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Article

How do physical fitness, nutritional status, and self-concept affect student learning outcomes in physical education with a focus on health and hygiene education?

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ABSTRACT

This study explores how physical fitness, nutritional status, and self-concept influence Physical Education (PE) learning outcomes at State Junior High School 13 Padang. Using a quantitative correlational approach, the research involved 58 students sampled from a population of 160. Data were gathered through physical fitness tests, Body Mass Index (BMI) measurements, self-concept questionnaires, and final PE grades. The results revealed that physical fitness contributes 5.18%, nutritional status contributes 6.78%, and self-concept contributes 9.33% to PE learning outcomes. Together, these factors explain 21.07% of the variance in students' PE performance. The analysis showed that each of these variables plays a significant role in shaping students' success in PE. To address the issues identified and enhance learning outcomes, the study recommends increasing the number of PE class hours, introducing school-based nutritional programs to improve students' diets, and developing initiatives to boost students' self-esteem and motivation. By focusing on these areas, schools can better support students' physical and psychological well-being, leading to improved educational outcomes in PE. This approach aims to provide a more holistic improvement in students' physical education, addressing both physical and mental aspects to foster better overall performance. Further research could examine the effectiveness of these interventions and their impact on broader educational goals.

Keywords:

Physical fitness,
Nutritional status,
Self-concept,
Learning outcomes,
Physical education

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Introduction

Physical Education (PE) in schools plays a crucial role in shaping both the physical health and mental well-being of students, which directly impacts their learning outcomes (Ockta et al., 2024; Pitnawati et al., 2023; Umar et al., 2023). In this context, three key variables—physical fitness, nutritional status, and self-concept significantly affect PE outcomes (Arfi et al., 2024; Hambali et al., 2024; Oktadinata et al., 2024; Purwanto & Ockta, 2024). Physical fitness is a fundamental component influencing how students participate in physical activities (Adrizal et al., 2024; Nusri et al., 2024). Students with higher levels of fitness, such as cardiovascular endurance, muscle strength, and flexibility, are more capable of engaging in intense physical activities and recovering quickly from exercise (Apriady et al., 2024; Hadinata et al., 2024). Optimal fitness not only impacts physical performance in PE activities but also contributes to improved concentration and overall energy levels, which supports active involvement and better learning outcomes (Insani et al., 2024; Pitnawati et al., 2023; Safitri et al., 2023). Research

shows that students with higher fitness levels tend to make greater progress in motor skills and participate more effectively in physical activities, leading to enhanced PE achievement (Insani et al., 2024; Iqbal et al., 2024; Pitnawati et al., 2023; Safitri et al., 2023; Yuliana et al., 2023). For instance, students involved in structured and continuous physical training programs show significant improvements in athletic skills as well as better academic achievements in PE (Ockta & Hardiansyah, 2023; Rambe et al., 2024; Triani et al., 2023).

Proper nutrition supports physical growth and development, and it also plays a role in enhancing physical and mental performance (Amin et al., 2023; Ferdian et al., 2023; Pitnawati et al., 2023). Adequate nutritional intake ensures that the body receives the necessary vitamins, minerals, and energy required to perform physical activities efficiently (Chinta et al., 2024; Haris et al., 2024; R. R. Illahi et al., 2023). Studies have shown that students with balanced diets, rich in proteins, carbohydrates, healthy fats, as well as vitamins and minerals, have better energy levels and endurance in PE activities (Al Zaki et al., 2023; R. F. Illahi et al., 2024; Likardo et al., 2023). Good nutrition also affects cognitive abilities, such as concentration and memory, which contribute to improved PE learning outcomes (Kettunen et al., 2023; Kim & Kim, 2020; Rutten et al., 2013). For example, students who consume a protein and complex carbohydrate-rich breakfast show increased energy and focus during PE sessions, supporting better engagement in physical activities and more effective learning (Dewi & Verawati, 2022; Syahrastani et al., 2022). Conversely, poor dietary habits can lead to fatigue and decreased physical performance, negatively impacting PE results (Cho, 2022; McClintic et al., 2022; Oliveira et al., 2010). Therefore, ensuring that students receive appropriate nutrition is a crucial step in supporting their success in physical education.

Self-concept plays an important role in influencing students' motivation and attitude towards Physical Education (Adi, 2023; Brunswick & Bargary, 2022; Mergiyaw et al., 2018). A positive self-concept can enhance students' confidence, which affects their motivation to actively participate in PE activities. Students with a positive view of their physical abilities are more motivated to engage in physical exercise and strive harder in PE (Purwaningsih et al., 2020). A strong self-concept affects how students perceive and assess their own capabilities, which in turn impacts their involvement in physical training and performance in PE assessments. For example, students who feel confident in their athletic abilities are more likely to actively participate in competitions or training, which can improve their physical skills and overall PE outcomes (Komaini et al., 2021; Risyanto et al., 2024; Zhamardiy et al., 2020). On the other hand, students with a negative self-concept may experience a lack of motivation and engagement, which can hinder optimal learning achievements (Adi, 2023; Berdida, 2023; Brunswick & Bargary, 2022). Therefore, developing a positive self-concept should be an integral part of PE to maximize students' learning outcomes. Furthermore, the relevance of health and hygiene education within the PE curriculum is significant. Health and hygiene education not only teaches students about the importance of personal cleanliness but also contributes to improving their nutritional status and physical fitness. Education about personal hygiene, such as regular handwashing, body cleanliness, and avoiding disease-promoting habits, helps students maintain their health and prevent infections that could interfere with their physical and mental performance in PE (Briguglio et al., 2020; Lenka et al., 2021; Salve et al., 2022). Additionally, education about healthy eating habits and clean living supports optimal nutritional status, which in turn affects physical fitness and PE outcomes. For instance, learning about the importance of a healthy breakfast and adequate hydration can enhance students' energy and physical performance during PE sessions. By integrating health and hygiene education into the PE curriculum, schools can create an environment that supports the comprehensive physical and mental development of students, facilitating better PE learning outcomes.

At State Junior High School 13 Padang, observations from the first semester of the 2023/2024 academic year revealed that 40% of students in grades VII, VIII, and IX scored below the Minimum Completeness Criteria (KKM) in Physical Education (PE), which is set at a score of 80. This outcome necessitates that these students undergo up to three remedial sessions, either through practical exams or theoretical tests, to meet the KKM score and have it reflected in their semester report cards. The KKM is a threshold score established by educational institutions to ensure that students attain a

minimum level of proficiency. Ideally, a successful teaching and learning process in PE is indicated when at least 75% of students achieve scores above this KKM. However, at State Junior High School 13 Padang, this target has not been met, indicating a significant issue in the current PE learning outcomes. The KKM, although generally set by the Ministry of Education and applied nationally, can be adapted by individual schools based on various contextual factors. In practice, schools may adjust the KKM score to account for local conditions that influence student performance. Therefore, the KKM at State Junior High School 13 Padang may differ from national standards or other schools, reflecting a level of flexibility in its application. Understanding this context is crucial, as it influences the evaluation of student performance and the effectiveness of remedial measures.

The observed low PE scores are closely linked to several underlying factors, including physical fitness, nutritional status, and self-concept. Evidence suggests that many students at State Junior High School 13 Padang display signs of inadequate nutritional status, such as lethargy, lack of enthusiasm, and disengagement during lessons, with some even falling asleep in class. These symptoms are indicative of broader issues related to malnutrition, which can be influenced by economic conditions, parental education levels, and parental occupations. Adequate nutrition is essential for maintaining physical fitness and overall well-being, which directly impacts students' ability to engage effectively in PE activities. Furthermore, physical fitness, nutritional status, and self-concept are interrelated factors that significantly affect learning outcomes. Students with poor physical fitness may struggle with the demands of PE, while inadequate nutrition can exacerbate physical and cognitive challenges. A negative self-concept can further diminish motivation and participation in PE. Addressing these variables is crucial for improving PE learning outcomes and achieving the desired educational goals. This study focuses on how physical fitness, nutritional status, and self-concept contribute to the observed low PE scores, aiming to identify strategies to enhance students' performance and overall educational experience.

Based on the description above, the researcher is interested in conducting an in-depth study on the relationship and contribution of several factors to Physical Education learning outcomes at State Junior High School 13 Padang. The factors to be examined include physical fitness, nutritional status, and self-concept. This research is expected to provide valuable information for physical education teachers, other subject teachers, and parents or guardians. The goal is to help improve Physical Education learning outcomes by paying more attention to students' physical fitness, nutritional status, and self-concept at State Junior High School 13 Padang.

Methods

This study employs a quantitative approach with a correlational research method to investigate the relationships between physical fitness, nutritional status, self-concept, and PE learning outcomes. Correlational research aims to identify and quantify the relationships between two or more variables. Specifically, this research will analyze how physical fitness, nutritional status, and self-concept (the independent variables) relate to PE learning outcomes (the dependent variable) to determine the strength and nature of these correlations. The research population consists of all 160 students enrolled at State Junior High School 13 Padang. To ensure a representative sample, the study utilizes Proportionate Stratified Random Sampling. This technique is designed to reflect the proportional representation of different strata within the population. In this case, stratification could be based on factors such as grade level or gender. However, detailed information on the stratification process is not provided, which limits the clarity of how strata are defined and how sampling is conducted within each stratum. The sample size of 58 students is determined using a 95% confidence level and a 5% margin of error. While this sample size aims to provide a reliable estimate, it may be considered small given the three independent variables under study. The rationale for selecting this specific sample size should be elaborated to justify its adequacy in representing the broader population and ensuring the robustness of the findings.

Data collection involves several measurements: physical fitness is assessed using the TKJI (Tes Kebugaran Jasmani Indonesia) for secondary school levels, nutritional status is evaluated through Body Mass Index (BMI), and self-concept is measured with a self-concept questionnaire. The TKJI is a widely used standard in Indonesia, but further details about its specific components and any pre-testing for reliability in this study's context are necessary. Similarly, BMI is a common measure for assessing nutritional status, but the research should explain how BMI thresholds are interpreted within the study. The self-concept questionnaire needs a detailed explanation of its development, adaptation, and validation processes, including any pre-testing for reliability (e.g., Cronbach's alpha) and validity with similar populations. Data analysis will be conducted to test the hypotheses using Product Moment correlation statistics for the first two hypotheses, while the fourth hypothesis will be examined using multiple correlation analysis. The significance level for the regression analysis is set at 0.05. While this provides a clear framework for analyzing the relationships between variables, further clarification is needed on several aspects. For example, pre-analysis steps such as testing for normality, linearity, and independence of data should be detailed. Results from normality tests and linearity assessments should be provided, including any necessary adjustments for non-normal or non-linear data distributions. Additionally, it is important to address how potential outliers will be managed, as they could significantly impact the results. The study should also consider whether any intervening or moderating variables are controlled to ensure accurate assessment of the relationships between the independent variables and PE learning outcomes.

Results and Discussion

Based on the normality test calculations conducted on the research data, which includes Physical Fitness, Nutritional Status, and Self-Concept in relation to Physical Education learning outcomes, the null hypothesis was accepted. This indicates that the population is normally distributed. Therefore, it can be concluded that the data for each variable follows a normal distribution.

Table 1. Normality Test

Variabel	n	L_0	L_t	Info
Physical Fitness (X_1)	58	0,1159	0,1163	Normal
Nutritional Status (X_2)	58	0,1099	0,1163	Normal
Self-Concept (X_3)	58	0,0573	0,1163	Normal
Learning Outcomes (Y)	58	0,1156	0,1163	Normal

From Table 1, it can be concluded that the data from each variable are normally distributed. Meanwhile, to determine whether each data variable (Physical Fitness, Nutritional Status, and Self-Concept) tends to form a linear relationship with Physical Education Learning Outcomes, the linear contribution of Physical Fitness, Nutritional Status, and Self-Concept to Physical Education Learning Outcomes will be tested using the null hypothesis. The testing criterion is that if the calculated F is less than the tabled F, for further details, refer to Table 2 below:

Table 2. Linearity Test

Variable	F_{count}	F_{table} $\alpha = 0,05$	Info
X_1 - Y	1,30	2,04	Linear
X_2 - Y	1,65	1,98	Linear
X_3 - Y	1,42	1,96	Linear

Thus, from the table above, it can be concluded that the data from each independent variable have a linear contribution to the dependent variable. Meanwhile, to test independence, it is based on the correlation coefficient (r) of the independent variables at a 95% significance level ($\alpha = 0.05$). To test the independence between independent variables, significance can be assessed using a t-distribution test. With $\alpha = 0.05$, numerator degrees of freedom = 2, and denominator degrees of freedom (58-2-1) = 55, the critical t-value is 1.6775.

Table 3. Independence Test

Correlation between	Correlation Coefficient	t_{count}	t_{table}	Conclusion
$X_1 - X_2$	0,2168	1,6622	1,6775	Not Significant
$X_1 - X_3$	0,2151	1,6484	1,6775	Not Significant
$X_2 - X_3$	0,1969	1,5026	1,6775	Not Significant

Based on the table above, it can be concluded that there is no contamination between variables X1, X2, and X3. After performing the prerequisites for analysis and reviewing the results of each research variable, which meet the criteria for statistical testing, the Product Moment Correlation analysis shows that r_{count} (0.278) > r_{table} (0.260). Additionally, the partial correlation results indicate that t_{count} (1.733) > t_{table} (1.675). Therefore, the Ho is rejected, and the Ha is accepted, meaning Hypothesis 1 is accepted, indicating a significant contribution of Physical Fitness to Physical Education Learning Outcomes. Furthermore, the contribution is calculated through the Coefficient of Determination (r^2), which is 1.7332 x 100%, meaning Physical Fitness as an independent variable contributes 5.18% to Physical Education Learning Outcomes as the dependent variable. A summary of the significance test results can be seen in Table 4 below:

Table 4. Test of the Correlation Coefficient between Physical Fitness and Learning Outcomes

Correlation Coefficien	t_{count}	t_{table}	Conclusion
0.228	1,733	1.675	Signifikan

The results of the Product Moment Correlation analysis showed that t_{count} (0.308) > t_{table} (0.260), while the partial correlation was obtained in the t_{count} (1.999) > t_{table} (1.675). Thus, it can be concluded that the working hypothesis proposed by Ho was rejected and Ha was accepted, which means that Hypothesis 2 was accepted, namely there is a significant contribution of Nutritional Status to Physical Education Learning Outcomes. Furthermore, calculating the amount of contribution through the Determination Index (r2) of 0.2602 x 100%, meaning that nutritional status as an independent variable contributes 6.78% to Physical Education Learning Outcomes as a dependent variable. A summary of the analysis of the results of the significance test for more details can be seen in the following table 5:

Table 5. Test of the Correlation Coefficient between Nutritional Status and Learning Outcomes

Correlation Coefficien	t_{count}	t_{table}	Conclusion
0.260	1,999	1.675	Signifikan

The results of the Product Moment Correlation analysis showed that the calculation (0.346) > the table (0.260), while the partial correlation was obtained in the tcount (2.379) > the table (1.675). Thus, it can be concluded that the work hypothesis proposed by Ho was rejected and Ha was accepted, which means that Hypothesis 2 was accepted, namely there is a significant contribution of Self-Concept to Physical Education Learning Outcomes. Furthermore, calculating the amount of contribution through the Determination Index (r2) of 0.3062 x 100% =, meaning that Self-Concept as an independent variable contributes 9.33% to Physical Education Learning Outcomes as a dependent variable. A summary of the analysis of the results of the significance test for more details can be seen in the following table 6:

Table 6. Test of the Correlation Coefficient between Self-Concept and Learning Outcomes

Correlation Coefficien	t_{count}	t_{table}	Conclusion
0.306	2,379	1.675	Signifikan

From the results of the statistical analysis of the variables of Physical Fitness (X1), Nutritional Status (X2) and Self-Concept (X3) have a significant contribution together (X1,2,3) to the Learning Outcomes of Physical Education, where the results of the Double Correlation analysis, the research data can be seen that there is a contribution of Physical Fitness, Nutritional Status and Self-Concept

to Physical Education Learning Outcomes. Based on the strength of the relationship between the two variables above, the value of the Regression equation can be seen as follows with Fcal (4.71) < Ftable (2.79), this result shows that Linear Regression on Physical Fitness (X1), Nutritional Status (X2) and Self-Concept (X3) on Physical Education Learning Outcomes (Y). Thus the working hypothesis proposed by Ha is acceptable. Furthermore, the results of the Determination Index (R2) together are 0.210, meaning that Physical Fitness, Nutritional Status and Self-Concept as independent variables contribute 21.07% to Physical Education Learning Outcomes as dependent variables. A summary of the analysis of the results of the significance test for more details can be seen in table 7 below:

Tabel 7. Test of the Correlation Coefficient between Physical Fitness, Nutritional Status, Self-Concept, and Learning Outcomes

Correlation Coefficien	t_{count}	t_{table}	Conclusion
0,459	0.210	4,790	2,790

The results of this study show that the information obtained is very consistent with the theoretical study presented by the researcher, where there is a significant relationship between physical fitness, nutritional status, and self-concept together on the learning outcomes of Physical Education. Health and Hygiene Education Materials in Schools aim to equip students with knowledge and skills about the importance of maintaining health and personal hygiene. The main focus of this material includes healthy living habits, a balanced diet, and personal and environmental hygiene practices. This education aims to form positive habits that support students' physical and mental health, as well as improve their quality of life. In the first hypothesis test, physical fitness was proven to have a significant relationship with physical education learning outcomes. Previous research supports these findings, such as research Kwon et al (2022) which shows that physical fitness contributes to the learning outcomes of Physical Education, and research Insani et al (2024) that shows a contribution of Physical fitness affects the learning outcomes of Physical Education because good physical fitness supports activities during the teaching and learning process, both in practice and theory. Based on data analysis, it is proven that physical fitness has a significant and positive relationship with physical education learning outcomes at a significance level of $\alpha = 0.05$. This can be seen from correlation analysis and partial correlation analysis, which show that physical fitness contributes a significant 5.18% to the learning outcomes of Physical Education. Although the contribution findings in this study were smaller compared to previous studies, the contribution of physical fitness was the third largest of the three independent variables studied. In the second hypothesis test, it was found that nutritional status had a significant positive relationship with physical education learning outcomes. These findings are supported by relevant research, such as research (Haris et al., 2024; R. R. Illahi et al., 2023) that shows that nutritional status contributes to the learning outcomes of Physical Education. Nutritional status affects learning outcomes because good nutritional status reflects a healthy lifestyle, including adequate food intake and nutrition (R. R. Illahi et al., 2023; Likardo et al., 2023). In addition, nutritional status is not only seen in students, but also reflects the attention of families, especially parents, in providing good nutritional intake before children leave school or after school, as well as the diet applied at home.

This equation means that every increase in one score in nutritional status tends to increase the learning outcomes of Physical Education by 0.21 with a constant of 67.84. Based on data analysis, it is proven that nutritional status has a significant and positive relationship with physical education learning outcomes at a significance level of $\alpha = 0.05$. This can be seen from correlation analysis and partial correlation, which shows that nutritional status contributes a significant 6.78% to the learning outcomes of Physical Education. Although this contribution was smaller compared to the findings of contribution to other relevant studies, nutritional status had the second largest percentage contribution among the three independent variables studied. In the third hypothesis test, it was found that self-concept had a significant positive relationship with the learning outcomes of Physical Education. These findings are supported by research Brunswick & Bargary (2022) which shows that self-concept contributes to learning achievement. Self-concept affects the learning outcomes of Physical Education because it helps students understand and recognize their potential. To achieve

maximum learning outcomes, students need to develop a self-concept and personality that is in accordance with their potential. This equation means that every increase in one score in self-concept tends to increase the learning outcomes of Physical Education by 0.13 with a constant of 66.4. Based on data analysis, it is proven that self-concept has a significant and positive relationship with physical education learning outcomes at a significance level of $\alpha = 0.05$. Correlation analysis and partial correlation showed that self-concept made a significant contribution of 9.33% to the learning outcomes of Physical Education. Although this contribution was relatively small compared to the contribution findings in other relevant studies, the contribution of self-concept was the highest of the three independent variables studied. In the fourth hypothesis test, it was found that physical fitness, nutritional status, and self-concept together had a significant positive relationship with physical education learning outcomes. The results showed that the three variables together made a significant contribution with a determination coefficient of 21.07%.

Each increase in one score in physical fitness (X1), nutritional status (X2), and self-concept (X3) tended to increase the learning outcomes of Physical Education by 0.37, 0.15, and 0.10, respectively, with a constant of 52.33. These three independent variables, if maximized in function, can make a good contribution to the learning outcomes of Physical Education. Self-concept, in particular, has a high potential contribution because it can be improved through the learning process and self-understanding of their potential, by preparing a planned, systematic, and measurable program. Self-concept is an element of psychology that can be relatively guided and improved. In contrast, physical fitness and nutritional status depend more on external factors. Physical fitness is obtained from exercise habits and routines both at school and outside of school hours, while nutritional status depends on support from the home environment, including a nutritious and balanced diet prepared by parents. In educational practice, the results of this study show that the focus should not only be on students' physical fitness and nutritional status, but also on the development of their Self-Concept. Students' Self-Concept, which is reflected in their confidence and motivation, can be the key to improving Physical Education learning outcomes. Therefore, teachers can use positive feedback techniques and teaching methods that encourage active participation and confidence. By integrating educational programs that focus on students' personal and social development—in addition to physical aspects—can have a more holistic and significant impact on learning outcomes. To improve the learning outcomes of Physical Education, schools must implement several practical steps. First, it is important to implement a Self-Concept development program that involves self-reflection exercises, mentoring, or group activities designed to build student confidence. Second, the integration between nutrition education and physical fitness needs to be strengthened; This can be done through collaboration between schools and parents to ensure that students get good nutritional intake and engage in a consistent fitness program. Third, teaching strategies need to be adjusted to be more effective in increasing student engagement and motivation. This can involve varied activities and provide opportunities for recognized personal achievement.

Overall, this study underscores the importance of attention to Self-Concept in the context of physical education. Although the relative contribution of physical fitness, nutritional status, and Self-Concept may not be very large individually, overall they affect the learning outcomes of Physical Education. Further research can explore more deeply how the development of Self-Concept can be more specifically associated with physical learning outcomes and how more effective interventions can be developed to support such achievement.

Conclusion

This study shows that physical fitness, nutritional status, and self-concept have a significant relationship with physical education learning outcomes in junior high school students. Of these three variables, self-concept makes the greatest contribution to learning success, followed by nutritional status and physical fitness. These findings emphasize the importance of developing students' self-concept as a top priority, in addition to attention to their physical fitness and nutritional status. To effectively improve Physical Education learning outcomes, schools and teachers need to implement

a holistic approach, including teaching techniques that support the development of self-concept, as well as collaboration between teachers, parents, and students in supporting physical fitness and nutritional status. Furthermore, future research is suggested to explore additional variables and apply a broader methodology to understand other factors that may affect Physical Education learning outcomes.

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