Physical literacy: physical literacy knowledge and its relationship to physical fitness of senior high school students

Alfabetización física: análisis del conocimiento sobre la alfabetización física y su relación con la aptitud física en estudiantes de educación secundaria

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Abstract

Introduction. This study aimed to investigate the level of physical literacy and its relationship with physical fitness among 10th-grade students in Sleman Regency using a correlational research design.
Objective. The subjects were 64 students (32 male, 32 female) aged 15–17. The research sample using a purposive sampling technique, selected based on several criteria: non-athletes and residents of Sleman Regency.
Methodology. The instrument in this study used two tests, were the Adolescence Physical Literacy Questionnaire (APLQ) and the Bleep Test. The APLQ showed good internal consistency (α = 0.951), validity (0.680–0.790), and reliability (0.837–0.981). The Bleep Test had a validity of 0.915 and reliability of 0.868. Thus, this research instrument was valid and reliable. Data analysis used the Spearman correlation test, were carried out with the help of IBM SPSS Ver. 20.
Results. The results of this study indicated that the linearity data obtained a Sig value of 0.975 > 0.05 and an F count value of 0.025 < F table of 2.528, so there was a significant linear relationship between physical literacy and physical fitness. Furthermore, hypothesis testing with Spearman analysis obtained a correlation coefficient between physical literacy and physical fitness of -0.091, these results showed a very weak relationship between the two variables.
Discussion. The significance value (p-value) was 0.473 > 0.05, so it can be concluded that there is no significant relationship between physical literacy and physical fitness. Conclusions. Thus, it was concluded that there is no significant relationship between physical literacy and physical fitness among 10th-grade students in Sleman Regency.

Keywords

Physical literacy, physical fitness, senior high school students.

Resumen

Introducción. Este estudio tuvo como objetivo investigar el nivel de alfabetización física y su relación con la condición física entre los estudiantes de décimo grado en el distrito de Sleman utilizando un diseño de investigación correlacional.
Objetivo. Los sujetos fueron 64 estudiantes (32 hombres y 32 mujeres) de 15 a 17 años. La muestra de investigación se seleccionó mediante un método de muestreo intencional, basado en varios criterios: no ser atletas y residir en el distrito de Sleman.
Metodología. Los instrumentos utilizados en este estudio fueron dos pruebas: el *Adolescence Physical Literacy Questionnaire* (APLQ) y el *Bleep Test*. El APLQ mostró una buena consistencia interna (α = 0.951), validez (0.680–0.790) y confiabilidad (0.837–0.981). El *Bleep Test* presentó una validez de 0.915 y un coeficiente de confiabilidad de 0.868. Por lo tanto, los instrumentos de investigación fueron válidos y confiables. El análisis de datos utilizó la prueba de correlación de Spearman, con el apoyo del programa IBM SPSS Ver. 20.
Resultados. Los resultados del estudio indicaron que los datos de linealidad obtuvieron un valor de significancia de 0.975 > 0.05 y un valor F calculado de 0.025 < F tabla de 2.528, lo que indica una relación lineal significativa entre la alfabetización física y la condición física. Sin embargo, la prueba de hipótesis mediante el análisis de Spearman arrojó un coeficiente de correlación entre la alfabetización física y la condición física de -0.091, lo que mostró una relación muy débil entre ambas variables.
Discusión. El valor de significancia (p-valor) fue 0.473 > 0.05, por lo que se concluye que no existe una relación significativa entre la alfabetización física y la condición física.
Conclusiones. Por lo tanto, se concluyó que no hay una relación significativa entre la alfabetización física y la condición física entre los estudiantes de décimo grado en el distrito de Sleman.

Palabras clave

Alfabetización Física, aptitud física, estudiantes de secundaria.

Introduction

Over the past few years, physical literacy has developed into an important concept in physical education. Physical literacy is recognized as the basic principle and purpose of superior physical education (Rahmat et al., 2024). The provision of physical education learning on healthy lifestyle materials, including physical literacy, must be conveyed optimally so that students have the awareness to maintain good habits and not endanger their health (Nevitaningrum et al., 2024). Physical literacy refers to a person's understanding and skills in moving physically, including an understanding of physical activity, fitness, movement techniques, and knowledge of the importance of healthy and active living (Keolahragaan, 2024). Therefore, students need to understand physical literacy to be more motivated to live a sustainable, active, and healthy lifestyle. Previous study asserts (Wulan et al., 2023) that physical literacy includes such things as motivation, self-confidence, physical competence, knowledge, and understanding to appreciate and be responsible for participation in physical activity throughout life. With physical literacy, individuals can manage their health more independently, make better decisions about physical activity, and take necessary actions to maintain health and fitness (Kurniawan et al., 2024). Physical literacy, especially for high school teenagers, is believed to be the foundation for developing good physical activity habits in the long run.

Adolescents of senior high school age are a critical age group. Adolescent health is a concern because adolescence is an important time in shaping lifestyles and habits that will have an impact on their health in adulthood. High school adolescents with high levels of physical literacy tend to have better fitness, lower risk of chronic diseases such as obesity, diabetes, and heart disease, and have better levels of mental well-being and fitness, and vice versa (Lubis et al., 2024). Based on the results of interviews with five high school teachers in Sleman, it was concluded that: 1) the level of physical activity carried out by students is decreasing, 2) lack of interest in physical activities outside school, and students prefer to play games and play social media, 3) lack of understanding about the importance of physical fitness, 4) students are more concerned with academic achievement than sports activities, 5) students also complain of fatigue due to crowded school schedules so they do not have time to exercise. World Health Organization (WHO) recommends that children and adolescents aged 5–17 engage in at least 60 minutes of moderate to vigorous intensity physical activity daily. Meanwhile, adults aged 18–64 should perform at least 150 minutes of moderate-intensity aerobic physical activity throughout the week (Ndagire et al., 2019).

In line with the previous research (Sauri & Arief, 2023) , it shows that out of a sample of 140 high school students in Kediri, there were 117 students in the very low fitness category. In another study, by obtaining the results of a fitness test using the Progressive Aerobic Cardiovascular Endurance Run Test from 204 high school students in Mojokerto, there was a very low fitness category of 102 students. Based on interviews and literature, it shows that the physical fitness of high school students is still at a low level. Mutohir et al. explain that the 2021 National Sports Development Index report states that the average adolescent vo2_max is 26.35 ml/kg/min, in men is 28.68 ml/kg/min, and in women is 23.98 ml/kg/min (Mutohir et al., 2021). From the available data, the fitness category is very poor at 53.63%, the category is poor at 22.68%, and only 5.86% is in the good and very good category, so it can be concluded that it can be concluded that the level of physical fitness of adolescents in Indonesia is still low. he majority of the youth population is physically inactive; specifically, 81% of children and adolescents do not engage in sufficient physical activity.

As a result, the physical fitness of adolescents is also very low, as it is directly related to physical activity (Gilic et al., 2022). In addition, in Indonesia, a total of 1,746,023 children and adolescents from 14 countries (China, Finland, Sweden, Belgium, New Zealand, Denmark, Spain, Norway, Mozambique, Poland, the United States, Lithuania, Portugal, Canada) over the period from 1969 to 2017 have shown a consistent decline in physical strength and endurance over time (Masanovic et al., 2020). Lee et al mengungkapkan bahwa kebugaran fisik – didefinisikan sebagai daya tahan kardiorespirasi dan otot, kekuatan otot, komposisi tubuh (yaitu, massa tubuh, lemak tubuh, distribusi lemak) dan fleksibilitas telah menurun di kalangan orang dewasa dan pemuda Kanada (Lee et al., 2019). Kashuba state that the number of children with chronic diseases in modern schools has increased from 30-35% for first-grade students to 47-75% for high school graduates. The proportion of children with low physical health levels has increased from 30.5-38.0% in elementary school to 53.1-65.9% in high school (Kashuba et al., 2018)

Physical fitness is the ability and capability of a body to adapt to the physical load given without causing excessive fatigue (Triansyah et al., 2024). Physical fitness is a state of physical ability that can adjust the function of body organs to certain physical tasks and/or to environmental conditions that must be overcome (Triansyah et al., 2024). Physical fitness is designed in physical education classes so that teachers allow them to develop and maintain the health of students (Nopembri & Sugiyama, 2022). School, especially in physical education learning, as a conducive environment and inherent opportunity for social interaction, stands as an ideal platform to promote physical literacy knowledge to students to achieve physical fitness, including high school students (Sanuddin et al., 2024). Students, especially senior high school students, need to have good fitness due to crowded school schedules and assignments at home. Iqbal et al. state that students need good physical fitness to be able to participate in all activities at school without significant fatigue so that they can follow learning to the maximum without feeling excessive fatigue (Iqbal et al., 2024).

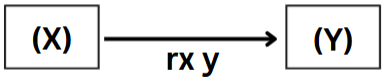
Based on the studies that have been discussed, it is therefore important for students to understand physical literacy which is not only understanding the knowledge of physical activity but also the skills and motivation to live a more active lifestyle. Physical literacy is a foundation that allows students to understand the importance of physical fitness so that students can maintain body fitness that supports focus and learning activities at school.

Based on the introduction above, this study aims to determine the level of physical literacy and its relationship to physical fitness in high school students, so that it can provide recommendations for schools, especially physical education teachers, to improve physical literacy and not only focus on physical programs.

Method

A correlational design was employed in this study. A correlational study is done with data collection as a determinant of the relationship between two or more variables (Marlina, 2021). The method used in this study was the survey method. This study aims to determine whether there is a relationship between physical literacy and physical fitness of students in the 10th grade of senior high school in Yogyakarta. The research design can be seen in the chart below:

Figure 1. Correlational research design



Source: (Hardani et al., 2020)

Description:
(X): Physical Literacy
(Y): Physical fitness
Rx y: The relationship between physical literacy and physical fitness

Participants

The subjects of this study were 10th-grade high school students in Sleman Regency. The research sample was taken using a purposive sampling technique, where the sample was selected based on the age criteria of 15-17 years old and non-sports athletes domiciled in Sleman Regency. The number of respondents involved in this study was 64 people, consisting of 32 female and 32 female students.

Procedure

Instrument

The instrument in this study used two tests, namely, a physical literacy test using a questionnaire and a fitness test using the Bleep Test. The physical literacy instrument used was the Adolescent Physical Literacy Questionnaire (APLQ), which has been translated into Indonesian. The validity of the APLQ instrument with good internal consistency (α = 0.951) with a validity of 0.680-0.790 and reliability showed a good internal consistency result (α = 0.951) with a reliability of 0.981 – 0.837, then the validity

and reliability of the APLQ instrument was declared valid and reliable (Mohammadzadeh et al., 2022). The following are physical literacy instruments for adolescents aged 12-18:

Table 1. Adolescent Physical Literacy Questionnaire

No	Questions	Answer				
		Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1	I enjoy exercising and being active.					
2	I would like to acquire more skills in sports.					
3	I am successful in doing sports and physical activity.					
4	I have more skills when exercising than my peers.					
5	I do sports and physical activities with family or friends.					
6	I encourage others to do sports and physical activity with me.					
7	I participate in group sports outside of school time.					
8	I have made new friendships in sports and physical activity.					
No	Questions	Answer				
		Very low	Low	Moderate	High	Very High
9	How familiar are you with the concepts of physical fitness (such as cardiorespiratory fitness, muscular endurance, coordination, and agility)?					
10	How much do you know about the right time for your age-related daily physical activity?					
11	How important are physical activity and exercise for health and fitness?					
12	How effective are physical activity and exercise for fitness?					
13	How much do you use your physical education knowledge in sports and physical activity?					
14	How much do you use your previous learned motor skills in sports or leisure?					
No	Questions	Answer				
		Never	Rarely	Sometimes	Very Often	Always
15	Do you do physical activity and exercise outside of school time?					
16	Do you do physical activity or exercise as a regular habit?					
17	Are you trying to learn new sports skills?					
18	Do you make changes in your life to have an active lifestyle?					
No	Questions	Answer				
19	If you have a specialized sport, how many years do you practice in this field?	Less than 1 year	Between 1-2 years	Between 2-3 years	Between 3-4 years	More than 4 years
20	If you have a specialized sport, how much skill do you have in your field?	Very low	Low	Moderate	High	Very High
21	On average, how many hours of physical activity or exercise do you do during a week?	Less than 2 hours	Between 2-4 hours	Between 4-6 hours	Between 6-8 hours	More than 8 hours
22	On average, how many hours a day do you do physical activity?	Less than 30 minutes	Between 30-60 minutes	Between 60-90 minutes	Between 90 – 120 minutes	More than 120 minutes
No	Questions	Answer				
		Very Poor	Poor	Average	Good	Very Good
23	How do you feel about your physical fitness (doing daily activities without fatigue, with energy and satisfaction)?					
24	How do you feel about your flexibility (the ability to stretch your muscles to maximize the range of motion of joints, such as sitting and reaching fingers to toes)?					
25	How do you feel about your muscular endurance (ability of a muscle to repeatedly exert, such as crunch or push-up)?					

Table 2 Five Scale Score Conversion Guidelines

Interval	Criteria
M + 1.5SD < X	Very good
M + 0.5SD < X ≤ M + 1.5SD	Good
M – 0.5SD < X ≤ M + 0.5SD S	Moderate

M – 1.5SD < X ≤ M + 0.5SD	Poor
X > M – 1.5SD	Very Poor

(Source: Azwar, 2019)

Description:

M = Mean

SD = Standard Deviation

Instruments to measure the physical fitness of 10th-grade students using the Bleep Test fitness test, the Bleep Test instrument has a validity of 0.915 and a reliability coefficient of 0.868 (Nurhasan in Rumaka, 2018). The following is the categorization of the Bleep Test assessment:

Table 3. Bleep Test Assessment Format

Gender	Category	Age (15-19 years)
Male	Very Good	≥48
	Good	42-47
	Fair	38-41
	Poor	33-37
	Very poor	≤32
Female	Very Good	≥42
	Good	36-41
	Fair	31-35
	Poor	27-30
	Very poor	≤26

(Source: Setiawan et al., 2022)

Data Collection Procedures

The research was conducted in Sleman Regency from the date the research was conducted in the Yogyakarta Special Region from the 9th of August to the 9th of October 2024. The steps in this research procedure included instrument preparation, field data collection, and finally data analysis to identify the relationship between physical literacy and physical fitness.

Data analysis

Data analysis in this study consisted of prerequisite tests (Linearity Test) and hypothesis tests.

Linearity Test

Linearity test used the help of IBM SPSS Version 20 program. The basis for making linearity test decisions was as follows:

If the probability value is ≥ 0.05, then the relationship between variables, X and Y, is linear.

If the probability value is ≤ 0.05, then the relationship between variables, X and Y, is linear.

Hypothesis Test

Hypothesis test is a test used to determine the relationship between research variables (Siregar et al., 2022). This hypothesis was tested using Spearman correlation with the help of IBM SPSS Version 20. The basis for decision-making is that if the significance value is < 0.05 then it is correlated, and if the significance is > 0.05 then it is not correlated, or if R count > R table then it is correlated, and R count < R table then it is not correlated (Rahmatih et al., 2020).

Results

This study consisted of data on physical literacy and physical fitness of 10th-grade students of Senior High School in Sleman Regency in 2024 with a total of 64 students consisting of 32 male and 32 female students. The results of this study are described as follows:

Description of research data

Physical Literacy

Statistical descriptive research data on the physical literacy of 10th-grade students of Senior High School in Sleman Regency can be seen in Table 4 as follows:

Table 4. Descriptive Physical Literacy Statistics

N	64
Mean	94
Median	95
Std. Deviation	7.41525
Minimum	66
Maximum	103
Sum	6037

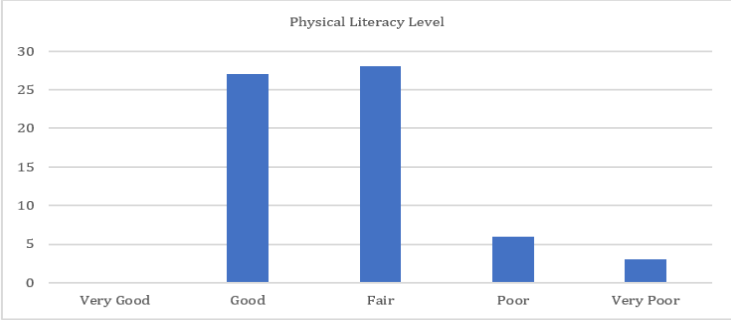
If it is conveyed in the form of frequency distribution of physical literacy of 10th-grade students of Senior High School in Sleman Regency, it can be seen in Table 5 as follows:

Table 5. Physical Literacy Frequency Distribution

No	Interval	Category	Frequency	Percentage
1	X > 105.13	Very good	0	0 %
2	97.71 < X ≤ 105.13	Good	27	42.1875 %
3	90.29 < X ≤ 97.71	Fair	28	43.75%
4	82.87 < X ≤ 90.29	Poor	6	9.375 %
5	X ≤ 82.87	Very Poor	3	4.6875 %
	Total		64	100 %

Based on the frequency distribution in Table 5 above, the physical literacy of 10th-grade students of Senior High School in Sleman Regency can be seen in Figure 1 as follows:

Figure 1. Physical Literacy Histogram



Based on Table 5 and Figure 1 above, physical literacy of 10th-grade students of Senior High School in Sleman Regency is in the category of "very good" by 0% (0 students), "good" by 42.1875% (27 students), "fair" by 43.75% (28 students), "poor" by 9.375% (6 students), and "very poor" by 4.6875% (3 students). Based on the average score, amounting to 94, the physical fitness level of middle-class students is in the "fair" category.

Physical Fitness

Statistical descriptive research data on the physical literacy of 10th-grade students of Senior High School in Sleman Regency can be seen in Table 6 as follows:

Table 6. Physical Fitness Statistics Descriptive

N	64
Mean	33.49
Median	32.4
Std. Deviation	8.45903
Minimum	20.8
Maximum	52.2
Sum	2143.1

If it is conveyed in the form of frequency distribution of physical literacy of 10th-grade students of Senior High School in Sleman Regency, it can be seen in Table 7 as follows:

Table 7. Physical Fitness Frequency Distribution

No	Interval	Category	Frequency	Percentage
1	X > 46.165	Very good	6	9.375 %
2	37.715 < X ≤ 46.165	Good	12	18.75%
3	29.265 < X ≤ 37.715	Fair	13	20.3125 %
4	20.815 < X ≤ 29.265	Poor	22	34.375 %
5	X ≤ 20.815	Very Poor	11	17.1875 %
	Total		64	100%

Based on the frequency distribution in Table 7 above, the physical literacy of 10th-grade students of Senior High School in Sleman Regency can be seen in Figure 1 as follows:

Figure 2. Physical fitness histogram

Based on Table 7 and Figure 2 above, physical fitness of 10th-grade students of Senior High School in Sleman Regency is in the "very good" category of 9.375% (6 students), "good" of 18.75% (12 students), "fair" of 20.3125% (13 students), "poor" of 34.375% (22 students), and "very poor" of 17.1875% (11 students). Based on the average score, amounting to 94, the physical fitness level of senior high school students is in the "fair" category.

Prerequisite Test Results

Linearity Test

The linearity test in this study is intended to determine whether or not the independent variable has a linear influence on the dependent variable. In this research, the relationship between variables X (Physical Literacy) and Y (Physical Fitness) is stated to be linear if it has a significance value of ≥ 0.05. The linearity test results are presented in Table 8:

Table 8. Summary of Linearity Test Results

Variable	df	F	Sig	Description
X/Y	2	0.025	0.975	Linear

Based on Table 8 above, the significance value (sig.) obtained by deviation from linearity sig. is 0.975, which is greater than 0.05. So, it can be concluded that there is a significant linear relationship between the variables of physical literacy knowledge and physical fitness. This is also shown from the F count value of 0.025 < F table 2.528. Where the F count value is smaller than the F table value, it can be concluded that there is a significant linear relationship between fitness variables and physical literacy knowledge.

Hypothesis Test Results

The hypothesis in this study is "there is no significant relationship between physical literacy and physical fitness of high school students in Sleman Regency". The results of hypothesis testing using Spearman correlation analysis can be seen in Table 9 below.

Table 9. Correlation Coefficient of Physical Literacy with Physical Fitness

Correlation	Correlation Coefficient	Sig	Description
X/Y	-0.091	0.473	No correlation

Based on Table 9, it is known that the correlation coefficient between physical literacy and physical fitness is -0.091. These results show a very weak relationship between the two variables, where the increase in physical literacy value is only accompanied by a slight decrease in the level of physical fitness. Apart from that, the significance value (p-value) is 0.473 > 0.05, so it can be concluded that there is no significant relationship between physical literacy and physical fitness.

It can be concluded that there is no significant relationship between physical literacy and physical fitness in this study. The very weak correlation coefficient and high p-value indicate that physical literacy has no effect or has no relationship with the physical fitness of 10th-grade senior high school students in Sleman Regency.

Discussion

Based on the results of the study above, there is no significant relationship between physical literacy and physical fitness of the 10th grade senior high school students in Sleman Regency. It is evidenced by the results of the coefficient of correlation hypothesis test between physical literacy and physical fitness of -0.091. Those results show a very weak relationship between the two variables, and the significance value (p-value) is 0.473 > 0.05, which means there is no significant relationship. It highlights that the higher level of physical literacy of students is not consistently followed by an increase in physical fitness and indicates that there is insufficient evidence to conclude that physical literacy has a relationship or influence on students' physical fitness.

However, this study has a limitation in the number of subjects, with only 64 participants consisting of 32 males and 32 females, which is considered too small to draw strong conclusions. Therefore, future research should expand the sample size to improve the validity and generalizability of the results.

Physical Literacy and Physical Fitness: Is Knowledge Enough?

Physical literacy is often considered an important foundation in encouraging an individual to be active in physical activities that contribute to fitness. Cornish et al. state that the concept of physical literacy consists of four domains: affective (motivation and self-confidence), physical (physical competence), cognitive (knowledge and understanding), and behavioral (engagement in lifelong physical activity)(Cornish et al., 2020). Kurniawan et al. state that with physical literacy, individuals can manage their health more independently, make better decisions about physical activity, and take the necessary actions to maintain health and fitness (Kurniawan et al., 2024). Physical literacy not only includes an understanding of movement regarding physical skills but also includes an understanding of how the environment and context influence behavior and decision-making in the context of physical activity and sport (Kurniawan et al., 2024). It is supported by research conducted at SMP Negeri 1 Depok, which shows that there is a significant relationship between physical literacy and physical fitness levels, but with a relatively low correlation coefficient value (r = 0.220), although there is a relationship, the effect is not very strong (G Kukuh Ikhsanto et al., 2023). This shows that knowledge of physical literacy alone is not enough to create significant changes in physical fitness, the need for self-motivation accompanied by concrete actions to improve physical fitness. Involvement in health-promoting behaviors, such as physical activity, depends on an individual's intention or motivation to engage in health behaviors (Lee et al., 2019) . Motivation is key to the adoption of a long-term physically active lifestyle (Gidney et al., 2024). Although physical literacy is as important as knowledge in improving physical fitness, other factors, such as exercise motivation, are also very influential (G Kukuh Ikhsanto et al., 2023). In line with research shows that 70% of adolescents have doubts in terms of exercise motivation, so awareness of carrying out sports has not been maximized (Handayani, 2021). Kelso et al. assert that motivation is the key to starting and maintaining beneficial health behaviors (Kelso et al., 2020). Some of these opinions highlight the importance of desire or motivation to be able to have good body fitness. Physical literacy includes not only a theoretical understanding of the importance of fitness but also a desire to maintain sustainable physical health. Without the drive to participate consistently in physical activity, physical literacy will not result in good physical fitness. Therefore, the concept of physical literacy should be emphasized not only in the cognitive domain but also in the affective, physical, and behavioral domains. Cornish et al. state that the scope of physical literacy needs to be expanded and tailored to the priorities or targets of individuals or populations, so that the physical literacy approach can become a new and

holistic framework for physical activity interventions aimed at improving fitness and health through lifelong participation in physical activity (Cornish et al., 2020).

Factors that influence physical fitness

The absence of a significant relationship between physical literacy and physical fitness indicates that other factors have more influence on students' physical fitness. Several other factors can directly affect physical fitness, such as daily physical activity, social environment, and diet. Physical activity is crucial during adolescence and young adulthood (Haverkamp et al., 2020) .Putro & Winarno state that adolescent physical activity can affect the quality of physical fitness (Putro & Winarno, 2022). The better the physical activity of students, the better the physical fitness. Self-regulation behaviors, such as setting fitness goals and consistently monitoring progress toward achieving fitness objectives, can also significantly support the improvement of physical fitness quality (Lee et al., 2019). The social environment can also affect physical fitness. Creating a supportive environment to increase physical activity levels among communities or groups is crucial, especially considering the differences in activity levels among various subgroups within society (Gidney et al., 2024). The social environment has a significant influence on physical activity behavior, for example, having someone such as colleagues, family, or physically active partners can have an impact on physical activity behavior (Ardiyanto & Mustafa, 2021). Health behaviors, such as physical activity, can be influenced by various levels: intrapersonal, interpersonal, physical environment, community, organizational, and policy levels (Gidney et al., 2024). In addition to physical activity and social environment, diet also greatly affects the fitness of an individual. Other research argues that a healthy lifestyle has an important role in improving and maintaining one's physical fitness (Dwiningrum & Nuruhidin, 2022). A healthy lifestyle, including consuming nutritious foods, especially in adolescence, is very important. It is reinforced by Sitoayu et al.'s research which says adolescents aged 16-19 years who often consume foods containing nutrients, especially iron, have good fitness levels, and vice versa (Sitoayu et al., 2020). Other research highlights that improving micronutrient status, such as iron, thiamine, riboflavin, pyridoxal phosphate, folate, and vitamin C, can support physical work capacity and endurance in children and adolescents. Therefore, micronutrient supplementation also supports the improvement of aerobic capacity and overall endurance (Vaz et al., 2011). Thus, it can be concluded that the absence of a significant relationship between physical literacy and physical fitness indicates that other factors can play a role in influencing students' physical fitness, such as the intensity of physical activity, an active social environment, and a balanced nutritional diet.

Conclusions

The results of this study highlight that the development of physical literacy programs in schools is needed. The approach to physical literacy is expanded on the formation of physical attitudes and behaviors. Programs that only focus on increasing knowledge are less effective in improving students' physical fitness without the formation of sports habits in schools for the 10th grade senior high school students in Sleman Regency.

Efforts to improve physical fitness require a more intensive and comprehensive approach, not only relying on increasing knowledge but also the encouragement or motivation to be more physically active. Schools can work on strengthening physical activity habituation programs at school, such as healthy gymnastics every once a week and fitness tests every three months. In addition, schools can also provide outdoor fitness equipment in the schoolyard area to support an active lifestyle.

This research is relevant for other educational levels, such as primary and secondary education, where the focus can be directed towards the development of fundamental movement skills and the habituation of physical activity from an early age. At the post-compulsory education level, physical literacy can also be developed to support a sustainable healthy lifestyle through training programs tailored to the needs of adults.

It is expected that future research could be focused on exploring other factors that influence physical fitness in addition to physical literacy. For example, variables such as fun sports, social environment, sports motivation, and the availability of sports facilities. In addition, research on interventions such as the development of teaching media as stimulation of physical fitness or physical activity programs for

students can be carried out to see the effectiveness in improving physical fitness and to provide practical input to be applied in schools, at the primary, secondary, and post-compulsory education levels. Thus, the research findings can offer broader practical contributions to comprehensively enhancing students' physical fitness.

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References

Ardiyanto, D., & Mustafa, P. S. (2021). Upaya Mempromosikan Aktivitas Fisik dan Pendidikan Jasmani via Sosio-Ekologi. *Jurnal Pendidikan: Riset Dan Konseptual*, *5*(2), 169–177. https://doi.org/10.28926/riset_konseptual.v5i2.331.

Azwar, S. (2019). Reliabilitas dan validitas: Edisi 4. Yogyakarta: Pustaka Pelajar.

Cornish, K., Fox, G., Fyfe, T., Koopmans, E., Pousette, A., & Pelletier, C. A. (2020). Understanding physical literacy in the context of health: a rapid scoping review. *BMC Public Health*, *20*(1). https://doi.org/10.1186/s12889-020-09583-8

Dwiningrum, R., & Nuruhidin, A. (2022). Edukasi Peran Pola Hidup Sehat Terhadap Kebugaran Jasmani Di Atlet Futsal Porprov Tanggamus. *Jurnal Pengabdian Kepada Masyarakat Ungu(ABDI KE UNGU)*, *4*(3), 175–177. https://doi.org/10.30604/abdi.v4i3.758

G Kukuh Ikhsanto, Agung Yuda Aswara, & Harun Ahmad. (2023). Kontribusi Literasi Fisik, Kesenangan Berolahraga, Aktivitas Fisik Terhadap Kebugaran Fisik Siswa Sekolah Dasar Di Jawa Timur. *SPRINTER: Jurnal Ilmu Olahraga*, *4*(3), 317–325. https://doi.org/10.46838/spr.v4i3.418

Gidney, G., Bocarro, J. N., Bunds, K., & Koenigstorfer, J. (2024). The relationship between the environment and physical activity-related motivational trajectories. *Psychology of Sport and Exercise*, *75*(June), 102719. https://doi.org/10.1016/j.psychsport.2024.102719

Gilic, B., Malovic, P., Sunda, M., Maras, N., & Zenic, N. (2022). Adolescents with Higher Cognitive and Affective Domains of Physical Literacy Possess Better Physical Fitness: The Importance of Developing the Concept of Physical Literacy in High Schools. *Children*, *9*(6). https://doi.org/10.3390/children9060796

Handayani, W., Imansyah, F., & Agustian, I. (2021). Motivasi Remaja Dalam Melakukan Olahraga Rekreasi Di Kambang Iwak Palembang. *Jurnal Penjaskesrek*, *8*(1), 17-31. https://ejournal.bbg.ac.id/penjaskesrek/article/view/1308

Hardani, Ustiawaty, J., Andriani, H., Fatmi Utami, E., Rahmatul Istiqomah, R., Asri Fardani, R., Juliana Sukmana, D., & Hikmatul Auliya, N. (2020). Metode Penelitian Kualitatif dan Kuantitatif. In *Yogyakarta: CV. Pustaka Ilmu* (Issue Maret).

Haverkamp, B. F., Wiersma, R., Vertessen, K., van Ewijk, H., Oosterlaan, J., & Hartman, E. (2020). Effects of physical activity interventions on cognitive outcomes and academic performance in adolescents and young adults: A meta-analysis. *Journal of Sports Sciences*, *38*(23), 2637–2660. https://doi.org/10.1080/02640414.2020.1794763

Iqbal, M., Darni, D., Jonni, J., & Sari, D. N. (2024). Hubungan Kebugaran Jasmani Dengan Hasil Belajar Pendidikan Jasmani Olahraga dan Kesehatan Siswa SMP Negeri 1 Enam Lingkung. *Jurnal JPDO*, *7*(1), 158–164. http://jpdo.ppj.unp.ac.id/index.php/jpdo/article/view/1619

Kashuba, V., Futornyi, S., Andrieieva, O., Goncharova, N., Carp, I., Bondar, O., & Nosova, N. (2018). Optimization of the processes of adaptation to the conditions of study at school as a component of health forming activities of primary school-age children. *Journal of Physical Education and Sport*, *18*(4), 2515–2521. https://doi.org/10.7752/jpes.2018.04377

Kelso, A., Linder, S., Reimers, A. K., Klug, S. J., Alesi, M., Scifo, L., Borrego, C. C., Monteiro, D., & Demetriou, Y. (2020). Effects of school-based interventions on motivation towards physical activity in children and adolescents: A systematic review and meta-analysis. *Psychology of Sport and Exercise*, *51*(June 2019), 101770. https://doi.org/10.1016/j.psychsport.2020.101770

Kurniawan, F., Hidayatullah, M. F., Kristiyanto, A., Riyadi, S., Ekawati, F. F., Ningrum, N. R., & Prabowo, T. A. (2024). Physical literacy needs in esports: literature review. *Retos*, *58*, 495–505. https://doi.org/10.47197/retos.v58.107885

Lee, J. E. C., Sudom, K., & Canada, D. (2019). *Physical activity trends in Canadian youth and implications for the Canadian Armed Forces Edited by Lieutenant-Colonel Jeff Stouffer & Commander Dave Woycheshin , PhD* (Issue December). https://www.researchgate.net/profile/Jennifer-Lee-66/publication/338093214_Physical_activity_trends_in_Canadian_youth_and_implications_for_the_Canadian_Armed_Forces/links/5dfd7df6299bf10bc36bc519/Physical-activity-trends-in-Canadian-youth-and-implications-for-the-Canadian-Armed-Forces.pdf#page=15

Lubis, R. D., Carsiwan, C., & Hambali, B. (2024). The relationship between physical literacy and health in adolescents. *JOKER (Jurnal Ilmu Keolahragaan)*, *5*(2), 365–372. Retrieved from https://joker.uho.ac.id/index.php/journal/article/view/720

Marlina (2021) Single Subject Research: Penelitian Subjek Tunggal. In: Single Subject Research: Penelitian Subjek Tunggal. RajaGrafindo Persada, Depok, pp. 1-193. ISBN 978-623-372-018-2

Masanovic, B., Gardasevic, J., Marques, A., Peralta, M., Demetriou, Y., Sturm, D. J., & Popovic, S. (2020). Trends in Physical Fitness Among School-Aged Children and Adolescents: A Systematic Review. *Frontiers in Pediatrics*, *8*(December). https://doi.org/10.3389/fped.2020.627529

Mohammadzadeh, M., Sheikh, M., Houminiyan Sharif Abadi, D., Bagherzadeh, F., & Kazemnejad, A. (2022). Design and psychometrics evaluation of Adolescent Physical Literacy Questionnaire (APLQ). *Sport Sciences for Health*, *18*(2), 397–405. https://doi.org/10.1007/s11332-021-00818-8

Mutohir, T. C., Lutan, R., Maksum, A., Kristiyanto, A., & Akbar, R. (2021). Laporan Nasional Sport Development Index Tahun 2021. *Kementerian Pemuda Dan Olahraga Republik Indonesia*, 1–126. https://deputi3.kemenpora.go.id/dokumen/30/laporan-nasional-sport-development-index-tahun-2021

Ndagire, C. T., Muyonga, J. H., & Nakimbugwe, D. (2019). Fruit and vegetable consumption, leisure-time physical activity, and sedentary behavior among children and adolescent students in Uganda. *Food Science and Nutrition*, *7*(2), 599–607. https://doi.org/10.1002/fsn3.883

Nevitaningrum, Kriswanto, E. S., & Pambudi, A. F. (2024). From headphone to health: utilizing podcast to improve the nutrition literacy of high school students. *Retos*, *59*, 267–273. https://doi.org/10.47197/retos.v59.108421

Nopembri, S., & Sugiyama, Y. (2022). Interaction Between Physical Fitness, Psychosocial, and Spiritual Aspects of Children in Indonesian Physical Education. *Journal of Physical Education (Maringa)*, *33*(1), 1–12. https://doi.org/10.4025/jphyseduc.v33i1.3306

Permana, R., Isti'adah, F. N., Dewi, R. S., Nurkamilah, M., Fitri, S., Nofrizal, D., Purba, P. H., Pranata, D. Y., S, A., & Sari, L. P. (2024). Instrument for Assessing Physical Literacy Skills Competence in Primary School Tasikmalaya, Indonesia. *Retos*, *58*, 477–484. https://doi.org/10.47197/retos.v58.107671

Putro, B., & Winarno, M. (2022). Analisis Aktivitas Fisik dan Status Gizi Terhadap Kebugaran Jasmani Junior High School: Literature Review. *Sport Science and Health*, *4*(1), 1–11. https://doi.org/10.17977/um062v4i12022p1-11

Rahmatih, A. N., Fauzi, A., & Ermiana, I. (2020). Hubungan Motivasi dan Kemandirian Belajar Mahasiswa Calon Guru Sekolah Dasar. *Wahana Sekolah Dasar*, *28*(2), 76–83. https://doi.org/10.17977/um035v28i22020p076

Rumaka, D. R. (2018). *Perbedaan Kebugaran Kardiovaskuler Siswa Ekstrakurikuler Sepakbola Smpn 1 Patuk Dengan Smpn 16 Yogyakarta Tahun 2018 Diferences of Cardiovascular Fitness Students Football*. 1–13. https://journal.student.uny.ac.id/pjkr/article/viewFile/14607/14181

Sanuddin, N. D., Rahman, S. A. A., Kosni, N. A., Ibrahim, N., Noew, A. A. J., Shafie, A. C. A., Ahing, T., Anchang, G. N. J., Afandi, M. A. M., & Nawawi, E. N. (2024). The effects of the SPARK program on physical activity engagement in 11-year-old children. *Retos*, *59*, 796–802. https://doi.org/10.47197/retos.v59.107446

Sauri, M. D. W., & Arief, N. A. (2023). Tingkat Kebugaran Jasmani Siswa Kelas X SMA Negeri 8 Kota Kediri. *Jurnal Basicedu*, *7*(3), 1876–1882. https://doi.org/10.31004/basicedu.v7i3.5834

Setiawan, M. R., Najat, F. Z., Farhan, R. V., & Suhendan, A. (2022). Analisis Faktor Kondisi Fisik Atlet Pencak Silat. *Jurnal Olahraga Dan Kesehatan Indonesia (JOKI)*, *3*(1), 1–7. https://jurnal.stokbinaguna.ac.id/index.php/JOK/article/view/768/542

Siregar, H. D., Wassalwa, M., Khairina Janani, & Harahap, I. S. (2022). Analisis Uji Hipotesis Penelitian Perbandingan Menggunakan Statistik Parametrika. *Al Itihadu Jurnal Pendidikan*, *1*(1), 3. https://jurnal.asrypersadaquality.com/index.php/alittihadu/article/view/44%0Ahttps://jurnal.asrypersadaquality.com/index.php/alittihadu/article/download/44/74

Sitoayu, L., Yuslaili, N., & Kuswari, M. (2020). Hubungan Asupan Zat Besi, Kadar Hb dan Kebugaran Jasmani Remaja Vegetarian di Pusdiklat Buddhis Maitreyawira. *Physical Activity Journal*, *2*(1), 11. https://doi.org/10.20884/1.paju.2020.2.1.2619

Triansyah, A., Hidasari, F. P., Susanto, W., Pranata, D., Amran, A., & Wahyudin Pratama, K. (2024). Physical fitness, motor ability, motivation and physical literacy knowledge of primary school students in Pontianak city, Indonesia. *Retos*, *63*. https://doi.org/10.47197/retos.v58.112629

Vaz, M., Pauline, M., Unni, U. S., Parikh, P., Thomas, T., Bharathi, A. V., Avadhany, S., Muthayya, S., Mehra, R., & Kurpad, A. V. (2011). Micronutrient supplementation improves physical performance measures in Asian Indian school-age children. *Journal of Nutrition*, *141*(11), 2017–2023. https://doi.org/10.3945/jn.110.135012

Wulan, N. C., Carsiwan, & Hambali, B. (2023). Hubungan Antara Literasi Fisik Dan Kesehatan Terhadap Perkembangan Personal Remaja Pada Siswa SMPDan SMADi Bandung Raya. *Jurnal Ilmiah Wahana Pendidikan*, *9*(19), 586–595. https://jurnal.peneliti.net/index.php/JIWP/article/view/5131

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