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The Correlation of Physical Fitness Towards an Academic Grades and Physical Education Grades in Senior High School

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Abstract

The purpose of this study is to determine the relationship between physical fitness and students' academic grades and physical education scores. The type of research conducted was correlational research using a correlation test to determine the relationship between variables, with a sample of 67 students of Senior High School 1 Grabag. The research by taking student physical fitness data using the Nusantara student fitness test (TKPN) and student report card data as a representation of academic scores and physical education scores. The correlation test on the physical fitness variable with academic scores showed a significant result of 0.0001 < 0.05 and had a strong relationship of 0.654 > 0.610. Likewise with the physical fitness correlation test which showed a significant result of 0.0001 < 0.05 and had a strong relationship of 0.621 > 0.610. The results of this study that physical fitness has a positive and strong relationship with academic grades and students' physical education scores. In depth, physical fitness plays a role in increasing brain neuroplasticity through BDNF secretion that optimizes cognitive function, as well as increasing cardiorespiratory capacity that supports movement efficiency and emotion regulation. In conclusion, physical fitness is a crucial internal instrument that directly and indirectly supports students' learning achievement holistically through physical, cognitive, and psychological readiness.

How to Cite

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INTRODUCTION

Physical fitness is an optimal body condition where the body can carry out daily activities well, has adequate endurance, strength, agility and body speed and is able to recover quickly (Missa et al., 2024) It is also in line with the concept of American College of Sport Medicine which states that physical fitness is the body's ability to carry out daily activities without experiencing significant fatigue (Kesuma, 2021). Physical fitness plays a big role in body health, individuals with a good level of physical fitness have a lower risk of chronic diseases and mental disorders (Franklin et al., 2023), then World Health Orqanization (WHO) also emphasized the importance of maintaining physical fitness by engaging in aerobic activities and strengthening muscles and reducing sedentary behaviors to maintain people's health for all age groups (Bull et al., 2020).

Physical fitness is an important pillar for students and has a positive correlation with academic achievement at all levels of education (Redondo-Flórez et al., 2022), this happens because physical fitness will improve psychological well-being, learning motivation, and student confidence in learning(Rico-González et al., 2025) In addition, physical fitness is also able to improve sleep quality which is important for optimal cognitive function (Su et al., 2025). The level of physical fitness will have an impact on adequate circulation and good body oxygen intake so that the body will feel fresh and the brain as the nerve center will work well (Marlissa & De Lima, 2022), based on this, good physical fitness, a person's concentration level will increase so that it will have an effect, especially on the quality of students in receiving and processing information(Hermawan et al., 2022). The statement regarding the increase in concentration supports the statement that physical fitness has an effect on student learning outcomes, this has a correlation because with an increase in concentration will support the student learning process so that learning outcomes in the form of academic grades will increase because students will easily receive material from teachers (Lovita et al., 2023)

Therefore, it is important to pay attention to the level of physical fitness because it is able to provide the ability for students to be active in the classroom, have high initiative, be willing to work hard in learning both inside and outside the classroom so that with that students are able to achieve maximum achievement and will affect their learning achievement (Martín Martínez et al., 2025).

Physical activity will increase the body's metabolism, smooth blood flow and distribution of essential nutrients to the brain (Putri et al., 2025), physical fitness can also increase the thickening of myelin in the brain so that the transmission of nerve impulses to the brain becomes faster, therefore physical fitness will affect the ability to maximize thinking power (Krissanthy et al., 2021). Physical fitness is also able to improve brain functions such as working memory, focus and self-control, which play an important role in achieving good academic grades(Latino & Tafuri, 2023). With good brain ability, children's cognitive function, intelligence level, and academic achievement will continue to develop (Oktaviani & Wibowo, 2021) Based on that, student physical fitness is also the main aspect that can affect student learning outcomes in terms of academic and non-academic, with better fitness will support student learning outcomes or academic achievement (Fadilla, 2022).

Physical fitness is consistently associated with cognitive and academic performance, as it has major implications for successful academic achievement (Chang et al., 2025) This is supported by increasing cardiorespiratory fitness which affects inhibition control so that students' focus will increase and have a positive effect on academic grades (Visier-Alfonso et al., 2020). In addition, doing light intensity physical fitness exercises in the morning and evening has a positive correlation with students' academic achievement (Ye & Tai, 2025), improving the quality of physical fitness components such as muscle strength, agility, and aerobic endurance has positive implications for mathematics subjects, Science and language (Xu & Sun, 2023) Therefore, physical fitness is an important aspect because it is able to improve cognitive skills, think critically, improve discipline and mental health conditions of students which will later have a positive effect on academic grades (Manuardi, 2021).

Therefore, it is necessary to pay attention to and improve the physical fitness of students because the more physical fitness increases, the more student learning outcomes will increase, or it can be said that physical fitness is directly proportional to the student's learning outcomes (Karatte, 2020)

American College of Sports Medicine Identify five key components related to physical fitness including cardiorespiratory endurance, muscle strength, muscle strength, flexibility and body composition (Lie et al., 2025), especially in terms of cardiorespiratory fitness, strength

and flexibility (Hagen et al., 2025) while physical education subjects are also familiar with the physical fitness component (Putra et al., 2025) then students with a good level of physical fitness tend to have higher physical education scores because they are able to follow physical activities more optimally(Faturohman, 2020). Physical fitness can affect physical education scores because students will have better confidence, motor skills, and physical endurance (Hagen et al., 2022). Therefore, it is very important to maintain physical fitness to support physical condition which will have positive implications for students' physical educationl earning (Farel & Candra, 2024).

However, the physical fitness condition of children in Indonesia is still diverse due to economic factors, parenting and limited facilities (Basrawy et al., 2022), in addition, social support and learning participation also affect student learning outcomes(Xiang et al., 2025). This must be a special concern because the child's growth period is a crucial time for the child's future. In adolescence, the brain is experiencing a frontal sypnatic phase, which is the brain's natural process to remove connections between nerves that are rarely used for efficiency and improved brain function (Averbeck, 2022). In addition, in adolescence, there is a phase of prefontal maturation of the cortex in the brain that determines the executive function of the brain (Kolk & Rakić, 2021). Then BNDF function resulting from brain secretion supported by physical fitness will tend to improve cognitive function in adolescence by further supporting brain cognitive function (Trudeau et al., 2025) while in childhood, development is still focused on basic structural and cognitive (Rico-González, González-Devesa, et al., 2025a). So that in adolescence, high school seniors, the ability to cognize, self-control and psychomotor is already in an optimal and stable phase and there are no fluctuations because it has passed the phase peak high velocity (PHV)

In this study, there is a novelty of research by using variables from the learning value of students, then separating between academic scores and physical scores and testing the two variables. This is because with good physical fitness, it will be directly proportional to the student's psychomotor which will support student learning outcomes, then the researcher sees the influence of physical fitness on academic grades based on physical fitness which is able to stimulate students' brain function with the secretion of special enzymes in the brain that function to boost the brain's cognitive ability, where the better the level of physical fitness, the better the blood circulation and oxygen supply in the brain increases which will be directly proportional to the secretion of the enzyme BNDF in the brain.

Cast this study aims to obtain data and information regarding the relationship between physical fitness in relation to and its influence on students' academic grades and physical education scores. In addition, this research also aims to emphasize the importance of maintaining physical fitness to provide tested solutions that are of significant benefit to teachers and students in improving student learning outcomes.

METHODS

This study uses a quantitative method, namely by using data in the form of numbers and statistical analysis to test hypotheses and relationships between variables (Yusuf et al., 2023). This type of research is a correlational research by collecting data and then analyzing it to see if there is a relationship or correlation between the variables being studied. In this study, the relationship between these variables can be in the form of positive correlation (unidirectional change) or negative correlation (opposite change). Then correlational research aims to determine the degree of relationship between these variables without trying to influence the variables, so that there is no manipulation of the variables (El Hasbi et al., 2023).

This study involved students of Senior High School 1 Grabag in Grabag District, Magelang Regency, as many as 67 students were selected as a research sample that could represent the population in a research subject(Candra Susanto et al., 2024). To obtain analytical data, a research instrument is needed as a method of data collection, the Nusantara Student Fitness Test (TKPN) (MINISTRY of Youth and Sports, 2022), this test is necessary to measure the level of physical fitness of students. The components of the TKPN test include: (1) BMI test to determine the status of student body mass, (2) v sit and reach to measure the student's muscle flexibility, (3) Sit-Up to measure muscle strength and endurance, (4) squat thrust to measure endurance, body control, balance, coordination and agility, (5) the Progressive Aerobic Cardiovascular Endurance Run (PACER) Test which is used to measure heart and lung performance ability. Then for student academic score data and physical education scores using 1-semester report card scores, this can be done because report card score data is included in secondary data, namely supporting data that we obtain from intermediaries, which in

this case are teachers (Sulung & Muspawi, 2024).

The data analysis used in this study is a correlational test. To test the validity of the data, it is also necessary to test normality and test linearity between the variables tested. The data analysis technique in this study uses a correlational test to find out if there is a relationship between the variables, as well as to find out how strong the relationship between the variables being tested.

RESULTS AND DISCUSSION

This study was conducted to test whether there is a relationship between students' physical fitness scores and physical education scores and academic scores, the researcher conducted data collection on Thursday, January 15, 2026 involving 67 students of Senior High School 1 Grabag to collect physical fitness score data using the Nusantara Student Fitness Test (TKPN) as well as physical education and academic score data using report card scores. Therefore, this descriptive data provides an overview of the variation in scores in physical fitness scores, physical educationscores and academic scores. The data can be seen in **Table 1.** Descriptive Statistics

Table 1. Descriptive Statistics

Variabel	N	Min	Max	Mean	Std. Deviation
Physical Fitness	67	2.1	4	2.921	0.5316
Physical Education Value	67	78	86	82.13	1.391
Academic Value	67	78	91	84.19	3.066

The **Table 1** above shows that there are 67 samples with an average physical fitness value of 2,921 with a standard deviation of 0.5316 and have the highest score of 4 and the lowest score of 2.1. Then the average physical education score is 82.13 with a standard deviation of 1,391 with the highest score of 86 and the lowest score of 78, and shows an average academic score of 84.19 with a standard deviation of 3,066 with the highest score of 91 and the lowest score of 78. Based on the test with 67 samples, the results were obtained from 9 students with very good physical fitness categories, 14% of the total sample, 23 students with good categories, 34% of the total sample and 35 students with adequate categories or as much as 52% of the total sample. Then from the distribution of academic scores, from 67 students there was 1 student who got a very good predicate or 1% of the number of samples, 62 students with a good category, 92% of the number of samples and 4 students with a sufficient category or 6% of the number of samples, in addition to the physical education score there were 64 students with a good predicate of 96% of the total sample and 3 students with a good predicate of 4% of the total sample.

Table 2. Normality Test

Variabel	Sig. (p)	Description
Physical Fitness physical education Value Academic Value	0.359	Signifikan

From the results of the **Table 2.** Normality Test using the residual values of the three variables in the table above, it shows the value of sig. 0.359 and based on the results of the test, the three variables tested were normally distributed because the value of the Kolmogorov Smirnov normality test of sig value > 0.05 could be stated that the data was normally distributed.

Table 3. Linearity Test

Variabel	Sig.(p)	Description
Physical Fitness * physical education Values	0.0001	Signifikan
Physical Fitness * Academic Value	0.0001	Signifikan

Based on the results of the **Table 3.** Linearity Test in the table above on the physical fitness variable with a physical education value showing a Sig value of 0.0001 so that it can be concluded that the linearity test on the variable is linear because the sig value. < 0.05. Then the test on the physical fitness variable and the academic score in the table above shows a sig value of 0.0001 so that it can be stated that the linearity test on the variable is linear by being able to meet the requirements of the sig value. <0.05.

Table 4. Correlation Test

Variabel	Sig(p)	PC	Deskripsi
Physical Fitness * Physical Education Value	0.0001	0.621	Signifikan
Physical Fitness * Academic Value	0.0001	0.654	Signifikan

Based on the correlation test in the **Table 4.** Correlation Test above on the variables Physical fitness and physical education values showed the results of sig. 0.001 so that it can be stated that the two variables have a correlation or relationship because the Sig. value < 0.05, besides that a Pearson correlation value of 0.621> 0.610 is also obtained which shows a strong relationship between the physical fitness variable and the

physical education value.

Then in the table, the results of the correlational test on the variables of physical fitness and academic values show a sig value of 0.0001 < 0.05 so that it can be concluded that there is a correlation between the two variables. In addition, the pearson correlation value of the variable shows a value of 0.654 > 0.610 which shows a strong relationship between these variables.

This study examines in depth the relationship between physical fitness and physical education scores and academic scores, where the researcher collects data on the physical fitness scores of each student with an official fitness data collection instrument from the relevant Ministry, namely the TKPN test and collects physical education scores and academic scores using report card scores where these scores have been declared to be able to represent student learning outcomes.

Based on the results of the study, a description of physical fitness score data was obtained with 67 research samples which showed the results of an average physical fitness score of 2,291 with a standard deviation of 0.5316, an average score of physical education score of 82.13 with a standard deviation of 1,391, and an average score of 84.19 with a standard deviation of 3,066

The results of the research obtained can be tested on these variables to find out the correlation value between the research variables. The researcher conducted a correlation test between the physical fitness value and the physical education value with a correlation test with the results of the sig value in the test of 0.0001 < 0.05. This shows that physical fitness has a relationship with learning outcomes in students' physical education scores. Then a pearson correlation value between the two variables was also obtained as much as 0.621 > 0.610, this shows a strong and positive relationship between the physical fitness aspect and the physical education value. Physical fitness has a strong relationship with the aspect of physical education values because good physical fitness can stimulate the body to actively participate in learning and support the body's ability to do physical activities in physical education learning activities (Farel & Candra, 2024).

The results of other correlation tests were also carried out on physical fitness scores and academic scores with a sig value of 0.001 < 0.05, therefore there is a relationship between these variables. Then the Pearson correlation value between the two variables is 0.654 > 0.610, this shows a strong relationship and that physical fitness plays a big role in student learning outcomes in terms of academics.

This study investigated the relationship between physical fitness and academic grades and physical education scores. Statistical analysis with research variables using correlation tests showed significant results between physical fitness on academic scores and physical fitness on physical education followers. Physically fitness strongly affects the results of academic grades and physical education scores, this is also shown by the efficiency of correlation scores, the higher the physical fitness score, the more likely it is to increase student learning outcome scores.

Physical fitness has a strong relationship with academic grades, this is because physical fitness is able to effectively stimulate the brain's ability to work more optimally (Putri et al., 2025). This is influenced by a good level of physical fitness so that it is directly proportional to the increase in blood flow to the brain, thereby stimulating the brain to release Brain-Derived Neurotrophic Factor, which is a protein that is able to increase the ability to connect between nerves (neuroplasticity) so as to stimulate the brain's ability to improve memory, focus and critical thinking, which will have implications for cognitive abilities and academic grades (Solberg et al., 2021). BNDF in the brain functions to support the executive function of the brain, but in childhood the function of the BNDF enzyme is still used for 2 different functions, namely brain structural development and cognitive function (Camuso et al., 2021), while in adolescent high school seniors the basic structure of the brain has been formed so that the function of the BNDF enzyme can be focused and efficient to improve cognitive function (Rico-González, González-Devesa, et al., 2025b).In addition, during adolescence, there is a natural phase of the brain called the frontal sypnatic which works as an efficiency of brain performance by removing connections between nerves that are no longer used, so that the function of BNDF in the brain at this time can be more focused on improving cognitive abilities (Averbeck, 2022).

In addition, a good level of physical fitness allows students to perform various activities optimally without experiencing fatigue due to having good cardiorespiration(Lie et al., 2025). Cardiorespiration is the ability of the heart and lungs to pump blood flow and absorb oxygen to be delivered to the body so that the body's functions can be maximized (Kao et al., 2019). Therefore, good physical fitness has positive implications for cardiorespiratory levels and academic achievement (Clennin et al., 2022). Of course, this is with regular physical activity and minimizing sedentary nature. In addition, the support of facilities

and the quantity of sports infrastructure is also considered to be able to increase interest in doing sports activities so that physical fitness can be maintained (Purwono et al., 2019), this is also based on the SDI points in Central Java reaching 0.277 and are included in the low category, one of which includes public participation and interest in sports (Setiawan et al., 2019).

Then in the psychological aspect, physical fitness also has a positive impact because it is able to improve self-control skills, mental well-being and brain memory which will significantly affect cognitive abilities which have an impact on the increase in students' academic scores (Muntaner-Mas et al., 2022). While good physical fitness can significantly improve emotional regulation, the implications in schools are effective in improving students' self-control, learning behavior, and social interaction (Sun et al., 2025). In students, physical fitness is related to perseverance and honesty as well as courage for future challenges, with a good level of physical fitness able to increase discipline, responsibility and positive attitudes of students(Suyato et al., 2024). Then the level of physical fitness will affect concentration, good study habits and cognitive focus of students (Wang et al., 2024). This states that physical fitness will increase students' readiness in the learning process.

Overall, physical fitness is able to stimulate better brain performance, increase the effectiveness and optimization of students' physical activities and foster disciplined character, which in this case is a learning activity so that it can support students' academic scores.

Furthermore, this study discusses the relationship between physical fitness and students' physical education scores. In the statistical analysis in this study, there is a strong relationship between the two variables. Students with good fitness will tend to have better movement skills and physical active participation (Farel & Candra, 2024). Fit students will have endurance, cardiorespiratory skills, strength and speed to make it easier to carry out sports learning practice activities better (Missa et al., 2024).

Students' physical fitness is also able to improve students' motor skills. This is because the physical fitness aspect has been proven to be able to improve hand eye coordination, reaction speed, movement accuracy, and agility(Khorkova et al., 2025). This aspect of fitness is also able to make motor movement patterns more flexible (Wu et al., 2021). Furthermore, in school-age children, motor skills are related to the performance of movement skills, the increase will foster motivation and confidence so that children participate more actively in physical educatioN learning (He et al., 2024). Because physical education learning tends to be more dominant in physical activity, students will be stronger, not easily tired and their movements will be effective (Simanjuntak & Nurhayati, 2024).

Furthermore, physical fitness is also able to increase students' enthusiasm in participating in physical education learning and students will tend to be more confident so as to increase students' positive participation in physical education learning (Abidin et al., 2024). This is supported by an increase in perceived motor competence or a person's self-assessment of their own physical skills and abilities(Cárcamo-Oyarzún et al., 2023). This confidence will boost students' perseverance, involvement and readiness in participating in learning(Guo et al., 2025), so that students will tend to experience a little stress and fear of failure during the physical education learning process(García-Ceberino et al., 2022).

To achieve a better physical education score, students are not only required to have physical readiness but also psychological condition. A positive attitude and strong motivation will increase the optimization of students' physical education learning, in addition to supporting the comfort of physical activity due to a high level of confidence (Sari et al., 2024). Overall, physical fitness supports physical education learning outcomes directly by improving students' motor skills and indirectly by increasing students' confidence and motivation to participate in physical education learning.

The world of education is a complex thing, student learning outcomes are influenced by many factors. Aspects of children's cognitive and intellectual abilities also play a role, this is because the intellectual aspects in children affect how quickly and deeply children process, understand, and process information (Costa et al., 2024). School factors in the learning process such as teacher teaching methods, completeness of facilities, and conducive school culture will affect learning output (Samsudi et al., 2024). This is of course also related to the curriculum implemented in schools, for now the implementation of the Independent Curriculum and good classroom management will significantly improve learning outcomes (Winarti et al., 2025). Of course, this study can also be synchronized with research in Kenya which shows that the coverage and implementation of a good curriculum can improve learning outcomes (Bekele, 2025), this is also supported by a study in Pakistan that confirms that

the quality of the curriculum is one of the factors that has a positive and significant influence on student learning outcomes(Zafeer et al., 2024).

Furthermore, the family support factor also has an influence on student learning outcomes. Education, parental involvement and support provide a positive injection into student learning outcomes (Al-Tameemi et al., 2023), social status is also able to affect achievement with cognitive stimulation by fulfilling access to adequate resources, facilities, and nutrition for children(Rakesh et al., 2024).

However, in this study, it examines the relationship between physical fitness and academic grades and physical education scores. Then get results that show a strong relationship between these variables, this is based on physical fitness as a biological foundation that is able to stimulate brain abilities by increasing cognitive capacity sharpening students' executive functions which include aspects of memory, critical thinking to problem-solving skills (De Bruijn et al., 2023), this is in line with the findings (Muntaner-Mas et al., 2022) which states that students with better physical fitness tend to have higher academic scores. Furthermore, physical fitness in addition to affecting students' cognition also ensures endurance, strength, agility, and speed so that the optimization of daily activities is created, then this will affect the increase in students' psychomotor abilities which in the context of physical education lessons is a prerequisite for mastering movement skills. Therefore, fit students make it easier for them to achieve psychomotor competency standards so that they significantly contribute to the maximum physical education score (Sihombing & Yugopuspito, 2023). The findings of this study support to pay attention to the aspect of physical fitness as one of the foundations in improving student learning outcomes, so that it becomes a special concern for students, teachers, and parents to be able to maintain and improve the physical fitness of students.

In this case, physical fitness is not the only aspect that affects the results of students' academic grades and physical education, there are other external factors such as student learning techniques, curriculum and learning programs from school to family and social support also play a role in student learning outcomes. However, this study examines physical fitness factors which are also important aspects of students to achieve good learning outcomes. It is proven by the results of statistical tests that show a strong relationship between physical fitness and academic grades and physical education scores, because basically physical fitness is able to stimulate the brain's ability to receive and process information, increase the effectiveness of students in carrying out daily activities, especially in this case in the school environment, and be able to maintain and improve students' psychology by increasing discipline and motivation to learn. Thus, physical fitness is able to significantly improve student learning outcomes.

CONCLUSION

Based on the discussion and results of data analysis as well as a series of statistical tests that have been carried out, it can be concluded that physical fitness has a positive relationship and has a real impact on the results of physical education scores and senior of high school students' academic scores through the integration of physiological, cognitive and psychological aspects. Neurologically, good physical fitness increases blood flow to the brain and triggers the secretion of Brain-Derived Neurotrophic Factor (BDNF) proteins that strengthen connections between nerves, thereby directly sharpening students' memory, concentration, and critical thinking skills in the academic field. On the other hand, physical fitness will improve the aspects of cardiorespiration and motor skills so that it allows students to perform physical activities with high efficiency without meaningful fatigue which has positive implications for positive participation and mastery of techniques in physical education teaching. Furthermore, physical fitness also forms a solid psychological foundation in the form of increased emotional regulation, confidence, discipline, and motivation to learn. In this case, in the adolescent senior of high school, the effect of physical fitness on academic grades and physical education grades will be more significant with psychomotor skills, cognitive function and also emotional control being in optimal and stable condition because they have passed the peak height helocity (PHV) period. Although learning success is still influenced by various other external factors, this study confirms that physical fitness is one of the crucial main foundations because it is able to stimulate students' brain abilities and physical resilience to achieve maximum learning performance in a holistic manner..

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