

The Relationship between Physical Activity Level and Physical Fitness with Learning Outcomes of Gifted Students at Junior High School

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Accepted: 10 August 2016	reviewed: September 5, 2016	Published: 20 November 2016
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Abstract: This study aims to analyze the relationship between physical activity level and physical fitness with learning outcomes of gifted students (LISCI) in grade VII at SMP Negeri 3 Sidoarjo. The research employed a quantitative approach with a correlational design. The sample consisted of 30 students selected using purposive sampling. Instruments used included the PAQ-C, the Indonesian Student Fitness Test (TKSI) phase D, and midterm report card scores. Data were analyzed using descriptive statistics, Pearson correlation, and multiple linear regression. Results showed: physical activity level was low (60%) and moderate (40%); physical fitness was poor (56.7%) and moderate (30%); learning outcomes were very high (93.3%). No significant relationship was found between physical activity and learning outcomes ($r = -0.065$; $p = 0.735$), nor between physical fitness and learning outcomes ($r = 0.253$; $p = 0.178$). Simultaneously, both variables contributed only 8.0% to learning outcomes ($R^2 = 0.080$; $p = 0.326$). It is concluded that there is no significant relationship between physical activity level and physical fitness level with learning outcomes of gifted students. These findings indicate that in gifted students ($IQ > 120$), cognitive and intellectual factors are more dominant in determining academic achievement than physical factors.

Keyword: Physical Activity, Physical Fitness, Learning Outcomes, Gifted Students, LISCI, Junior High School

Introduction

A negative stigma often surrounds the role of sports in enhancing thinking abilities. Physical activity is frequently perceived as contributing only to physical (psychomotor) aspects rather than cognitive ones. This perception extends to the educational field, where physical education teachers are often undervalued compared to teachers of other subjects. However, empirical evidence suggests otherwise. Various recent studies have demonstrated a positive relationship between physical activity and students' cognitive abilities, including increased learning motivation and concentration (Lubis & Nuralita, 2021; Suwandaru & Hidayat, 2021). This misconception persists in public discourse, as exemplified by a viral statement from content creator Timothy Ronald in August 2025, who claimed that weightlifting does not improve thinking capacity. In reality, research indicates a strong correlation between exercise and cognitive ability (Lubis & Nuralita, 2021).

Regular physical activity is associated with improved physical fitness. Physical fitness is defined as the body's ability to perform daily activities without undue fatigue. At the student level, optimal physical fitness should enhance endurance and quality of life, including cognitive processes during learning at school and at home (Wiradihardja & Syarifudin, 2017). Research by Kaharina et al. (2024) demonstrated that physical activity in children and adolescents provides significant benefits to cognitive outcomes, including academic performance and executive function. Solikha and Muhammad (2022) asserted that physical fitness in the school environment needs to be

developed to achieve optimal teaching and learning processes. Students with good physical fitness can carry out their learning tasks effectively.

Learning outcomes in schools are commonly represented by numerical scores derived from the evaluation of the learning process. Numerous factors influence learning outcomes. Students' innate abilities, parenting styles, and living environments serve as both external and internal factors affecting learning outcomes. More broadly, physical and psychological aspects also significantly influence the learning outcomes achieved by students (Sudjana, 2019; Susanto, 2016). In Sidoarjo, there are six public schools that provide individual services for gifted students (LISCI). The primary difference from regular junior high schools lies in the duration of study. While regular schools require three years of study, students in the LISCI program complete their junior high school education in only two years. The academic selection of LISCI students is also based on intelligence quotient (IQ) levels, where students entering the LISCI category must have an IQ above 120.

Research by Suwandaru and Hidayat (2021) revealed a significant relationship between physical activity and student learning outcomes. Muhammad et al. (2025), in a study involving 1,870 junior high school students, found a positive and significant relationship between physical activity and learning outcomes using the PAQ-C instrument. Kaharina et al. (2024) proved that a four-week physical activity mentoring program significantly improved the physical fitness of senior high school students ($p = 0.000$). Solikha and Muhammad (2022) reported that the physical fitness level of vocational high school students was in the good category, with an average $VO_2\text{Max}$ of 22.9–23.3. In contrast to these studies, this research examines the gifted student population (LISCI) with an IQ above 120, which has been underexplored in the context of the relationship between physical activity, physical fitness, and learning outcomes.

Based on the foregoing, this study aims to: (1) analyze the relationship between physical activity level and learning outcomes of gifted students; (2) analyze the relationship between physical fitness level and learning outcomes of gifted students; (3) analyze the simultaneous relationship between physical activity level and physical fitness level with learning outcomes of gifted students; and (4) analyze the significance level of the relationship between both variables and learning outcomes.

Literature Review

Theoretical Framework

This study is grounded in the theory that physical activity and physical fitness are related to cognitive function and learning outcomes. The World Health Organization (WHO, 2020) states that physical activity in children and adolescents provides health benefits, including cognitive outcomes (academic performance, executive function) and mental health. Kaharina et al. (2024) define physical activity as any bodily movement produced by skeletal muscles that requires energy expenditure. This definition aligns with the World Health Organization's view that physical activity encompasses all movements performed in daily life, whether for work, recreation, or exercise. Physical fitness is defined as the ability to perform daily activities without undue fatigue (NCERT, 2023; Kaharina et al., 2024). Learning outcomes are defined as behavioral changes encompassing knowledge and skills as a measure of student achievement resulting from the learning process (Sudjana, 2019; Susanto, 2016).

Physical education in the educational system serves as one of the programs included in the national curriculum, aimed at improving the quality of human resources. Solikha and Muhammad (2022) stated that physical education is a subject that teaches psychomotor skills to individuals or groups. Physical education learning aims not only to promote physical health but also to enhance students' knowledge, attitudes, and skills through physical activities at school.

Empirical Studies

Muhammad et al. (2025), in a study involving 1,870 junior high school students, found a positive and significant relationship between physical activity and learning outcomes using the PAQ-C instrument the same instrument employed in this study. The research employed a correlational approach with 1,870 junior high school students, utilizing the PAQ-C, Body Mass Index (BMI), the Concentration Grid Test (CGT) for cognitive function, and academic scores. The results indicated that physical activity had a significant relationship with student learning outcomes.

Kaharina et al. (2024) proved that a four-week physical activity mentoring program significantly improved the physical fitness of senior high school students in Sidoarjo Regency ($p = 0.000$). This study used a combination of health education methods and physical activity training with 97 senior high school students. The physical fitness test results showed a significant improvement from pre-test to post-test scores, indicating that the activity's objectives were successfully achieved namely, improving physical fitness and motivation to engage in regular and measurable physical activities.

Solikha and Muhammad (2022) reported that the physical fitness level of students at SMKN 2 Buduran was in the good category, with an average VO_2Max of 22.9 for grade X and 23.3 for grade XI. This study used a non-experimental design with the Multistage Fitness Test (MFT) as the instrument. The results showed no significant difference in physical fitness levels between grade X and grade XI students.

Suwandaru and Hidayat (2021) found a significant relationship between physical activity and learning achievement of students at SMKN 1 Surabaya. Their research indicated that appropriately dosed physical activity can increase learning motivation and contribute positively to learning outcomes.

Adhianto and Arief (2023), in their study on the relationship between physical activity and physical fitness of students at SMPN 2 Sidoarjo, found a significant relationship between physical activity and physical fitness, with physical activity contributing 6% to students' physical fitness. Maulinda (2024) also examined the relationship between physical activity and physical fitness of students participating in badminton extracurricular activities at SMPN 2 Palimanan, Cirebon, and found a significant relationship with a 47% contribution of physical activity to physical fitness.

In contrast to these studies, which generally used regular student populations, this research examines the gifted student population (LISCI) with an IQ above 120, which has been underexplored in the context of the relationship between physical activity, physical fitness, and learning outcomes. This constitutes the novelty of the present study.

Conceptual Framework

The conceptual framework of this study illustrates the relationship between the independent variables physical activity level (X_1) and physical fitness level (X_2)—and the dependent variable learning outcomes of gifted students (Y). This study examines the partial relationship between X_1 and Y , X_2 and Y , as well as the simultaneous relationship between X_1 and X_2 with Y .

Physical activity level refers to the frequency, duration, and intensity of bodily movements performed by students regularly, whether through sports, daily activities, or extracurricular activities. Physical activity level was measured using the Physical Activity Questionnaire for Older Children (PAQ-C). Physical fitness level refers to students' physical ability to perform daily activities, including cardiorespiratory fitness, muscle strength, flexibility, and endurance, measured using the Indonesian Student Fitness Test (TKSI) phase D. Learning outcomes of gifted students refer to academic achievement measured through midterm report card scores across all subjects.

Methods

Research Design

This study employed a quantitative approach designed as non-experimental research with a correlational design. This design was chosen because the study aims to determine the relationship between physical activity level and physical fitness level with learning outcomes of gifted students at SMP Negeri 3 Sidoarjo, without intervention or manipulation of variables.

Participants and Sampling

The research was conducted at SMP Negeri 3 Sidoarjo, Jalan Raden Patah No. 95 Pucanganom, Sidoarjo, which is one of six public junior high schools in Sidoarjo Regency that organize the Individual Services for Gifted Students (LISCI) program. The research was conducted from January 5–7, 2026, beginning with the administration of the PAQ-C questionnaire on Monday, January 5, 2026, and the implementation of the Indonesian Student Fitness Test (TKSI) on Tuesday–Wednesday, January 6–7, 2026.

The population of this study was all LISCI students in grade VII at SMP Negeri 3 Sidoarjo in the 2025–2026 academic year. The sample was selected using purposive sampling technique, consisting of 30 students (23 female and 7 male) who met the gifted criteria in grade VII LISCI in the 2025–2026 academic year. Sample characteristics included: (1) students enrolled in the LISCI program; (2) having an IQ above 120 based on intelligence test results; (3) aged 12–14 years; and (4) willing to participate with parental/guardian consent.

Data Collection

The instrument for physical activity level used a validated physical activity questionnaire, namely the Physical Activity Questionnaire for Children (PAQ-C), adapted to the local context for junior high school age (12–14 years). The PAQ-C consists of three assessment components: daily activities (A1), physical activities during leisure time (B1–H1), and physical activities in the past week (J). The total PAQ-C score is obtained from the average of these three components and categorized into three levels: low (1.00–1.99), moderate (2.00–2.99), and high (3.00–4.00).

The instrument for physical fitness level used the Indonesian Student Fitness Test (TKSI) phase D, which includes five test items: (1) hand and eye coordination test (30 seconds) to measure hand-eye coordination; (2) sit-up test (30 seconds) to measure abdominal muscle strength; (3) standing broad jump test to measure leg muscle explosive power; (4) T-Test to measure agility; and (5) Multistage Fitness Test (MFT/beep test) to measure cardiorespiratory endurance. Each test item was scored 1–5, then summed to obtain a total score categorized as Very Poor (5–9), Poor (10–14), Moderate (15–19), Good (20–24), and Very Good (25).

The instrument for learning outcomes used midterm report card scores (cawu) for the odd semester as an evaluation of promotion and demotion for gifted students at SMPN 3 Sidoarjo. The data consisted of 12 subjects: Islamic Religious Education, Pancasila Education, Indonesian Language, Mathematics, Natural Sciences, Social Sciences, English, Physical Education, Informatics, Crafts, Javanese Language, and Quranic Reading and Writing.

Data collection procedures included three stages: (1) research permission and parental/guardian consent were obtained prior to questionnaire distribution; (2) distribution of the physical activity questionnaire (PAQ-C) directly to students at school; (3) implementation of the physical fitness test (TKSI) at the school; and (4) collection of learning outcome data from midterm report cards.

Data Analysis

Data analysis techniques used descriptive statistics to describe the distribution of the three research variables in the form of mean, standard deviation, minimum value, maximum value, and frequency distribution based on each variable's category. Prerequisite tests included normality tests

(Kolmogorov-Smirnov and Shapiro-Wilk), linearity tests, and multicollinearity tests. Hypothesis testing used Pearson correlation analysis and multiple linear regression with a significance level of $\alpha = 0.05$ using SPSS software.

Ethical Considerations

This study received permission from the Principal of SMP Negeri 3 Sidoarjo and parental/guardian consent through informed consent. All data were kept confidential and used only for research purposes. Student identities were not published in any form. Student participation was voluntary, and they could withdraw from the study at any time without penalty.

Result And Discussion

Based on the descriptive statistical analysis, the general profile of respondents shows that of the 30 LISCi students, 23 (76.67%) were female and 7 (23.33%) were male. All respondents were aged 12–14 years, with details: 12 years (6.66%), 13 years (90%), and 14 years (3.33%).

Table 1 - Summary of Descriptive Statistics for All Variables.

Variable	n	Mean	SD	Min	Max
Physical Activity Level	30	1.87	0.333	1.48	2.65
Physical Fitness Level	30	13.77	3.545	7	23
Learning Outcomes	30	92.53	2.036	86.67	94.83

The physical activity level of LISCi students had a mean of 1.87 (SD = 0.333) with a minimum value of 1.48 and a maximum of 2.65. A total of 18 students (60.0%) were in the low category and 12 students (40.0%) in the moderate category, while no students were in the high category.

Table 2 - Frequency Distribution of Physical Activity Level.

Category	Score Range	Frequency (n)	Percentage (%)
Low	1.00 – 1.99	18	60.0
Moderate	2.00 – 2.99	12	40.0
High	3.00 – 4.00	0	0.0
Total		30	100

The physical fitness level of students had a mean of 13.77 (SD = 3.545) with a minimum value of 7 and a maximum of 23. A total of 17 students (56.7%) were in the poor category, 9 students (30.0%) in the moderate category, 3 students (10.0%) in the good category, and 1 student (3.3%) in the very poor category. No students were in the very good category.

Table 3 - Frequency Distribution of Physical Fitness Level.

Category	Score Range	Frequency (n)	Percentage (%)
Very Poor	5 – 9	1	3.3
Poor	10 – 14	17	56.7
Moderate	15 – 19	9	30.0
Good	20 – 24	3	10.0
Very Good	25	0	0.0
Total		30	100

Learning outcomes of students had a mean of 92.53 (SD = 2.036) with a minimum value of 86.67 and a maximum of 94.83. A total of 28 students (93.3%) were in the very high category and 2 students (6.7%) in the high category. No students were in the moderate or low categories.

Table 4. Frequency Distribution of Learning Outcomes

Category	Score Range	Frequency (n)	Percentage (%)
Very High	≥ 90	28	93.3
High	80 – 89	2	6.7
Moderate	70 – 79	0	0.0
Low	< 70	0	0.0
Total		30	100

Prerequisite Tests

Prerequisite tests showed that all variables were normally distributed based on the Shapiro-Wilk test ($p > 0.05$), the relationships between variables were linear ($p > 0.05$), and there was no multicollinearity (VIF = 1.056; Tolerance = 0.947).

Correlation Analysis

The Pearson correlation test results showed that physical activity level had no significant relationship with learning outcomes ($r = -0.065$; $p = 0.735$), physical fitness level also had no significant relationship with learning outcomes ($r = 0.253$; $p = 0.178$), and the relationship between physical activity level and physical fitness level was also not significant ($r = 0.230$; $p = 0.221$).

Table 5 - Correlation Matrix between Variables

	Physical Activity	Physical Fitness	Learning Outcomes
Physical Activity	1.000	0.230 ($p=0.221$)	-0.065 ($p=0.735$)
Physical Fitness	0.230 ($p=0.221$)	1.000	0.253 ($p=0.178$)
Learning Outcomes	-0.065 ($p=0.735$)	0.253 ($p=0.178$)	1.000

Regression Analysis

The multiple linear regression analysis results showed $R = 0.282$ and $R^2 = 0.080$ (Adjusted $R^2 = 0.011$) with F significance = 0.326 ($p > 0.05$). The regression equation obtained was $\hat{Y} = 1111.094 - 0.070X_1 + 0.876X_2$. The effective contribution of physical activity variable was 0.845% and physical fitness was 7.133%, so the total effective contribution was 7.978%.

Discussion

1. Interpretation of Findings

The results of this study indicate no significant relationship between physical activity level and learning outcomes of gifted students ($r = -0.065$; $p = 0.735$). Similarly, physical fitness level did not show a significant relationship with learning outcomes ($r = 0.253$; $p = 0.178$). Simultaneously, both variables contributed only 8.0% to learning outcomes ($R^2 = 0.080$; $p = 0.326$), while the remaining 92.0% was influenced by other factors outside this study.

These findings present an interesting and contradictory phenomenon. Descriptively, LISCi students at SMP Negeri 3 Sidoarjo had very high learning outcomes (mean 92.53), yet their physical activity level was predominantly low (60%) and physical fitness was predominantly poor (56.7%). This condition indicates that in the gifted student population ($IQ > 120$), cognitive and intellectual factors are far more dominant in determining academic achievement compared to physical factors. The superior cognitive capacity possessed by LISCi students appears to "compensate" for physical limitations, enabling them to achieve high academic performance despite being less physically active and less fit.

2. Comparison with Previous Research

The results of this study differ from the findings of Suwandaru and Hidayat (2021)

and Lubis and Nuralita (2021), who found a positive relationship between physical activity and learning outcomes in regular student populations. This difference can be explained by several factors. First, the different subject characteristics: regular students have varying cognitive baselines, so the effect of physical activity on cognitive function is more detectable, whereas in LISCi students, the already very high cognitive baseline makes the marginal effect of physical activity difficult to observe. Second, the different dependent variables: previous studies often measured learning outcomes in specific subjects or specific cognitive aspects, while this study used the accumulated scores from 12 subjects, most of which are theoretical-cognitive in nature. Third, the low homogeneity of physical activity and physical fitness data (concentrated in the low-moderate categories) caused narrow data variation, making it difficult to detect statistically significant relationships.

This study's results also differ from Muhammad et al. (2025), who reported a positive and significant relationship between physical activity and learning outcomes of junior high school students. This difference is interesting to examine given that both studies used the same PAQ-C instrument. The most likely factor explaining this difference is the fundamentally different subject characteristics. Muhammad et al. (2025) involved 1,870 junior high school students with varying academic ability ranges, while this study used gifted students (LISCi) with $IQ > 120$.

This study also differs from Kaharina et al. (2024), who proved that a four-week physical activity mentoring program significantly improved the physical fitness of senior high school students ($p = 0.000$). The fundamental difference lies in the research design and objectives. Kaharina et al.'s (2024) study was an intervention study (pre-test and post-test) aimed at testing the effectiveness of a physical activity program, while this study is correlational and aims to observe natural relationships between variables without intervention. Thus, both studies complement each other: Kaharina et al. (2024) proved that physical activity can improve physical fitness, while this study shows that in the gifted student population, improved physical fitness does not automatically translate into improved academic learning outcomes.

The results of this study also differ from Solikha and Muhammad (2022), who found that the physical fitness level of SMKN 2 Buduran students was in the good category with an average $VO_2\text{Max}$ of 22.9–23.3. This difference may be caused by differences in subject characteristics and academic burden. Vocational high school students may have more flexible learning schedules with fieldwork practice involving physical activity, while LISCi students at SMPN 3 Sidoarjo face a compressed academic burden (acceleration from 3 years to 2 years), resulting in very limited time for physical activity.

3. Theoretical Implications

These findings indicate that theories about the relationship between physical activity and learning outcomes need to consider population characteristics. In the gifted population, cognitive and intellectual factors are more dominant. This enriches the understanding that the influence of physical activity on learning outcomes is contextual and depends on subject characteristics.

Although physical fitness showed a greater effective contribution (7.13%) compared to physical activity (0.85%) to learning outcomes, both remained insignificant. This is theoretically reasonable because physical fitness is a more stable functional physiological condition of the body, while physical activity is merely a behavior that does not always correlate directly with functional capacity. In other words, being fit is more important than merely being active in relation to cognitive function, but in the gifted population, this effect remains overshadowed by the dominance of intellectual factors.

4. Practical Implications

These findings have important implications for the LISCi program and accelerated

learning. The compression of the curriculum from 3 years to 2 years causes students to have limited time for physical activity outside of study hours, creating a gap between academic achievement and physical health. Schools and parents need to realize that although physical activity has not been proven to significantly improve academic scores in this population, physical activity and physical fitness remain crucial for long-term health, mental well-being, and students' quality of life—not merely for academic achievement.

Physical education teachers need to provide education about the importance of an active and healthy lifestyle, not only for academic achievement but also for long-term health, prevention of non-communicable diseases, and improved quality of life. Schools with LISCI programs can use the data from this study as a basis for developing policies that consider the balance between academic achievement and students' physical health, including scheduling that considers rest time and physical activity.

5. Limitations and Future Research

This study has several limitations that need to be acknowledged. First, the non-experimental correlational design cannot prove causal relationships between physical activity and physical fitness with learning outcomes. The findings only show statistical association, not causal influence. Second, the limited sample size (30 students) for multiple regression analysis with two predictors affects statistical power and generalizability of results. Third, the purposive sampling technique from only one school and one cohort limits the generalizability of results to the LISCI student population at SMPN 3 Sidoarjo. Fourth, the PAQ-C instrument is a self-report measure that is vulnerable to recall bias and social desirability bias, so students' reports of physical activity may not fully reflect actual conditions. Fifth, the gender imbalance (76.67% female) means the results may more reflect the characteristics of female students. Sixth, the study did not control for confounding variables such as intelligence level (IQ), socioeconomic status, stress level, sleep quality, nutritional intake, learning motivation, and parental support.

Future research is advised to use experimental or quasi-experimental designs to test the effects of structured physical activity interventions on improving learning outcomes; use larger samples (at least 50–100 respondents) and involve multiple LISCI-program schools; use objective measurement tools such as accelerometers or pedometers to measure physical activity; add mediating variables (concentration, learning motivation, sleep quality) and moderating variables (gender, nutritional status, social support); use mixed methods approaches for deeper understanding; and conduct longitudinal studies to observe changes over time.

Conclusion

Based on the research results and discussion, it can be concluded that there is no significant relationship between physical activity level and learning outcomes of gifted students at SMP Negeri 3 Sidoarjo ($r = -0.065$; $p = 0.735$). There is no significant relationship between physical fitness level and learning outcomes of gifted students ($r = 0.253$; $p = 0.178$). There is no significant simultaneous relationship between physical activity level and physical fitness level with learning outcomes of gifted students ($R^2 = 0.080$; $p = 0.326$). Cognitive and intellectual factors are more dominant in determining academic achievement in the gifted student population compared to physical factors.

It is recommended that physical education teachers design attractive structured physical activity programs; schools ensure a balance between academic burden and physical activity; education departments facilitate training for physical education teachers in LISCI schools; and future researchers use experimental designs, larger samples, more objective physical activity measurements, and add mediating/moderating variables.

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