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The influence of BMI, physical fitness, and clean and healthy living behavior on student learning outcomes

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Abstract: This study aims to optimize the learning outcomes of Physical Education, Health, and Sports through the values of body mass index, physical fitness, and clean and healthy living behavior of students in junior high schools. This study is a type of descriptive quantitative research that uses path analysis techniques. Data was collected by measuring students' height and weight, using the TKSI phase D test, using the PHBS questionnaire, and measuring students' PJOK scores. Data analysis was used with path analysis with a significance level of $\alpha = 0.05$. The instrument used to measure nutritional status variables was a BMI test. To measure physical fitness, the TKJI test was used. For learning outcomes, it was done by collecting students' report card scores. The results of the research that has been carried out are 1) there is no relationship between BMI and PHBS with a sig value of 0.397. 2) There is no relationship between physical fitness and PHBS with a sig value of 0.397. 3) The contribution given by BMI and KJ is 3.3%. 4) Indirectly, BMI through PHBS on learning outcomes does not have a significant effect with a value of -0.014. 5) Indirectly, KJ through PHBS on learning outcomes has a significant positive effect with a value of -0.129. 6) The contribution given by IMT, KJ, and PHBS together to learning outcomes is 20.9%.
Keywords: PJOK, BMI, Physical Fitness, PHBS

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INTRODUCTION

The subjects of physical education, sports, and health (PJOK) are crucial in helping students develop both mentally and physically. At the junior high school (SMP) level, this course stresses a healthy lifestyle that can impact students' general quality of life in addition to teaching sports skills. Physical fitness, body mass index (BMI), and clean and healthy living behavior (PHBS) are the primary markers that are frequently linked to PJOK learning performance. Thus, it's critical to comprehend how these three elements affect PJOK learning results in order to maximize classroom instruction.

School-based health education interventions, particularly multi-component ones involving teachers, parents, and digital components, show the potential to reduce BMI in adolescents aged 10–19 years (Jacob et al., 2021). Among high school students, fewer healthy lifestyles were associated with higher BMI, blood pressure, resting heart rate, and recovery, while more healthy behaviors were associated with less overweight or obesity (Sang et al., 2022). Schools that use multiple health programs and activities must balance the amount provided with their capacity to sustain success in improving student health-related wellness (Walker et al., 2021).

Physical Education learning has a significant impact on students' knowledge of healthy lifestyles, especially in eating habits and physical activity (Friskawati et al., 2020). Higher BMI levels were associated with significantly higher physical fitness index scores in students (Qin et al., 2022). Higher levels of physical fitness in Chinese secondary school students are associated with better well-being, motivation, and enjoyment in physical education (Zheng et al., 2023).

Students with normal BMI achieve significantly higher learning outcomes (Alhazmi et al., 2021). In addition, physical activity produces important changes in the brain, mediating improvements in cognitive performance and academic achievement in school-age children (Latino & Tafuri, 2023). Physical fitness is associated with improved attention and memory function in children, particularly through coordination (Drozdowska et al., 2021). Coordination exercises improve adolescents' motor skills and cognitive control, leading to better academic performance (Quka & Selenica, 2022).

PHBS helps students prevent various diseases by washing hands, wearing masks, maintaining environmental cleanliness, exercising regularly, and consuming nutritious food (Efendi et al., 2023). PHBS aims to improve student behavior and raise awareness of the importance of a clean and healthy lifestyle in the school environment (Arifiani et al., 2023). PHBS supports a healthy lifestyle by creating conditions for individuals, families, and the environment to play an active role in realizing health (Yunizar Ritonga et al., 2023). Implementation of PHBS in schools helps prevent disease, improve student health, and create a healthy environment (Zulkahfi et al., 2024).

The field's reality reveals that many junior high school kids struggle to maintain a balance between their body mass index, physical fitness, and good lifestyle choices, such as infrequent exercise, poor food consumption, and a lack of concern for their own health. One of the factors contributing to students' lack of awareness about maintaining daily cleanliness and health is their lack of awareness of good practices of clean and healthy living behavior (PHBS), according to (Aminah et al., 2021). Because of this issue, PJOK needs a more successful approach to help students comprehend the significance of maintaining body mass index, staying physically fit, and adopting hygienic and healthy lifestyle choices.

According to earlier studies, self-determined interventions in physical education classes boost students' motivation, engagement, and sports enjoyment (Abdoshahi, M., & Shemshaki, 2021). However, more research is needed to give empirical support for the significance of a holistic approach in physical education by examining the relationship between optimum BMI, physical fitness, and healthy lifestyle choices and learning outcomes. The efforts to increase the efficacy of physical education instruction in junior high schools are another reason why this research is urgent. Schools are at the forefront of supporting student health in light of global issues including rising obesity rates and inactive lifestyles. In addition to advancing the philosophy of physical education, this study offers useful suggestions for educators in creating physical education curricula.

METHODS

With the use of SPSS version 23, this study employs a quantitative descriptive methodology, survey method, and path analysis. This method was selected to assess how student learning outcomes (Y) in PJOK topics relate to BMI factors (X1), physical fitness (X2), and PHBS (X3). Padang City junior high schools served as the study's sites. With the following inclusion criteria: 1) students who actively participate in PJOK learning, 2) male, 3) willing to participate, and 4) healthy, a sample of 35 students was selected for this study using a purposive selection technique.

The following tools were utilized in this study: 1) BMI measurement; 2) weight measurement using a calibrated digital scale with an accuracy of 0.1 kg; and 3) height measurement using a microtome with an accuracy of 0.1 cm. 2) Assessing physical fitness using the TKSI phase D test (Kemendikbud-Ristek, 2019) yielded validation values of 0.774 and 0.697 for the beep test, 0.740 and 0.698 for the sit-up test, 0.766 and 0.695 for the standing board jump test, 0.795 and 0.692 for the T-Test, and 0.706 and 0.701 for the hand-eye coordination test. 3) PHBS measurement utilizing an expert-validated questionnaire that has a validity value of 0.965. 4) Student report card scores are used to determine learning achievement.

The following is one way to go about gathering data: 1) Gathering the research sample of students, 2) Outlining each step of the sample research, 3) Obtaining research participants' informed consent, 4)

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determining height and weight, 5) distributing PHBS surveys, 6) carrying out TKSI tests, which include: a) Vertical Jump Explosive Power Test; b) Hand-Eye Coordination Test; c) T-Test Agility Test; d) Hand Touch Reaction Test Reaction Time Test; e) Arm and Shoulder Muscle Endurance Test (Dipping Test); and f) Cardiorespiratory Endurance Test (Multi-Stage Fitness Test).

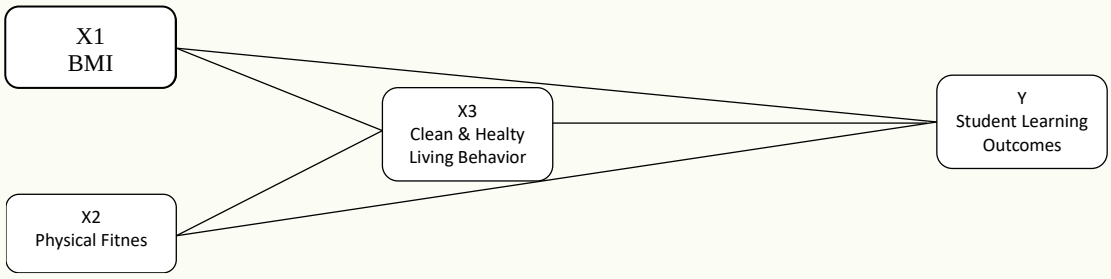

Figure 1. Diagram Model

RESULT AND DISCUSSION

Results

Based on an overview of the raw data collected from 35 samples, all of which had male students between the ages of 13 and 14. With a standard deviation of 331.75 for X1, 1.86 for X2, 3.49 for X3, and 7.06 for Y, the average values for variables X1, X2, and X3 are 78.51, 13.91, 57.94, and 84.21, respectively. Refer to the following table for further information:

Table 1. Data Description

Variabel	N	Mean	St.Dev
Body Mass Index (BMI) (X1)	35	78,51	331,75
Physical Fitness (KJ) (X2)		13,91	1,86
Healthy and Clean Living Behavior (PHBS) (X3)		57,94	3,49
Learning outcomes (Y)		84,21	7,06

With the aid of SPSS, a normality test was performed on the data using the Kolmogorov-Smirnov test; the findings showed a normal distribution with a Sig. value > 0.05. The obtained sig values were Y 0.200, X1 0.200, X2 0.117, and X3 0.150. Refer to the following table for further information.

Table 2. Normality Test

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
X1	0,091	35	.200*	0,981	35	0,796
X2	0,134	35	0,117	0,941	35	0,061
X3	0,129	35	0,150	0,965	35	0,315
Y	0,113	35	.200*	0,957	35	0,182

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

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By emphasizing body mass index (BMI), physical fitness, and encouraging healthy lifestyle choices, junior high school physical education can be optimized. These components are crucial for enhancing both the general health and academic performance of students. There is no significant link between X1 and X3, according to the data analysis results of 0.548. In contrast, X2 against X3 is 0.397, indicating no meaningful correlation. 3.3% is the contribution from X1 and X2 to X3, whereas other factors account for 96.7%. Refer to the following table for further information.

Table 3. Model Test 1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	57,002	6,679		8,535	,000
	X1	-,140	,230	-,107	-,607	,548
	X2	,284	,331	,152	,858	,397

a. Dependent Variable: X3

The data analysis conducted to see the direct influence of X1 on Y was 0.424 and the indirect influence of X1 through X3 on Y was -0.014, which means that the indirect influence is smaller than the direct influence, which concludes that indirectly X1 through X3 on Y does not have a significant influence. A meta-analysis found a weak negative correlation between BMI and academic achievement. This means that increasing BMI is slightly associated with decreasing academic achievement, although the effect is not significantly large (He et al., 2019). Another study found no significant relationship between BMI and academic achievement among children (Baxter et al., 2013). And it was emphasized again in the study (Santana et al., 2017) There is not enough evidence to support a direct relationship between body mass index and poor academic achievement in school-age children. This can be concluded that the good or bad body mass index of a student cannot affect his academic achievement, academic achievement can be influenced by other factors such as motivation, environment, and even peers.

Data analysis of X2 to X3 on Y obtained a direct effect of X2 on Y of -0.129 and an indirect effect of X2 to X3 on Y of 0.020 which means that the direct effect is smaller than the indirect effect. This concludes that indirectly X2 to X3 has a significant positive effect on Y. The contribution given by X1, X2, and X3 to Y is 20.9% and 79.1% is influenced by other factors. the results of this study are supported by (Agustin et al., 2021) research, that there is a significant relationship between physical fitness and student learning outcomes with a contribution value of 34.8%. Research (Andica et al., 2024) also states that physical fitness has a relationship of 91.7% to student PJOK learning outcomes. in addition, there is a positive relationship between physical fitness and academic learning values for student-athletes in sports schools, with higher physical fitness resulting in better academic achievement (Rattanakoses et al., 2022). For more details, see the table below:

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Table 4. Model Test 2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	49,515	22,444		2,206	,035
	X1	1,225	,424	,466	2,885	,007
	X2	-,490	,614	-,129	-,797	,432
	X3	,261	,330	,129	,790	,436

a. Dependent Variable: Y

Discussion

Based on the research results obtained, it state that body mass index and physical fitness contribute 3.3% to clean and healthy living behavior. Clean and Healthy Living Behavior (PHBS) is an important aspect of public health, which emphasizes behaviors adopted by individuals, families, and communities to maintain and improve health. Health and physical fitness significantly predict lifestyles that improve their health (Liu et al., 2021). This concept is an integral part of health promotion and disease prevention efforts.

Knowledge plays an important role in the implementation of PHBS. Various studies show that the higher the level of knowledge about health behavior, the better the implementation of PHBS among students and the community (Aulia zulkifli et al., 2024; Helmi et al., 2024; Iin Setiawati et al., 2023). Educational interventions, such as health education in schools, have been effective in improving students' understanding and practice of PHBS (Iin Setiawati et al., 2023; Nasiatin et al., 2021). Such as, washing hands with soap before and after eating, throwing garbage in its place, consuming healthy and nutritious food, promoting bathing and brushing teeth twice a day, and maintaining personal hygiene.

Both environmental and personal sanitation continue to be neglected by high school pupils. Parents' and teachers' roles in the classroom are crucial for that. Students can gain an awareness of clean and healthy living practices by being introduced to them, receiving counseling, and receiving instruction on the value of clean and healthy living (Mai Siska & Suryana, 2022). Research (Wira Mustapa et al., 2024) claims that 75% of respondents at the Az Zahro Islamic Boarding School agreed that using public health podcasts to teach students about clean and healthy living practices can boost their understanding. Students have successfully learned about clean and healthy living practices through this exercise, such as exercising, eating a balanced diet, and maintaining a clean environment (Harvianto et al., 2023). In line with research (Nurhanifah et al., 2024) education about clean and healthy living behavior can be done through counseling, campaigns, educational materials, and collaboration with health centers, schools, and social media. Educational programs about clean and healthy living behavior effectively increase student knowledge, contribute to a healthier school environment, and support learning achievement (Rafika Aini et al., 2024).

Clean and healthy living behavior (PHBS) among students is influenced by various factors, including knowledge and attitudes, media and education, parents and teachers, facilities and infrastructure, environment, and school health programs. With the collaboration of all these factors, it can provide knowledge of clean and healthy living behavior to students and students can apply PHBS in everyday life. The results of the study showed that higher levels of knowledge and positive attitudes toward health behavior were associated with better PHBS practices among students (Aulia zulkifli et al., 2024; Hanjiansyah et al., 2024; Kartini & Sumarmi, 2023; Purba et al., 2020). This PHBS behavior certainly

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requires support from family, school, and peer groups in implementing clean and healthy living behavior (Afandi et al., 2023; Dela Saputri et al., 2024).

Social media, which is accessible to everyone and everywhere, can be used to promote clean and healthy living habits. Students' knowledge and attitudes concerning PHBS can be improved by using educational interventions such audiovisual materials and health promotion media, which are more effective. Students' clean and healthy living habits are greatly influenced by the engagement of their parents and teachers. The implementation of PHBS is supported by the provision of sufficient infrastructure and facilities in schools. Students who attend schools with greater resources typically practice better health habits. The influence of the environment and peers can also improve PHBS among students and is supported by health programs in schools (Fakhrurozi et al., 2024; Iin Setiawati et al., 2023; Lestari et al., 2023; Nasiatin et al., 2021; Purba et al., 2020; Sidiq et al., 2024; Wijayanti, 2014).

Fitness is a condition where a person does not feel tired when doing work or physical tasks (Bile et al., 2021; Dimitri et al., 2020; Fahmi & Wellis, 2020; Khairuddin et al., 2023; Khan & Jose, 2021; Safarina; et al., 2021; Sepriadi et al., 2023). Physical fitness is a reflection of the ability of the body's systems to function which can create an increase in the quality of life in every physical activity (Sepriadi et al., 2023). Better learning results for kids have been repeatedly linked to physical fitness. According to the study's findings, student learning outcomes were influenced by body mass index, physical fitness, and healthy living choices in 20.9% of cases. Additional elements that may influence student learning results include a mix of social and academic engagement, students' cognitive and affective characteristics, the caliber of instruction, the learning environment, and motivation. (Arigiyati et al., 2023; Bai et al., 2022; Hidayat et al., 2024; Howard et al., 2021; Jo & Kim, 2024; Li et al., 2023; Li & Xue, 2023; Retmawadi, 2022). One of the things that enhances student learning outcomes is active participation in social and academic activities. The learning environment and the standard of school facilities are mediated by this activity. Peers, family, and the environment all have a significant impact on students' learning achievements. Other elements like motivation, self-control, and cognitive and affective abilities also play a big role. These elements have the potential to impact student learning outcomes, particularly in physical education classes. Another important aspect influencing learning results and BMI is physical fitness (Adi et al., 2024).

At SMA Negeri Unggul Dharmasraya, a positive relationship was observed between physical fitness and learning outcomes in physical education, indicating that students with better fitness levels were better able to absorb lessons (Saputra et al., 2023). This is supported by the results of research in Yogyakarta, where physical fitness correlated significantly with physical education learning outcomes (Utomo & Komarudin, 2022). Apart from physical fitness being able to improve student learning outcomes, other factors such as learning motivation and self-concept can improve student learning outcomes (Mon et al., 2020; Sepriani et al., 2024). Having a fit physique and avoiding excessive weariness during activities is the aim of physical fitness for students. A student's learning outcomes at school improve with their level of fitness. Student learning results can also be impacted by motivation, environment, support, and physical fitness.

The findings of this study indicate that body mass index through healthy living behavior does not show a significant impact. In line with the research (Adi et al., 2024) namely, body fat and BMI factors do not show a direct impact on learning outcomes. Student nutritional status, as measured by BMI, is associated with physical fitness levels in the school environment (Aliriad et al., 2023). Students' body mass index and physical activity are important indicators of student health. However, their direct impact on learning outcomes is less clear. Although a healthy BMI is associated with good physical health, a direct correlation with students' learning outcomes is not well supported. However, maintaining a normal BMI through regular physical activity may contribute to better overall health, which indirectly supports successful learning outcomes (García-Hermoso et al., 2021; Hoseini et al., 2022).

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According to other research, there is a substantial inverse relationship between students' BMI and their academic achievement, indicating that a greater BMI could be linked to worse academic achievement (GAYEF et al., 2021). Additionally, in keeping with studies (Forster & Reuter, 2024; Shafie et al., 2022), which found no significant correlation between academic achievement and BMI, BMI is not a good indicator of academic success. In addition to BMI, several other supporting elements should be considered in order to observe positive learning outcomes, including students' cognitive and affective abilities, physical fitness, learning motivation, and the learning environment, facilities, and infrastructure.

CONCLUSION

There is no correlation between learning outcomes and body mass index that can be explained by clean and healthy lifestyle choices. Student learning results can be impacted by a wide range of additional supporting elements, including the learning environment, infrastructure and facilities, and motivation. Although student learning outcomes are impacted by physical fitness, the study's findings indicate a direct correlation between the two variables. Similarly, there is a strong correlation between student learning outcomes and physical fitness as measured by clean and healthy living habits. Physical fitness and a clean, healthy lifestyle do not have a significant impact on learning outcomes. The input made, however, barely affects the learning outcomes of the students. Supporting elements for the achievement of student learning outcomes also include motivating factors, the environment, infrastructure and facilities, parents, and schools. Educating students on the value of maintaining physical fitness and clean, healthy living habits in order to get high learning outcomes and maintain a healthy body mass index is one optimization that can be done in accordance with the research objectives.

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