

The effect of physical fitness on academic achievement through self-confidence in adolescents aged 16 – 18 years: a scoping review

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Abstract

Background and Study Aim Although the relationship between physical fitness and academic achievement has been widely studied, the mechanisms that explain this relationship still need to be explored further. One possible mechanism that may serve as a mediator is self-confidence. This study aims to conduct a scoping review of the literature that discusses the effects of physical fitness on academic achievement through self-confidence.

Material and Methods This study is a scoping review that analyzes the relationship between physical fitness, self-confidence, and academic achievement in adolescents aged 16–18 years. The literature review was conducted systematically using the PubMed, Scopus, and Web of Science databases for articles published in English between 2015 and 2024. Article selection was based on predefined inclusion and exclusion criteria and followed the PRISMA procedure.

Results The analysis identified 9 articles demonstrating a positive relationship between physical fitness, self-confidence, and academic achievement in adolescents. Most studies found that better physical fitness levels, especially cardiorespiratory fitness, were correlated with higher academic achievement. In addition, self-confidence was shown to act as a mediator that strengthens the relationship between physical fitness and academic achievement. However, several studies also reported variations in results, such as students with high fitness but low academic achievement. In general, these findings confirm the important role of physical activity and self-confidence in supporting adolescents' academic success.

Conclusions Physical fitness plays an important role in supporting academic achievement through self-confidence in adolescents. The positive relationship between physical fitness, self-confidence, and academic achievement emphasizes the importance of integrating physical fitness programs into the school environment as part of a holistic effort to improve the quality of education. Although this study has several limitations, future research is expected to employ stronger designs and broader scopes to provide more applicable recommendations for improving the quality of education and children's health.

Keywords: physical activity, psychology, adolescents, mental health

Introduction

Education is one of the main pillars in the development of quality human resources. One indicator of educational success is academic achievement in students [1]. Various factors have been identified as contributing to academic achievement, including both internal and external factors. One factor that is currently receiving increasing attention is the physical fitness of students [2, 3]. Physical fitness not only influences physical health but is also thought to have a close relationship with academic performance [4].

Engaging in regular physical activity helps improve physical fitness, which in turn enhances blood and oxygen circulation to the brain, thereby supporting better cognitive function [4]. This optimal

cognitive function is very important in helping students understand subject matter and complete academic tasks more effectively [5]. In addition, physical activity is also known to reduce stress and anxiety levels, as well as improve mood [6, 7], thereby enhancing students' mental condition and enabling them to become more focused and motivated in learning. Furthermore, regular involvement in physical activities can also foster positive traits such as discipline, responsibility, and effective time management, all of which greatly contribute to academic success [3]. Numerous empirical studies indicate that students who possess higher levels of physical fitness generally achieve higher academic scores than those who are less physically active [2, 4].

Then, the results of previous studies showed that students with good levels of physical fitness tend to have more optimal concentration, memory, and cognitive abilities, which can support higher academic achievement [8, 9]. In addition, physical

fitness is also related to psychological aspects, one of which is self-confidence [10, 11]. Self-confidence is an individual's belief in their own ability to complete certain tasks, including in the context of learning [12, 13, 14]. Students who have high self-confidence are usually more motivated, willing to take on challenges, and more persistent in facing learning difficulties.

Although the relationship between physical fitness and academic achievement has been widely studied, the mechanisms that explain this relationship still need to be explored further. One possible mediating mechanism is self-confidence. In other words, increasing physical fitness can enhance self-confidence, which in turn can improve students' academic achievement [15]. Nevertheless, comprehensive research that systematically explores the connections between physical fitness, self-confidence, and academic achievement remains limited, particularly in the form of scoping reviews that can offer an in-depth overview of this subject.

Based on this background, this study aims to conduct a scoping review of the literature that discusses the effects of physical fitness on academic achievement through self-confidence, in order to provide a deeper understanding of the relationship among the three variables and serve as a basis for further research and intervention in the fields of education and children's health.

Materials and Methods

Study Organization

This research is a scoping review, which is a literature review method that aims to map the main concepts, evidence, and existing research gaps related to a particular topic [16]. The scoping review method was chosen because it allows researchers to identify, analyze, and synthesize various studies, specifically in this study to analyze the relationship between physical fitness, academic achievement, and self-confidence comprehensively.

Data source

Empirical studies published between 2015 and 2024 were identified through searches in three leading international databases: PubMed, Scopus, and Web of Science. The search was restricted to peer-reviewed articles written in English. Identification, screening, eligibility, and inclusion of available research were the steps used to implement this method. Researchers examined articles relevant to the research questions. Each step was carried out in a structured and systematic manner by following predetermined stages.

Inclusion and Exclusion Criteria

After comprehensive keyword definitions, inclusion and exclusion criteria were outlined and applied through database filters. The inclusion criteria were: (a) research published between 2015

and 2024 related to the impact of physical fitness on self-confidence and academic achievement in students aged 16–18 years; (b) research involving specific physical activities (e.g., structured exercise, daily physical activity, or physical fitness programs) that were relevant to their impact on self-confidence and academic achievement using standardized indicators.

The exclusion criteria were: (a) research measuring the impact of physical fitness on self-confidence and academic achievement in students under 16 years of age; (b) studies published before 2015; and (c) publications with different contexts such as medication, non-empirical studies, non-English language, or irrelevant populations.

Based on the inclusion and exclusion criteria, 4,110 studies were identified. The researcher then conducted re-screening through step-by-step selection of the material contained in each article. The final selection was carried out according to the procedures specified in PRISMA 2020 [17] (Fig. 1).

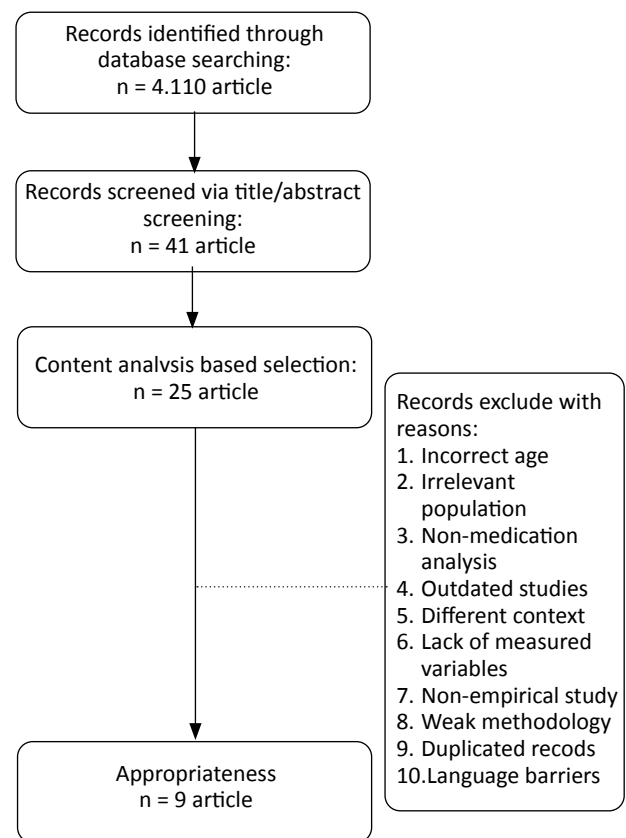


Figure 1. PRISMA flowchart of the article selection process

After the analysis was completed, 25 articles met the requirements. Among these, 9 articles were deemed worthy of in-depth examination and analysis because they are relevant to the research theme and aligned with the research objectives. The following is a chart illustrating the stages carried out by the researchers in conducting this Systematic Literature Review (SLR) using Publish or Perish (PoP).

Results

The findings presented in this literature review consist of analyses and summaries of articles examining the effects of physical fitness on self-

confidence and academic achievement (Tabl. 1). A total of nine relevant studies were selected for review to assess how physical fitness influences adolescents' self-confidence and academic performance, as detailed in the table below.

Table 1. Review of Research Results

Author	Study Design	Subject	Result	Findings	Source
Fatima (2015)	This study uses a comparative descriptive design. It can also be considered a cross-sectional study, with data collected at one point in time from different samples.	The study involved 1,000 adolescents aged 17 to 19 years, consisting of 361 males and 639 females, with 671 living in urban areas and 329 in rural areas.	A positive correlation was found between self-confidence and academic achievement. This suggests that increased self-confidence is associated with improved academic performance in adolescents.	The findings indicate that adolescents' self-confidence increases along with academic achievement. However, this relationship is considered very small and unpredictable. This suggests that self-confidence may serve as a mediating variable affecting adolescent academic achievement.	[18]
Sardinha et al. (2016)	This longitudinal study allowed researchers to evaluate the long-term relationship between physical fitness and academic achievement among students.	The study involved 1,286 students from 14 schools, aged between 11 and 14 years.	The study found that students with good levels of cardiovascular fitness tended to achieve better academic outcomes. Students who were categorized as «unfit» at the start but improved their fitness during the follow-up period demonstrated academic improvement compared to those who remained «unfit.»	Students who improved from an unfit to a fit status also showed better academic performance. This indicates that not only is consistent physical fitness important, but improvements in fitness can positively influence academic achievement.	[19]
Han (2018)	The research used a correlational design.	The sample consisted of 236 students aged 13–15, randomly selected from three high schools in the city of D, South Korea.	Pearson's correlation test revealed a significant negative relationship between PAPS scores and final exam scores, indicating that students with higher levels of physical fitness tended to achieve better academic outcomes.	There was a significant correlation between students' physical fitness and their academic achievement. The results showed that healthier students tended to score better on final exams, particularly in core subjects such as math, English, and science.	[20]
Gil-Espinosa et al. (2020)	This study employed a data collection method conducted during the first semester of the 2015/2016 school year.	The sample was a convenience sample consisting of 403 adolescents (53.6% male) with an average age of 13.7 ± 1.2 years from a secondary school in Andalusia, Spain.	The research demonstrated a positive association between components of physical fitness, especially cardiovascular fitness, and academic achievement. Adolescents with higher levels of physical fitness tended to perform better academically.	The study found a positive correlation between general intelligence and cardiovascular fitness in adolescents. This indicates a relationship between higher fitness levels and better cognitive performance as measured by intelligence tests. Teenagers who are physically fit are more likely to achieve academic success. Regular physical activity can improve fitness and, in turn, positively impact both intelligence and academic performance.	[21]

Table 1. Continued

Author	Study Design	Subject	Result	Findings	Source
Batez et al. (2021)	Using a longitudinal design, the study observed students over a three-year period.	The sample consisted of 1,286 students between the ages of 11 and 14 years.	Children's academic achievement was generally found to be positively related to physical fitness and motor competence. The study also noted that weight status (BMI) was negatively correlated with GPA, suggesting that children with higher BMIs tended to have lower academic achievement.	The findings indicate a positive correlation between physical fitness levels and academic achievement. Specifically, children with better fitness test results tended to have higher GPAs. This suggests that physical exercise may support learning. Cognitive processing, overall health, and motivation may mediate this relationship. In other words, the connection between physical fitness and academic achievement is positive, significant, and complex.	[22]
Vist Hagen et al. (2022)	This cross-sectional study collected data from a representative sample at a single point in time.	The sample consisted of high school students aged 13–16 years; participants were selected from various schools.	The research showed that physical fitness had a greater influence on academic achievement in physical education (PE) compared to motor competence.	In physical education, a significant relationship exists between fitness and academic achievement. Students who are fitter tend to have better PE scores than those who are less fit. This study emphasizes the importance of physical fitness as a factor that can affect academic achievement and suggests that physical education teachers consider individual fitness levels when assessing and instructing students.	[23]
Yuda et al. (2022)	This study employed a correlational method.	The sample consisted of 90 students in grades 7 to 9 at Ibtidaiyah Junior High School.	A significant positive correlation was found between self-confidence, academic stress, coping strategies, and academic achievement. Regression analysis showed that coping strategies had the greatest influence on academic achievement, followed by self-confidence and academic stress.	During the COVID-19 pandemic, self-confidence was identified as an important predictor of students' academic achievement in physical education classes. Students with higher confidence tended to perform better academically. Academic stress also influenced outcomes, as it could motivate some students, while excessive stress hindered performance.	[24]
Li et al. (2023)	The study used a cross-sectional design, observing a group of participants at a single point in time.	A total of 304 eighth-grade students aged 13–14 from seven public schools in Tekirdağ, Turkey, were recruited. Schools were selected based on similar socioeconomic backgrounds.	The study found significant differences in VO ₂ max scores across academic achievement groups, with the low-performing group showing higher VO ₂ max scores than both the average and high-performing groups (47.1 vs. 42.6 and 42.4, respectively).	The findings suggest that students with poor academic performance may engage more in physical activity, potentially at the expense of their studies. These results challenge conventional assumptions about the relationship between physical fitness and academic success.	[25]

Table 1. Continued

Author	Study Design	Subject	Result	Findings	Source
Ortega-Gómez et al. (2023)	Although the study was designed to be longitudinal, the analysis presented here focuses on cross-sectional baseline data collected between February and May 2015.	The sample consisted of 268 high school students aged 14 years, including 138 males and 130 females.	The study found a positive association between physical activity levels, especially moderate to vigorous physical activity, and physical fitness components (such as lower-body muscle strength and cardiovascular fitness), as well as confidence and interpersonal relationships in adolescents.	The findings indicated that physical fitness elements, including muscle strength, speed-agility, and cardiorespiratory fitness, were positively correlated with higher levels of self-confidence in adolescents.	[15]

Discussion

The main purpose of this literature review is to evaluate the influence of physical fitness and self-confidence on academic achievement in adolescents. Several studies have shown that physical fitness positively impacts students' academic achievement. Sardinha et al. [19] reported that physical fitness influences both academic and health outcomes in adolescents. Another study by Gil-Espinosa et al. [21] found a positive relationship between cardiorespiratory fitness and flexibility and academic achievement, while muscular strength did not show a significant relationship with performance in certain subjects.

Engaging in regular physical activity not only enhances physical fitness but also significantly contributes to the improvement of cognitive abilities, including students' focus and memory. As a result, students who are more physically active generally demonstrate stronger concentration and memory skills. Xiong et al. [26] showed that students who are physically active generally achieve higher academic grades compared to those who are less active. In addition, children who exercise regularly tend to have better health conditions and higher school attendance rates. Further evidence from Zhang et al. [27] showed that an 11-week aerobic exercise intervention significantly improved children's executive functions, including inhibitory control, working memory, reaction time, and cognitive flexibility. Erickson et al. [28] also emphasized that physical activity can stimulate the release of hormones that support cognitive function and increase blood flow to the brain, which in turn improves sleep quality and enhances memory and learning ability.

The relationship between physical fitness and academic achievement is increasingly being discussed, particularly in relation to self-

confidence. In general, fitness and self-confidence are interrelated and can influence each other [15]. Improving physical fitness can be a positive step toward building self-confidence, and conversely, high self-confidence can motivate individuals to be more active in maintaining their fitness. Through regular and active participation in physical activity, students' self-confidence can increase, and they tend to feel more positive about their appearance [24]. This may be because engagement in physical activity often involves social interaction, which can help strengthen self-confidence.

High self-confidence is generally positively associated with academic achievement. Students who are confident tend to approach difficult tasks more courageously and are more active in class discussions and extracurricular activities [7]. Self-confidence also helps students manage academic stress more effectively. Therefore, by promoting physical activity, schools not only help students maintain physical health but also support their academic performance. Research by Fatima [18] demonstrated that students with high levels of self-confidence are typically more motivated in their learning and academic participation. Self-confidence enables students to face academic challenges and increases their resilience to stress and pressure. Positive outcomes of physical fitness, such as improved mood and reduced anxiety, can in turn enhance self-confidence [29]. Thus, when students feel better emotionally and are able to cope with stress, they tend to have a more positive view of themselves and their abilities, which makes them more likely to achieve strong academic results.

This study has several limitations, including the review of literature limited to sources in Indonesian and English and within a specific time span, which may have resulted in the omission of relevant research. Additionally, the diversity of designs and methods among the reviewed studies

may lead to heterogeneous results, limiting the generalizability of the findings. Nevertheless, the results of this study offer important implications for the field of education, particularly by emphasizing the importance of integrating physical fitness programs to support academic achievement and the development of student self-confidence. These findings can serve as a basis for more holistic educational policies and interventions. In the future, it is recommended that research be conducted using stronger designs, such as longitudinal or experimental studies, involving more diverse populations and standardized measurement instruments, to provide more robust evidence and applicable recommendations for the advancement of children's education and health.

Conclusions

Based on the results of the scoping review, it can be concluded that physical fitness plays an important role in supporting academic achievement

through self-confidence in adolescents. The positive relationship among physical fitness, self-confidence, and academic achievement highlights the importance of integrating physical fitness programs into the school environment as part of a holistic effort to improve educational quality. Although this study has several limitations, such as language constraints and variation in study designs, the findings still provide a strong foundation for the development of more comprehensive educational policies and interventions. Future research is expected to adopt stronger designs and broader scopes to reinforce the evidence on the relationship between physical fitness, self-confidence, and academic achievement, thereby offering more applicable recommendations for improving the quality of education and children's health.

Conflict of Interest

The authors declare no conflict of interest.

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