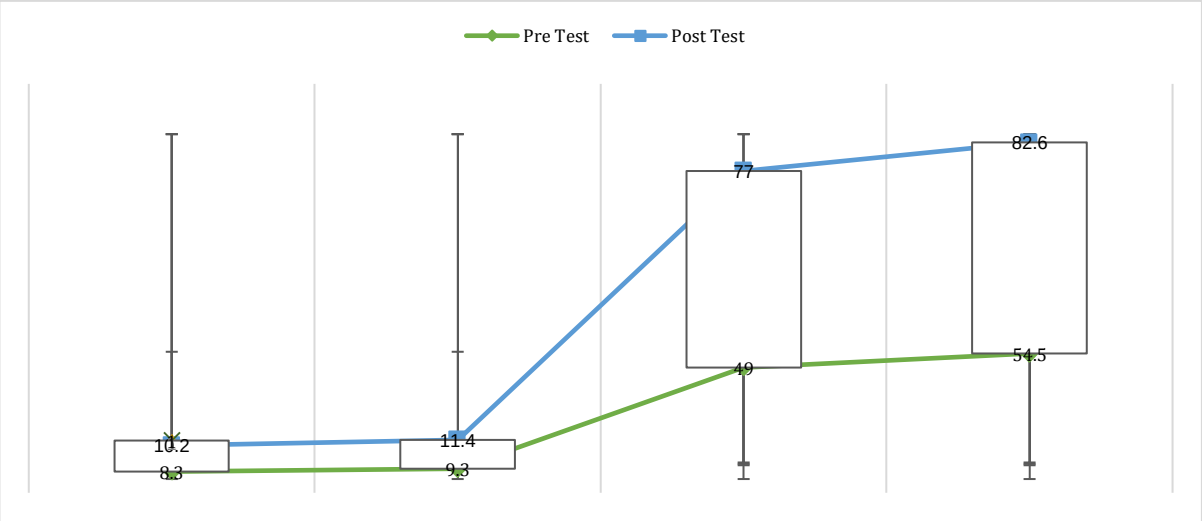

Figure.1 Visual Analysis Pretest and Posttest

Values shown in the calculation of motor skills in the independent sample t-test in the category with an average/mean of 11.40 in the intervention group and in the control group got a value of 9.30, while in the calculation of physical activity got a value of 82.60 in the intervention group and in the control group got a value of 54.50 thus it can be concluded that there is a difference. To find out whether the difference has significance or not, it will be explained in the Table 4.

Table 4. Independent Samples Test

	Levene's Test for Equality of Variances t-test for Equality of Means						
	F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**
Motor Skills	.220	.645	2.142	18	.046	2.100	980
Physical Activity	2.852	.109	4.144	18	.001	28.100	6.781

Results shown in Table 4, the Sig. Levene's Test for Equality of Variances value for motor skills is 0.645 > 0.05, and for physical activity it gets a value of 0.109 > 0.05, which means that the data variance between the intervention group and the control group is homogeneous or the same, so that the interpretation of the output table above is guided by the values contained in the equal variances assumed table. With the explanation in the independent t-test output table for motor skills, it is known that Sig (2-tailed) is 0.046 <

0.05, and for physical activity it gets a value of 0.001 < 0.005, so a decision can be taken that in the independent sample t-test it can be concluded that Ho is rejected and Ha is accepted, thus the results of this study concluded that there was a significant difference in the final test results of the inclusive physical literacy model between the intervention group and the control group.

Study showed that there was a significant difference between the intervention group and the control group in the motor skills and physical activity of students with ADHD in elementary school. The motor skills scores of the intervention group were higher than those of the control group, with an average of 11.40 compared to 9.30. This difference is important because better motor skills allow children with ADHD to participate more effectively in daily physical activities, in line with previous findings that physical activity-based interventions can improve the motor skills of students with ADHD (Yu et al., 2018), In terms of physical activity, the intervention group also showed a significant increase with a score of 82.60, compared to the control group which only got a score of 54.50. This indicates that inclusively designed interventions are able to encourage increased participation in physical activity (Darmawan et al., 2022), which is an important element in the development of physical literacy of students with special needs.

Several other studies also explain that the influence of video modeling on improving the social skills of ADHD children has undergone significant changes (Wilkes-Gillan et al., 2017), this explains that the use of video modeling in several components such as physical activity, motor skills and social skills of ADHD children has a significant role in facilitating and developing various abilities in ADHD children (Wilkes-Gillan et al., 2021). The use of video modeling carried out in this study has a positive influence in facilitating ADHD children in improving motor skills and physical activity, this can be seen when before the use of video modeling, ADHD children had difficulty in moving and still had limited physical activity, in addition, the provision of learning materials provided at schools in physical education subjects is still limited, so there is a possibility that the influence of learning methods and learning media provided is still less appropriate (Priyohutomo et al., 2025). These various limitations result in the need for appropriate media in stimulating students' motor skills and physical activity.

Contribution of this study lies in the application of the inclusive physical literacy model, which broadens the understanding of how programs focused on physical literacy can be implemented effectively. In the last decade, the literature has shown an increasing interest in inclusive physical literacy (Morgan et al., 2013). Study also makes a significant contribution to the field of inclusive education by demonstrating that interventions focused on physical activity can provide benefits not only limited to improvements in motor skills (Nying & Evelyne, 2023), but also to overall physical activity engagement (Cairney et al., 2019). This is an important development as engagement in physical activity is often overlooked in inclusive education (Johnson & Wolfe, 2020).

Implications of this study can be taken by educators and practitioners, who can adopt the physical inclusion model to improve motor skills and physical activity in ADHD students. It also supports inclusive education policies that encourage full participation of students with special needs in the general education environment (Graham, 2021). Study provides an empirical foundation for future research that seeks to explore more deeply the various aspects of physical inclusion in elementary schools (Aeny et al., 2022). In addition, the findings also provide practical insights into how the implementation of physical literacy programs can be tailored to the needs of students with ADHD in inclusive settings (Prastiwi & Abduh, 2023), which may have previously received less attention in the literature (Green & Holloway, 2018).

Overall, this study not only fills the gap in the literature regarding the effectiveness of physical literacy interventions for students with ADHD, but also provides important practical contributions to the development of inclusion programs at the elementary school level. It suggests that an inclusive physical literacy approach may be one of the effective solutions in improving the participation and physical skills of students with ADHD, which will overall support their physical and psychological growth.

CONCLUSION

Contribution of this study is the application of an inclusive physical literacy model based on video modeling that expands the understanding of the importance of structured physical programs in improving motor skills and physical activity in children with ADHD. This study suggests that an inclusive physical literacy approach can be an effective solution to improve participation and physical skills in children with ADHD, which ultimately supports their physical and psychological growth. In addition, the findings of this study provide practical insights in adjusting physical literacy programs to suit the needs of children with ADHD in an inclusive environment. The results of this study are relevant for educators in designing inclusive programs that not only improve physical skills but also encourage active participation of students with special needs in general education. In addition, this study serves as an empirical foundation for future research to apply the use of an inclusive physical iteration model based on video modeling on a wider scale.

Limitations of this study lie in the limited sample size, this will affect the level of generalization of the findings, and the results of the study may not fully represent the wider population of ADHD students, the involvement of parents and teachers in efforts to determine physical activity and motor skills has not been fully carried out, so that the data in this study has not fully interpreted the problems in children with ADHD. To overcome these limitations, further research is recommended to be conducted on a larger scale by involving more participants from various backgrounds, including schools with different characteristics, as well as adjusting the video modeling, especially in more interesting animations, as well as in the material or content of the video modeling that emphasizes daily activities as a part that needs to be redeveloped.

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CONFLICT OF INTEREST

The authors state not conflict of interest.

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