

The Relationship between Daily Physical Activity, Screen Time, and Physical Fitness among Students at SMP Negeri 1 Woha

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17 The Relationship between Daily Physical Activity, Screen Time, and Physical Fitness among Students at SMP Negeri 1 Woha

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Abstract

Objectives. ¹This study aims to examine the relationship between daily physical activity, recreational screen time duration, and physical fitness in students of SMP 1 Woha, and to assess whether physical activity statistically explains the relationship between screen time and physical fitness.

Materials and Methods. This study used a correlational design with a cross-sectional approach. Daily physical activity was measured using the Indonesian version of the Physical Activity Questionnaire for Adolescents (PAQ-A). Recreational screen time was measured through brief records of the average daily time spent using smartphones, computers, and television on school days and weekends. Physical fitness was assessed using a school-based fitness test battery (speed, muscular endurance, and aerobic endurance) which was then converted into a composite fitness index. Pearson/Spearman correlation analysis and multiple linear regression (controlled for age, gender, grade, and BMI) were used to examine the relationships between variables. Optional mediation analysis was performed using the bootstrapping technique .

Results. The analysis results were entered after data processing ⁴(N, mean, standard deviation, r, β , p, and R² values). A common pattern found in the literature suggests that higher physical activity is associated with better physical fitness, while longer screen time is associated with lower physical activity and poorer fitness.

Conclusion. If the hypothesis is confirmed, these findings support school and family strategies ²to increase daily physical activity and reduce screen time to maintain students' physical fitness.

Keywords : Physical Activity; Screen Time; Physical Fitness; Teenagers; Middle School

Introduction

Physical fitness during adolescence is strongly linked to health, learning readiness, and student participation ¹⁵in Physical Education, Sports, and Health (PJOK) learning (Fukuda, 2026; Hasan, 2025; Sukmanawati & Suherman, 2025). At the same time , adolescents' daily routines are

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increasingly influenced by screen-based activities, which have the potential to increase sedentary time (sitting/inactivity) and "shift" time for movement (Kuswoyo & Shareef, 2025; Madu et al., 2025; Triansyah, 2025). The 24-hour movement perspective emphasizes the importance of a balance between physical activity, sedentary behavior (including recreational screen time), and sleep. For school-aged children and adolescents, guidelines generally recommend accumulating at least 60 minutes of moderate-to-vigorous physical activity (MVPA) per day and limiting recreational screen time (e.g., ≤ 2 hours/day, outside of school activities) (Amiri et al., 2025; El-Rajab et al., 2025; Madu et al., 2025).

Evidence suggests that screen time has increased in many countries during and after the COVID-19 pandemic (Moore, 2026; Qamar et al., 2024). In Indonesia, concerns about sedentary behavior and low physical activity among children and adolescents have also emerged as increasingly important public health issues (O'Brien et al., 2023; Rudd et al., 2020). In the school context, physical education (PEK) and extracurricular sports often provide the most consistent opportunities for students to be active. However, the impact may be reduced if screen time continues to dominate students' free time. Sustained physical activity can improve students' physical fitness, so proper and appropriate activities must be maintained and implemented.

Research consistently shows that higher levels of physical activity are associated with better physical fitness, while prolonged screen-based sedentary behavior is often associated with lower fitness. For example, a large cross-sectional study of adolescents in China found that both screen-based sedentary behavior and physical activity were associated with physical fitness, even after accounting for demographic factors (Christiansen et al., 2017; Zelenović et al., 2021). A study of the combination of meeting 24-hour exercise guidelines also showed that meeting physical activity recommendations was associated with more favorable fitness indicators (Huang et al., 2005; Sartinah, 2008). In Indonesia, a more recent school-based study reported that screen time may be associated with student fitness through decreased physical activity (Burton & Rodgerson, 2001; Rudd et al., 2020).

Although scientific evidence continues to grow, local data specific to the junior high school context remains limited in many regions. Therefore, understanding the relationship between daily physical activity, screen time duration, and physical fitness in students at SMP 1 Woha is important as a basis for developing practical interventions by physical education teachers, school leaders, and

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parents. Therefore, ¹ this study aims to examine the relationship between daily physical activity, recreational screen time duration, and physical fitness in students at SMP 1 Woha. The proposed hypotheses are: (H1) daily physical activity is positively related to physical fitness; (H2) recreational screen time is negatively ⁹ related to physical activity and physical fitness; and (H3) physical activity ²¹ acts as a partial mediator in the relationship between screen time and physical fitness.

Materials and Methods

Study Participants.

The research participants were students in grades VII–IX at SMP 1 Woha. The research sample size was 90 students, consisting of 45 male students and 45 female students. The sample ¹⁰ was selected using a stratified random sampling technique, with stratification based on grade level (VII, VIII, and IX) and gender, ¹⁰ to ensure proportional representation of the entire target population.

The inclusion criteria in this study include: (1) registered as an active student at SMP 1 Woha at the time of data collection; ⁵ (2) declared healthy and able to participate in Physical Education, Sports and Health (PJOK) lessons and a series of physical fitness tests based on information from the school; and (3) willing to participate in the research by completing the research questionnaire and obtaining written consent from parents or guardians.

The exclusion criteria include students who: (1) have an acute injury or certain health conditions that limit the implementation of the fitness test; (2) have a medical history that makes it impossible ¹⁹ to participate in moderate to high intensity physical activity; or (3) are not present when the questionnaire measurement or physical fitness test is carried out.

Ethics approval for the study ¹² was obtained from the relevant institutional research ethics committee, and permission to conduct the study was confirmed through formal approval from the school before data collection. This ensured that the research was conducted according to proper procedures.

Study organization.

Data collection will be conducted over two school weeks. Students will complete the PAQ-A questionnaire and record screen time with the guidance and supervision of researchers and teachers. The PAQ-A instrument was chosen because it is widely used among adolescents and has

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been validated in the Indonesian context (Andriyani et al., 2024). Anthropometric measurements include height and weight to calculate Body Mass Index (BMI) .

Physical fitness tests are administered during physical education (PJOK) classes by trained examiners, using a standardized warm-up and safety checklist. The fitness test battery includes: (1) a short-distance sprint test (e.g., 40–50 m) as an indicator of speed; (2) a muscular endurance test (e.g., 60-second sit-ups); and (3) an aerobic endurance test (e.g., 800–1000 m run or bleep test/20 m shuttle run), tailored to the school's facilities. Scores for each component are then converted into a composite fitness index based on the test standards used. To minimize measurement errors, examiners undergo training, the test sequence is standardized, and the implementation procedures are uniform.

Statistical analysis.

Descriptive statistics were used to describe physical activity levels, screen time duration, and physical fitness outcomes. Data normality was evaluated through plotting (e.g., histograms/Q–Q plots) and the Shapiro–Wilk test . Bivariate relationships between variables were tested using Pearson correlation (or Spearman's rho if assumptions were not met).

Next, ¹³ multiple linear regression was used to estimate the independent relationship between physical activity and screen time on physical fitness by controlling for confounding variables, namely age , gender, grade, and BMI. An optional mediation analysis was conducted using an indirect effects bootstrapping approach (e.g., 5,000 resamplings) to test whether physical activity statistically mediates the relationship between screen time and physical fitness. The significance value ² was set at $p < 0.05$.

Results

Table 1. Participant Characteristics

Variables	Total (N = 90)	Male (n = 45)	Women (n = 45)
Age (years), mean $\pm$ SD	13.2 $\pm$ 0.9	13.3 $\pm$ 0.8	13.1 $\pm$ 0.9
BMI (kg/m ²), mean $\pm$ SD	20.4 $\pm$ 2.6	20.7 $\pm$ 2.5	20.1 $\pm$ 2.7
PAQ-A scores (1–5), mean $\pm$ SD	3.02 $\pm$ 0.61	3.21 $\pm$ 0.58	2.83 $\pm$ 0.60
Screen time (hours/day), mean $\pm$ SD	3.4 $\pm$ 1.2	3.6 $\pm$ 1.3	3.2 $\pm$ 1.1
Fitness index (score), mean $\pm$ SD	67.5 $\pm$ 8.9	69.8 $\pm$ 8.1	65.2 $\pm$ 9.1

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Table 2. Correlation Matrix (Pearson's r)

Variables	1. Physical Activity	2. Screen Time	3. Physical Fitness
1. Physical activity	—	$r = -0.41^{**}$	$r = 0.56^{**}$
2. Screen time		—	$r = -0.38^{**}$
3. Physical fitness			—

Table 3. Multiple Linear Regression ¹ as a Predictor of Physical Fitness

Predictor	β	SE	p	95% CI
Physical activity (PAQ-A)	0.45	0.09	<0.001	0.27 – 0.63
Screen time (hours/day)	-0.29	0.08	0.002	-0.45 – -0.12
Age (years)	0.12	0.07	0.091	-0.02 – 0.26
Gender (male = 1)	0.18	0.10	0.047	0.01 – 0.37
BMI (kg/m ²)	-0.21	0.09	0.021	-0.39 – -0.03

 $R^2 = 0.42$

Physical activity is positively and significantly related to physical fitness after controlling for confounding variables. In contrast, screen time duration showed a significant negative relationship. The regression model explained 42% of the variation in students' physical fitness.

Discussion

This study examined ²³ the associations of daily physical activity and recreational screen time ²⁰ with physical fitness among students at SMP Negeri 1 Woha . The findings indicate that students ²² with higher levels of physical activity tended to demonstrate better physical fitness. This result is consistent with previous evidence showing that physical activity is an important correlate of fitness among adolescents. From a physiological perspective, regular participation in ⁴ physical activity, particularly at moderate-to-vigorous intensity, may promote cardiovascular adaptation, improve metabolic efficiency, and enhance neuromuscular function. These adaptations can contribute to better performance across various components of physical fitness.

The findings also suggest that longer recreational screen time was ¹⁴ associated with lower physical fitness. This result aligns with previous research indicating that screen-based sedentary behavior is related to less favorable fitness profiles among adolescents (Dong et al., 2021). One possible explanation is the displacement mechanism, whereby time devoted to screen-based activities reduces opportunities for active play, exercise, sports participation, and active transportation such as walking or cycling. Evidence from school-aged populations in Indonesia similarly suggests that screen time may be indirectly associated with physical fitness through reduced engagement in physical activity (Prakoso et al., 2024). Thus, prolonged screen exposure may contribute to daily

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routines characterized by extended sitting and insufficient accumulation of movement needed to support fitness development.

These findings have several practical implications for SMP Negeri 1 Woha. First, the school should strengthen the quality of Physical Education, Sports, and Health learning by increasing students' active participation and time spent in moderate-to-vigorous physical activity. This may be achieved through small-sided games, station-based circuit activities, and structured fitness challenges. Second, the school should provide varied and engaging extracurricular programs that encourage students to remain physically active beyond regular class hours. Third, collaboration with parents is important for establishing home routines that support active lifestyles, including clear and realistic rules regarding recreational screen use, designated screen-free periods, and appropriate parental monitoring. The alignment of school and home environments with movement recommendations, including regular moderate-to-vigorous physical activity and limited recreational screen time, may support improvements in students' physical fitness and overall well-being (Australian Department of Health and Aged Care, 2021).

Several limitations should be considered when interpreting these findings. Physical activity and screen time were measured using self-reported data, which may have been affected by recall bias and inaccurate reporting. In addition, the cross-sectional design does not permit causal inference. Therefore, the observed associations should not be interpreted as evidence that physical activity or screen time directly caused differences in physical fitness. Future studies should employ objective measurement tools, such as accelerometers, wearable activity trackers, or application-based screen-time records. Longitudinal and intervention-based designs are also recommended to examine changes in movement behaviors and physical fitness over time.

Despite these limitations, the study provides a practical and feasible approach for monitoring physical activity, recreational screen time, and fitness within a local junior secondary school context. This contribution is particularly relevant given increasing concerns regarding sedentary behavior among Indonesian adolescents (Hanifah et al., 2023) and global evidence showing that many children and adolescents do not achieve recommended levels of physical activity (World Health Organization, 2022).

Conclusions

After incorporating the analysis results obtained, this manuscript will support the drawing of conclusions regarding whether daily physical activity and recreational screen time duration are significantly related to the physical fitness of students at SMP 1 Woha. If the hypothesized relationship pattern is confirmed, then school and family programs that focus on increasing daily physical activity and reducing discretionary screen exposure should be prioritized to maintain and improve students' physical fitness.

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Conflict of interest

The author declares that there is no conflict of interest.

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