

# The Relationship between Physical Activity and Physical Fitness of Elementary School Students

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**Abstract** The aim of this research was to determine the effect of physical activity on the physical fitness of elementary school students. The sample in this research was elementary school students in the city of Medan with a total of 60 students. This type of research uses correlational variables with physical activity and physical fitness. The results of the research show that there is a significant correlation between physical activity variables and physical fitness, and the correlation coefficient is 0.234 with a (p) value of 0.043, which means that the significant relationship between physical activity and students' physical fitness is acceptable. The correlation results above obtained a determinant coefficient value of 0.059. The result shows that the percentage of the relationship between these two variables is  $0.070 \times 100 = 7\%$ . So, 7% of students' physical fitness is influenced by physical activity and 93% is influenced by other factors. The conclusion of this study is that the results of data analysis prove that there is a significant correlation between physical activity and students' physical fitness, physical activity has a low relationship to physical fitness and the direction of the relationship is linear.

**Keywords** Physical Activity, Improving Physical Fitness, Elementary School

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## 1. Introduction

Sports physical education at school aims to develop aspects of physical fitness, movement skills, critical thinking, social, reasoning, emotional stability, moral actions, aspects of a healthy lifestyle and introduction of a clean environment through selected physical activities, sports and health planned systematically in order to achieve national education goals [1][2][3]. Physical education is a process of human development that lasts a lifetime. Physical education provides opportunities for students to be directly involved in various learning experiences through physical activities, playing and exercising which are carried out systematically, directedly and plannedly [4]. The provision of learning experiences is directed at developing and forming a healthy and active lifestyle throughout life.

Physical fitness is the body's condition for carrying out daily work efficiently without causing significant fatigue so that you can still enjoy your free time [5]. Physical fitness is a description of the body's ability to carry out physical activities and is an important indicator of health. Regular participation in sports activities is an important aspect of physical activity for children and adolescents [6]. A person who is fit to carry out physical activities and sports is able to carry out daily activities with a healthy body, does not exceed the body's limits and is at risk of getting sick due to low levels of physical activity and fitness conditions [7] [8]. Physical fitness focuses more on physiological fitness, so that it can define the level of suitability of the dynamic level of health possessed by the implementer to the severity of the physical tasks that must be carried out [9].

Physical fitness is the body's ability to carry out daily work tasks without causing significant fatigue. To be able to achieve prime physical fitness, a person needs to do physical exercise that involves physical fitness components with the correct training methods. [10] divides fitness into two, namely: (1) Physical fitness which is related to health and (2) Physical fitness which is related to skills. Physical fitness related to health consists of components, namely heart lung endurance, muscle strength, muscle endurance, flexibility and body composition. Meanwhile, physical fitness related to skills consists of components, namely speed, explosive power, balance, agility and coordination.

A person with a good level of physical fitness will be able to carry out daily activities for a relatively long time, compared to those with a low level of physical fitness [11]. Good physical fitness will show a person's work patterns enthusiastically while the work is being carried out. Good fitness conditions are characterized by stable elements of good physical condition. Strength is one of the biomotor components as the foundation [12], a thorough process of development aimed at enhancing physical fitness components, physical quality, body equipment functionality, and positive psychological traits [13].

The test used to measure physical fitness is in the form of a test battery consisting of a collection of tests. The physical fitness test battery for the age group consists of: (1) 60 m sprint, (2) hanging body lift (*pull up*), (3) lying down (*sit up*), (4) Jump upright (*vertical jump*), and (5) 1200 m [14]. Several physical fitness tests are carried out to measure aerobic endurance, muscle strength, muscle explosive power and speed. The physical fitness test battery accommodates the needs of these physical condition elements. Physical fitness tests are carried out to measure the fitness level of ordinary people and also to measure the level of physical condition for athletes. The test items are different so they require more special preparation. Fitness test for athletes includes Leg Dynamometer, Push Up, Grip Dynamometer, Sit Up, Sit and Reach, Vertical Jump, Ball Medicine, MFT [15].

Fitness tests for elite athletes are usually tailored to the

characteristics of the sport they are involved in. So this research cannot accommodate all fitness test items for all sports. The focus of this research is measuring 5 test items, namely endurance, strength, explosive power, speed and muscle endurance. These five test items can essentially represent all physical fitness test items. Physical fitness tests are also commonly called test suitability. Test type suitability is in principle the same as tests for other groups but essentially the same. The type of test suitability is as follows; 12, pull up, sit up, push up, dan shuttle [16].

According to [17], one of the measurements of physical fitness can be observed based on cardiovascular endurance. Cardiovascular endurance is the main component of physical fitness that has been recognized by the public. This means that a person's ability to withstand loads on the cardiovascular system is an important indicator in determining their fitness level.

Physical fitness is important for students, especially elementary school students, so that they have good physical fitness and can do their schoolwork well [18]. [19] the need for physical fitness is very important for achieving learning outcomes, because physical fitness is the body's ability to adapt to daily tasks without fatigue, having enough energy to enjoy free time or face emergencies at any time. Without physical fitness, it is impossible for someone to carry out their daily activities continuously. A fit body will make students move actively and have high initiative, while their body health will be maintained and they will not get sick easily.

One of the dangerous behaviors that often occurs is having low physical fitness and a monotonous lifestyle, which can increase the possibility of developing diseases such as obesity and diabetes in children and adolescents [20][21]. This can be overcome with effective strategies such as increasing the amount of physical activity so that it has an impact on increasing physical fitness. In addition, it is important to monitor and measure the level of physical activity and physical fitness for children and adolescents. In the school education process, physical fitness measurements in children and adolescents can be carried out using standard fitness tests. Globally, there are more than fifteen types of tests used to assess physical fitness and the most frequently used tests are Euro fit, Fitness gram, then Unfittest [22][23][24][25]. Apart from that, in schools there is physical education, which encourages children and teenagers to engage in physical activity that can directly improve physical fitness. According to [26], essentially physical education is an educational process with benefits that include physical activities that help produce changes in the physical, mental or emotional quality of an individual. As confirmed by [27], all forms of human activity always require help and support from physical abilities, so that problems with existing physical abilities can be the cause of every activity a person carries out. However, it is felt that the physical activity obtained during learning does not support students to gain physical fitness. Therefore, a student's physical fitness is not solely

acquired through Physical Education, Sports, and Health (PJOK) classes, but also through participation in various activities outside of PJOK, such as cycling, swimming, running, football, and others.

The fitness of school-aged children is also very important. Especially fitness in supporting students' learning motivation and training students' basic movement skills. Logically, if a person is sick, students find it difficult to concentrate on studying. High learning motivation can improve learning achievement.

Thus, fitness does not significantly contribute directly to learning achievement, but children at school age have enormous potential to optimize all aspects of their development, including physical aspects. This means the physical aspects development of elements of maturity and control of body movements. There is an interplay between body relations, movement skills, and movement control. Children's movement skills will not develop without maturity in movement control. Movement control will not be optimal without physical fitness. Body fitness cannot be achieved without physical exercise.

When physical activity is carried out regularly, it will support the child's development and potential for fitness. Physical fitness is always related to the condition of children's bodies. It can be known and understood that a student's ability to carry out daily activities can be seen from a person's level of physical fitness because it is the most basic description of human activity and is closely related to daily human movement activities. So physical fitness really supports a person's life, if you are not fit, it will result in you not being physically optimal [28]. So it's necessary to make a strategy. Understanding physical activity patterns has a positive impact on students on a regular basis and provides understanding and motivation for children to gain experience regarding physical activity [29] [30]. Movement activities are movement skills with time allocation with an effective program that is in accordance with the character of elementary school students, by carrying out these activities, the body's condition of endurance gradually increases, reactions and responses are useful and related to the child's physical as well as the child's movement ability which is a form of the educational process [31]. Physical activity in children's environments should be a focal point for broader considerations because it is related to children's development and progress. Based on this research, it tends to be reasonable that the physical activity completed by children is at a light-moderate level of 74.2%. Physical activity according to WHO is recommended for children and adolescents aged 5-17 years to spend about one hour every day in direct focusing physical activity with repetition no less than 3 times every week. HRQoL in young children consists of various supporting angles in determining children's personal satisfaction. Considering

the research results obtained, the actual welfare component tasks for male and female students are different, where male students will generally be more dominantly dynamic in carrying out productive tasks. The correlation results are quite unidirectional and significant, making physical activity influence the quality of life of the research subjects, where the greater the physical activity is carried out, the greater the value of their quality of life.

The urgency is that elementary school children really need physical activity to improve their physical fitness. Apart from that, the physical activity carried out must also be appropriate for elementary school children. There are differences between elementary school children and adults in physical activity. Several studies related to urgency are relevant to the background that has been described as a basis comparison to find the root of the problem the author puts forward [32]. The results of the research prove that there is a significant correlation between physical activity and students' physical fitness with a correlation coefficient of 0.244 and (p) 0.046, meaning there is a significant relationship between physical activity and students' physical fitness. In addition, physical activity has a weak relationship with physical fitness and the direction of the relationship is linear. So it can be interpreted that the higher the physical activity, the positive impact it will have on increasing students' physical fitness. Based on the results above, it can be concluded that physical activity has a positive impact on students' physical fitness. Physical fitness is significantly associated with children's academic achievement ( $p=0.04$ ). Children who are not fit have academic achievement 5.6 times lower than children who are fit. Physical fitness can improve the academic performance of school children. [33] concluded that there is an influence of physical activity patterns on physical fitness based on the significance value (2-tailed) which obtained a value of  $0.00 < 0.05$ . [34] research results show that there are 0 students or 0% in the very good classification, there are 19 students or 1% in the good classification, there are 267 students or 15% in the medium classification, there are 1432 students or 80% in the poor classification, and there are 71 students or 4% in the very poor classification. Thus it can be concluded that students aged 10-12 years have a poor level of physical fitness. [18] Based on the data obtained, it shows that there is an influence of physical activity on motor skills and physical fitness. Physical activity is important because doing physical activity can reduce the risk of contracting a disease. However, there are still many people who are less aware of the importance of physical activity for their health. The low level of physical activity is a problem that must be addressed immediately. Getting children to move more and engage in physical activity is beneficial for increasing the development of motor skills which can result in greater physical activity habits.

## 2. Methods

This type of research uses correlational variables with physical activity and physical fitness. The research was conducted in Medan city elementary schools using a purposive sampling technique using objects that had known characteristics and features [35]. The sample criteria included students in grades IV-VI aged 10 and 12 years, so that the sample obtained was 67 students. The instrument used in this research is a physical activity questionnaire adopted from [36] with item validity ranging from 0.140 to 0.730 and inter-item correlation ranging from 0.000 to 0.616 and the reliability result is 0.682, indicating that the instrument is reliable. Apart from the physical activity questionnaire, the instrument used is the PACER Test to measure physical fitness. In its implementation, participants run back and forth for 20 meters accompanied by an audio remix [37]. After obtaining the data, researchers analyzed descriptive, normality, linearity and Pearson correlation using SPSS version 26.

## 3. Results

This section will show the results of research based on descriptive test analysis, test condition data, and correlation test. The following analysis results can be observed in table 1 as follows:

**Table 1.** Descriptive Test of Physical Activity and Physical Fitness

	N	Mean	SD
Physical Activity	60	2,10	0,54
Physical fitness	60	17	6,20

Based on test results descriptive physical activity and physical fitness, table 1 shows that the level of physical activity of students is at number  $M \pm SD$  ( $2.10 \pm 0.54$ ) which means the mean is in the medium category, while physical fitness is at number  $M \pm SD$  ( $17 \pm 6.20$ ) which means the mean is in the low category.

**Table 2.** Frequency Distribution of Physical Activity

Category	Interval	Frequency	Percentage %
Very well	4.21-5.00	0	0%
Good	3.41-4.20	1	4%
Currently	2.61-3.40	14	23%
Less	1.81-2.60	31	47%
Less than once	1.00-1.80	14	23%

Based on the results of the frequency distribution of physical activity in table 2, it shows that 14 people (23%) were in the very poor category, 31 people (47%) were in the poor category, 14 people (23%) were in the moderate category, and 1 person was in the good category. (4%).

**Table 3.** Physical Fitness Percentage

Category	Frequency	Percentage (%)
Very low	50	90%
Low	10	10%

Based on the results of the percentage of physical fitness in table 3, it shows that physical fitness is in the very low category as many as 50 people (90%), and as many as 10 people (10%) in the low category.

**Table 4.** Normality Test Data and Linearity Test

Category	P	Say	Information
Physical Activity	0,089	0,05	Normal
Physical fitness	0,075	0,05	
Physical Activity	0,060	0,05	Linear
Physical fitness			

Based on the results of the normality test and linearity test in table 4, it shows that the physical activity and physical fitness variables have a p value greater than 0.05, which states that these variables are normally distributed. Meanwhile, the relationship between physical activity and physical fitness is stated to be linear because the value (p) is  $0.060 > 0.05$ .

**Table 5.** Correlation Test Data Results

Connection	N	P	Correlation Coefficient (rxy)	Determinant Coefficient (r <sup>2</sup> )
Physical Activity	60	0,043	0,234	0,070
Physical fitness				

Based on the results in table 5, there is a significant correlation between the physical activity variables and physical fitness, and the correlation coefficient is 0.234 with a (p) value of 0.043, which means that a significant relationship between physical activity and students' physical fitness is acceptable.

Based on the correlation results above, the determinant coefficient value is 0.059. The result shows that the percentage of the relationship between these two variables is  $0.070 \times 100 = 7\%$ . So, 7% of students' physical fitness is influenced by physical activity and 93% is influenced by other factors.

## 4. Discussions

Based on the research results, it can be observed that the results of the frequency distribution related to physical activity prove that there are no students whose physical activity is classified as very good. This is in line with research results that types of physical activity can be

grouped into three categories: light, moderate and heavy [38]. The level of energy consumption required in each activity varies depending on the duration and intensity of the muscle movements involved. There is a strong link between human physical activity and quality of life, well-being and health. Physical activity includes any body movement that involves muscles and uses energy. Based on the results of filling out the physical activity questionnaire, students do not use their free time very well, most of them still do physical activity which is classified as insufficient and a few students' physical activity is classified as good.

Based on what has been explained above, it can be said that the physical activity of elementary school students tends to be low in category not enough. In addition, according to research by [39] without supervision in sports activities, a person will tend to remain silent and experience limited physical conditions. Based on the results of the PACER Test, on average, male teenagers perform better than female teenagers. Based on the results of the frequency distribution of students' physical fitness, it can be determined based on data when carrying out the PACER Test. Based on these data, it shows that the physical fitness category is very low as many as 66 people (99%), and the low category is 1 person (1%).

Based on the data above, the physical fitness of students who are very low can be seen to be very high. Of course, students, parents and teachers need to pay more attention to this because it has an impact on daily activities when carrying out an activity [40]. Apart from that, it also has an impact on health and learning achievement. If students' physical fitness is low, and then learning achievement will also be low. This explanation is reinforced by [41] that physical fitness and social interactions have a significant relationship with students' achievement. This is caused by the psychological impact of being less fit so that it is difficult to convey the knowledge given compared to students who are good at physical fitness.

Based on the results of research data, there is a significant relationship between physical activity and the physical fitness of elementary school students. This is proven by the correlation coefficient value of 0.244 with (p) 0.046. The percentage of this relationship is 6%. There are several factors that influence the relationship between physical activity and physical fitness, such as the lifestyle lived [42], education, the surrounding environment [43] [44], heredity [45] [46].

The research results prove that there is a significant correlation between physical activity and students' physical fitness with a correlation coefficient of 0.244 and (p) 0.046, meaning there is a significant relationship between physical activity and students' physical fitness [32]. In addition, physical activity has a weak relationship with physical fitness and the direction of the relationship is linear. Physical activity carried out at high intensity will have the effect of increasing students' physical fitness. Based on the results above, it can be concluded that

physical activity has a positive impact on students' physical fitness.

Physical fitness can influence academic achievement by increasing school children's thinking abilities and learning concentration. Research was conducted to analyze the relationship between physical fitness and academic achievement of school children [47]. Observational analysis uses a cross sectional design. Ninety-five children at SDN Tegalgede 01 Jember were research subjects using purposive sampling. Physical fitness was analyzed from the 20 m shuttle run test. Academic achievement is assessed using school-wide test scores in Mathematics, Indonesian and Science subjects. Then, data was collected and analyzed using Chi Square. The results showed that there were more healthy children (66.3%) than unhealthy children. The proportion is good. The academic achievement of fit children is greater than that of unfit children (96.8%). Physical fitness has a significant relationship with children's academic achievement ( $p=0.04$ ). Children who are not fit have academic achievement 5.6 times lower than children who are fit. Physical fitness can improve school children's academic performance.

The results of this study showed an increase in children's physical fitness as evidenced by the classical pre-action physical fitness score reaching 52.28%. Research is considered successful after action is taken. In cycle I, the classical score increased to 87.19% and in cycle II, a satisfactory classical score reached 94.74% [48]. Explains that the game model developed is effective in increasing physical activity [49].

The need for physical fitness is very important for achieving learning outcomes, because physical fitness is the body's ability to adapt to daily tasks without fatigue [50], having enough energy to enjoy free time or face emergencies at any time [31] [51]. The results of this research show that physical fitness is not one of the factors that determine the increase or decrease in student learning outcomes. The results showed that there were 0 students or 0% in the very good classification, there were 19 students or 1% in the good classification, there were 267 students or 15% in the medium classification, there were 1432 students or 80% in the poor classification, and there are 71 students or 4% in the very poor classification. Thus, it can be concluded that students aged 10-12 years in Gorontalo City have a poor level of physical fitness [34].

The results of the study showed that on average 72 children (74.2%) carried out physical activity with light to moderate intensity. The item category for children's physical activity was the highest with a mean score of 4.93 ( $\pm 1.92$ ). The physical activity category during lunch time was the lowest with a mean score of 2.30 ( $\pm 1.38$ ). The total mean for the PAQ-C questionnaire was 3.22 ( $\pm 1.29$ ). Then for HRQoL social support was the highest value with a mean of 14.78 ( $\pm 3.19$ ). The lowest value in the table is on the physical well-being scale with a mean value of 9.52 ( $\pm 2.19$ ). The average in the child's quality of life

questionnaire was 11.87 ( $\pm 2.99$ ). There is a fairly unidirectional correlation between physical activity and quality of life as shown by the figure 0.259, with probability that the p-value shows 0.011. The conclusion of this research is that physical activity provides various benefits and positive influences on children's survival and health. Meanwhile, from all dimensions of HRQoL it can be concluded that they have a correlation or relationship in determining a child's quality of life [52].

Research results for fitness classification in the pretest were in the less than 22 categories (45.83), for the moderate posttest 24 students (50%), based on calculations to see the comparison of pretest and posttest data with using paired sample T - test can be seen that the sig value is  $0.00 < 0.05$ , so it can be done concluded that there is an influence of weekly physical activity patterns on the physical fitness of Pandan State Elementary School students based on the sig value [33].

The results of research on the physical activity and motor skills variables show a sig value of  $0.028 < 0.05$ , which means there is a positive relationship between physical activity and students' motor skills. Meanwhile, for the physical activity and physical fitness variables, a sig value of  $0.034 < 0.05$  was obtained, which means that there is a positive relationship between physical activity and students' physical fitness. The research results show that there is an influence on physical activity on students' motor skills and physical fitness [18].

The results in this study show a t-count value of 3.545 with a Sig of  $0.002 < 0.05$  so  $H_0$  is rejected and a t-count value of 2.011 with a Sig value.  $0.225 > 0.05$   $H_0$  is accepted. The conclusion of this study explains that there is an influence of basic movement activities on the development of social processes (associative) in elementary school students, but there is no influence of basic movement activities on the development of social processes (dissociative) in elementary school students. This research contributes to the need to continue in the form of developing basic movement activities to improve social interaction and other aspects [53] [54]. In conclusion, our research presents an artificial intelligence-based fitness monitoring system (AI fitness trainer) that provides real-time guidance during exercise. The com system features a posture recognition unit, a fitness movement analysis unit, and a feedback unit, and has shown promising results producing accuracy and performance for "wall-sit" and "plank" poses. However, our prototype still has limitations that need to be addressed in future work, such as the need for more diverse and representative training data, integration par mechanism personalized feedback, and improved system interpretation. Despite these limitations, our experience, interim results show that the AI fitness trainer with computer Vision technology has the potential to serve as an effective and efficient fitness training tool. Our research contributes to the HCI field by demonstrating the potential of AI technology in improving human fitness and promoting healthy lifestyles.

[55] The results of the research show that: (1) The correlation between the traditional game Gobak Sodor and the level of physical fitness of class IV male students at SD Negeri Cibodas 1, Tangerang City shows a correlation. *Pearson Product Moment r* table (N-1) with a significance level of 0.05 is 0.284. Because  $r_{xy} = 0.284 > r_{table} (N-1) = 0.894$ . So it can be concluded that there is no significant correlation between the traditional game gobak sodor and the level of physical fitness of class IV male students at SD Negeri Cibodas 1, Tangerang City. (2) The level of physical fitness of class IV male students at SD Negeri Cibodas 1 Tangerang City is at a Medium Classification level (27%). The conclusions of this research are (1) There is no correlation between the traditional game gobak sodor and the level of freshness physical Class IV male students at Cibodas 1 State Elementary School, Tangerang City (2) The physical fitness level of IV class male students at Cibodas 1 Public Elementary School, Tangerang City is Medium.

## 5. Conclusions

Based on the results of data analysis, it proves that there is a significant correlation between physical activity and students' physical fitness, physical activity has a low relationship with physical fitness and the direction of the relationship is linear. Based on these results, it can be explained that the higher the physical activity carried out, the more positive impact it will have on students' physical improvement. There are several factors that cause weak relationships, namely lifestyle, education, surrounding environment, physical appearance, heredity.

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## REFERENCES

- [1] R. Dewi and I. Verawati, "The Effect of Manipulative Games to Improve Fundamental Motor Skills in Elementary School Students," *Int. J. Educ. Math. Sci. Technol.*, vol. 10, no. 1, pp. 24–37, 2022, doi: 10.46328/ijemst.2163.
- [2] D. Endriani, H. Sitompul, R. Mursid, and R. Dewi, "Development of a Lower Passing Model for Volleyball Based Umbrella Learning Approach," *Int. J. Educ. Math. Sci. Technol.*, vol. 10, no. 3, pp. 681–694, 2022, doi: 10.46328/ijemst.2508.
- [3] I. Akhmad, Suharjo, Hariadi, R. Dewi, and A. Supriadi, "The Effects of Learning Strategies on Senior High School Students' Motivation and Learning Outcomes of Overhead

- Passing in Volleyball,” *Int. J. Educ. Math. Sci. Technol.*, vol. 10, no. 2, pp. 458–476, 2022, doi: 10.46328/ijemst.2291.
- [4] I. Verawati, R. Dewi, and D. A. Ritonga, “Development of Modification of Big Ball Game with Play Approach in Order to Develop Basic Movement Skills in Elementary School Students,” *Budapest Int. Res. Critics Inst. Humanit. Soc. Sci.*, vol. 4, no. 2, pp. 3186–3192, 2021, doi: 10.33258/birci.v4i2.2051.
- [5] I. Akhmad, *PJOK Subject Competency Standards. Ministry of Education and Culture, Directorate General of Teachers and Education Personnel*, 2016.
- [6] J. Irmansyah, R. Lumintuarso, F. X. Sugiyanto, and P. Sukoco, “Children’s social skills through traditional sport games in primary schools,” *Cakrawala Pendidik.*, vol. 39, no. 1, pp. 39–53, 2020, doi: 10.21831/cp.v39i1.28210.
- [7] D. Siedentop and H. van der Mars, *Introduction to Physical Education, Fitness and Sport*, 9th ed. United State of America: Human Kinetics, 2023.
- [8] G. Griban *et al.*, “Formation of health and fitness competencies of students in the process of physical education,” *Sport Mont*, vol. 19, no. 3, pp. 73–78, 2020, doi: 10.33462/jotaf.10.26773/smj.201008.
- [9] A. Yulianti, R. P. Damayati, and N. M. Rosiana, “Physical Fitness and Learning Achievement of Elementary School Children,” in National Seminar on Research Results, Politeknik Negeri Jember, 2017, pp. 1–5. [Online]. Available: <https://publikasi.poliije.ac.id/index.php/prosiding/article/view/746/485>
- [10] M. A. Suganda and S. Suharyana “Development of a Volleyball Learning Model for Upper Elementary School Students,” *J. Keolahragaan*, vol. 1, no. 2, pp. 156–165, 2013, doi: 10.21831/jk.v1i2.2571.
- [11] A. G. Lemos, E. L. Avigo, and J. A. Barela, “Physical Education in Kindergarten Promotes Fundamental Motor Skill Development,” *Adv. Phys. Educ.*, vol. 02, no. 01, pp. 17–21, 2012, doi: 10.4236/ape.2012.21003.
- [12] A. Fikri *et al.*, “Tennis Ball Exercise: Variation to Increase Arm Muscle Strength in Martial Athletes at Sriwijaya State Sports School,” *Int. J. Hum. Mov. Sport. Sci.*, vol. 10, no. 5, pp. 964–972, 2022, doi: 10.13189/saj.2022.100513.
- [13] L. W. Fathir, S. Hartanto, and N. W. Kusnanik, “Strength, endurance and speed development using functional strength training (Fst) program for recreational runners performance,” *J. Phys. Educ. Sport*, vol. 21, pp. 2453–2457, 2021, doi: 10.7752/jpes.2021.s4330.
- [14] S. Syamsuar and Z. Zen, “Teaching game for understanding model: increasing motivation and students’ physical fitness,” *JPPI (Jurnal Penelit. Pendidik. Indones.)*, vol. 7, no. 1, pp. 128–136, 2021, doi: 10.29210/02021951.
- [15] R. D. Burns, Y. Fu, Y. Fang, J. C. Hannon, and T. A. Brusseau, “Effect of a 12-Week Physical Activity Program on Gross Motor Skills in Children,” *Percept. Mot. Skills*, vol. 124, no. 6, pp. 1121–1133, 2017, doi: 10.1177/0031512517720566.
- [16] N. Susanto and E. M. Nurhasan, “The Effect of Learning Models on Creativity, Knowledge, and Big Ball Game Skills in High School Students,” *J. Human Univ. Nat. Sci.*, vol. 48, no. 8, 2021, [Online]. Available: <http://www.jonuns.com/index.php/journal/article/view/681>
- [17] B. Indrayana and M. U. Z. Hasibuan “Overview of Physical Conditions (Vo2max) in the Paal 5 Jambi Basketball Lover Community,” *J. Coach. Educ. Sport.*, vol. 2, no. 2, pp. 195–204, 2021, doi: 10.31599/jces.v2i2.737.
- [18] D. Yoga, P. Purbodjati, and N. A. Kumaat, “The Effect of Physical Activity on Students’ Motor Skills and Physical Fitness,” *Bravo’s J. Progr. Stud. Pendidik. Jasm. dan Kesehat.*, vol. 11, no. 2, p. 240, 2023, doi: 10.32682/bravos.v11i2.3083.
- [19] R. R. Prastyawan and K. A. Pulungan, “The Significance of Physical Fitness on Primary School Student Learning Achievement,” *J. Pendidik. Jasm. Indones.*, vol. 18, no. 2, pp. 185–193, 2022, doi: 10.21831/jpii.v18i2.55859.
- [20] V. Andersen *et al.*, “Comparison of muscle activity in three single-joint, hip extension exercises in resistance-trained women,” *J. Sport. Sci. Med.*, vol. 20, no. 2, pp. 181–187, 2021, doi: 10.52082/jssm.2021.181.
- [21] S. E. Cuda *et al.*, “Metabolic, behavioral health, and disordered eating comorbidities associated with obesity in pediatric patients: An Obesity Medical Association (OMA) Clinical Practice Statement 2022,” *Obes. Pillars*, vol. 3, p. 100031, 2022, doi: 10.1016/j.obpill.2022.100031.
- [22] W. Zhu, “Science and art of setting performance standards and cutoff scores in kinesiology,” *Res. Q. Exerc. Sport*, vol. 84, no. 4, pp. 456–468, 2013, doi: 10.1080/02701367.2013.845517.
- [23] I. Ericsson and M. K. Karlsson, “Motor skills and school performance in children with daily physical education in school - a 9-year intervention study,” *Scand. J. Med. Sci. Sport.*, vol. 24, no. 2, pp. 273–278, 2014, doi: 10.1111/j.1600-0838.2012.01458.x.
- [24] A. Pioreschi *et al.*, “Examining the relationships between body image, eating attitudes, BMI, and physical activity in rural and urban South African young adult females using structural equation modeling,” *PLoS One*, vol. 12, no. 11, 2017, doi: 10.1371/journal.pone.0187508.
- [25] F. Budi Setyawan and D. Puspitarini, “Potential Learning Loss to Basic Motion Ability in Elementary School Students During Physical Education Learning during a Pandemic,” *J. Sport. J. Penelit. Pembelajaran*, vol. 8, no. 3, pp. 1–16, 2022, doi: 10.29407/js\_unpgri.v8i3.18795.
- [26] S. Gultom, Baharuddin, D. Ampera, H. Fibriasari, and N. Sembiring, “Profile of Student Physical Fitness Level of Sports Science Study Program: Relationship between Nutrition Status and Learning Achievement during COVID-19 Pandemic,” *Int. J. Educ. Math. Sci. Technol.*, vol. 10, no. 1, pp. 100–112, 2022, doi: 10.46328/ijemst.2115.
- [27] H. HDP, A. Sunarno, and A. Sinulingga, “Effect of Basic Movement Skills in The Game of Ability Early Children’s Cognitive,” *J. Phys. Educ. Heal. Recreat.*, vol. 5, no. 1, p. 72, 2020, doi: 10.24114/pjkr.v5i1.26450.
- [28] M. Reichert *et al.*, “Ambulatory assessment for physical activity research: State of the science, best practices and future directions,” *Psychol. Sport Exerc.*, vol. 50, 2020, doi: 10.1016/j.psychsport.2020.101742.

- [29] L. Pannekoek, J. P. Piek, and M. S. Hagger, "Motivation for physical activity in children: A moving matter in need for study," *Hum. Mov. Sci.*, vol. 32, no. 5, pp. 1097–1115, 2013, doi: 10.1016/j.humov.2013.08.004.
- [30] G. M. M. Boonekamp, J. A. J. Dierx, and E. Jansen, "Motivating students for physical activity: What can we learn from student perspectives?," *Eur. Phys. Educ. Rev.*, vol. 27, no. 3, pp. 512–528, 2021, doi: 10.1177/1356336X20970215.
- [31] D. S. N. Izatulislami and Noortje Anita Kumaat, "The Relationship between Physical Activity and Quality of Life of Kedungdoro IV Surabaya State Elementary School Students," *J. Kesehat. Olahraga*, vol. 10, no. 04, pp. 93–102, 2022.
- [32] K. G. Adhianto and N. A. Arief, "The Relationship of Physical Activity to the Physical Fitness of Junior High School Students," *Jambura J. Sport. Coach.*, vol. 5, no. 2, pp. 134–141, 2023, doi: 10.37311/jjsc.v5i2.20978.
- [33] I. Ma'arif and P. S. Hasmara, "The Relationship Between Physical Activity and Physical Fitness of Elementary School Students Aged 10-12 Years," *J. RESPECS (Research Phys. Educ. Sport.)*, vol. 5, no. 1, pp. 81–88, 2023, doi: 10.31949/respecs.v5i1.4059.
- [34] Syarif Hidayat, "Physical Freshness of 10-12 Year Old Students in Gorontalo City," *Jambura J. Sport. Coach.*, vol. 1, no. 1, pp. 12–21, 2019, [Online]. Available: <http://ejurnal.ung.ac.id/index.php/jjsc/article/view/1995>
- [35] Sugiyono, *Educational Research Methods Quantitative, Qualitative and R&D Approache*. Bandung: Alfabeta, 2010.
- [36] Sugiyono, *Quantitative, Qualitative, and R&D Research Methods*. Bandung: Alfabeta, 2017.
- [37] H. O. Yeni, R. Sanusi, and F. Noprari, "Development of a Flexiometer Test Equipment for Measuring Waist Flexibility/Pliability, Health and Recreation Physical Education Study Program, Teacher Training and Education Faculty," *J. Pendidik. MINDA*, vol. 2, no. 1, pp. 13–25, 2020.
- [38] M. Y. Habut, I. P. S. Nurmawan, and I. A. D. Wiryanthini, "The Relationship between Body Mass Index and Physical Activity on Dynamic Balance in Students of the Faculty of Medicine, Udayana University," *Maj. Ilm. Fisioterapi Indones.*, vol. 4, no. 2, pp. 45–51, 2016, doi: 10.24843/MIFI.2016.v04.i02.p08.
- [39] R. S. Massa, H. Hadjarati, and S. Kadir, "Student Evaluation: Capacity Level (VO2Max)," *Jambura J. Sport. Coach.*, vol. 4, no. 2, pp. 103–108, 2022, doi: 10.37311/jjsc.v4i2.15363.
- [40] A. Saputra, "Online Sports as a Solution to Maintain the Quality of Physical Fitness During the Covid-19 Pandemic," *Indones. Sport J.*, vol. 6, no. 1, 2023, [Online]. Available: <https://jurnal.unimed.ac.id/2012/index.php/isy/article/view/48590/0>
- [41] I. Akhmad, T. Nugraha, and P. Sembiring, "Speed, Agility, and Quickness (SAQ) training of the circuit system: How does it affect kick speed and agility of junior taekwondo athletes?," *J. Sport Area*, vol. 6, no. 2, pp. 175–182, 2021, doi: 10.25299/sportarea.2021.vol6(2).6433.
- [42] N. Zenic *et al.*, "Levels and changes of physical activity in adolescents during the COVID-19 Pandemic: Contextualizing urban vs. Rural living environment," *Appl. Sci.*, vol. 10, no. 11, pp. 1–14, 2020, doi: 10.3390/APP10113997.
- [43] P. Knobel *et al.*, "Quality of urban green spaces influences residents' use of these spaces, physical activity, and overweight/obesity," *Environ. Pollut.*, vol. 271, 2021, doi: 10.1016/j.envpol.2020.116393.
- [44] A. C. Jeffries, S. M. Marcora, A. J. Coutts, L. Wallace, A. McCall, and F. M. Impellizzeri, "Development of a Revised Conceptual Framework of Physical Training for Use in Research and Practice," *Sport. Med.*, vol. 52, no. 4, pp. 709–724, 2022, doi: 10.1007/s40279-021-01551-5.
- [45] P. N. Sawunggaluh, "The Relationship between the Level of Physical Fitness, Intelligence and Sociability of Students with Achievement in Class XI of SMA Negeri 1 Kalibawang, Kulonprogo Regency in 2015/2016," Universitas Negeri Yogyakarta, 2016. [Online]. Available: <https://journal.student.uny.ac.id/ojs/index.php/pjkr/article/download/2340/2020>
- [46] G. E. Furtado *et al.*, "Sustaining efficient immune functions with regular physical exercise in the COVID-19 era and beyond," *Eur. J. Clin. Invest.*, vol. 51, no. 5, 2021, doi: 10.1111/eci.13485.
- [47] A. Yulianti, R. P. Damayati, and N. M. Rosiana, "Physical Fitness and Academic Achievement of Elementary School Children," *Proceedings*, vol. Politeknik, pp. 1–5, 2017, [Online]. Available: <https://publikasi.polije.ac.id/index.php/prosiding/article/view/746>
- [48] M. Ardi and S. Purwanto "Physical fitness and discipline of lower grade elementary school children," *J. Pedagog. Olahraga dan Kesehat.*, vol. 2, no. 2, pp. 71–82, 2021, doi: 10.21831/jpok.v2i2.17763.
- [49] Rikza Azharona Susanti, "Improvement of Physical Fitness Through Cheerful Colours Circuit Game," *J. Pendidik. Usia Dini*, vol. 8, no. 2, pp. 347–358, 2014, [Online]. Available: <https://doi.org/10.21009/JPUD.082.014>
- [50] H. Kaur, T. Singh, Y. K. Arya, and S. Mittal, "Physical Fitness and Exercise During the COVID-19 Pandemic: A Qualitative Enquiry," *Front. Psychol.*, vol. 11, 2020, doi: 10.3389/fpsyg.2020.590172.
- [51] A. Holtermann, J. V. Hansen, H. Burr, K. Sjøgaard, and G. Sjøgaard, "The health paradox of occupational and leisure-time physical activity," *Br. J. Sports Med.*, vol. 46, no. 4, pp. 291–295, 2012, doi: 10.1136/bjism.2010.079582.
- [52] Makbullah, M. Muliarta, G. N. I. Pinatih, L. M. I. Sri Handari Adiputra, I. B. Ngurah, and S. Purnawati, "The physical fitness of students who take part in extracurricular sports activities is better compared to students who only take physical education subjects at Smpn 02 Masbagik, East Lombok Regency, 2016/2017 academic year," *Sport Fit. J.*, vol. 6, no. 2, pp. 65–71, 2018, doi: 10.24843/spj.2018.v06.i02.p08.
- [53] R. Dewi, I. Verawati, A. Sukamton, H. Hakim, E. Burhaein, and C. C. V. Lourenço, "The Impact of Basic Motion Activities on Social Interaction in Elementary School Students," *Int. J. Hum. Mov. Sport. Sci.*, vol. 11, no. 1, pp. 143–151, 2023, doi: 10.13189/saj.2023.110117.
- [54] J. Haoran, S. Karungaru, and K. Terada, "AI Fitness Coach

at Home Using Image Recognition," *Int. J. Hum. Mov. Sport. Sci.*, vol. 11, no. 4, pp. 850–857, 2023, doi: 10.13189/saj.2023.110419.

[55] A. H. Yanuar and S. Supriyono "Correlation of the

Traditional Game Gobak Sodor with the Level of Physical Fitness of Class IV Boys at SD Negeri Cibodas 1, Tangerang City," *Indones. J. Phys. Educ. Sport*, vol. 3, no. 2, pp. 496–504, 2022, doi: 10.15294/inapes.v3i2.59001.