

The Role of Physical Education in Preventing Obesity in Elementary School Children

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INFO ARTIKEL	ABSTRAK
Accepted: July 02, 2025 Revised: August 24, 2025 Approved: September 10, 2025 Published: September 24, 2025	Obesity in elementary school age children is a global health problem that can have an impact on increasing the risk of chronic diseases and reducing children's quality of life, physical education as part of the school curriculum is seen as having an important role in preventing obesity by increasing physical activity, fitness, and forming healthy living habits from an early age. This study aims to analyze the role of physical education in the prevention of obesity in elementary school children and examine the factors that affect its effectiveness, including aspects of nutrition, child awareness, socio-economic, and educational policies. The method used is Systematic Literature Review (SLR), a literature search is conducted on international databases such as PubMed, Scopus, and Web of Science for publications in 2020–2025, from the results of identification, screening, and full review, 23 articles that meet the inclusion criteria are obtained, including 11 main articles relevant to the research focus. The results of the study show that formal physical education is the most influential variable in reducing the prevalence of obesity in children, especially if it is carried out regularly, intensively, and integrated with nutritional interventions and child awareness improvement programs. Socio-economic factors were found to have an inconsistent influence, while single nutrition education and awareness without physical activity proved to be less effective, and education policy support played a very important role in ensuring the success of the program.
Keywords: Physical Education, Childhood Obesity, Primary School, School-Based Interventions, Systematic Literature Review	

INTRODUCTION

Obesity in elementary school-age children is an increasingly worrying global public health problem, children who are obese are at higher risk of developing chronic diseases in adulthood, such as type 2 diabetes, hypertension, and cardiovascular disorders, in addition obesity can affect psychological health, reduce self-confidence, and reduce children's quality of life (Podnar et al., 2021; Singhal et al., 2020). Lifestyle factors such as increased consumption of high-calorie foods, as well as low children's involvement in daily physical activity are the main causes of the increasing prevalence of obesity, children in primary schools are increasingly exposed to digital technology, which although beneficial in education, also encourages reduced physical activity (Navidad et al., 2021), so school-based preventive interventions are very important

because schools are the place where children spend most of its time (Goswami et al., 2021).

Physical education (PE) is an important component of the school curriculum that has great potential to prevent obesity, through physical education, children are introduced to active living habits, are invited to move regularly, and are equipped with motor skills that support a healthy lifestyle in the future (Ługowska & Kolanowski, 2022). In addition, physical education can also be a means to build awareness of the importance of maintaining an ideal weight and physical health (Di Maglie et al., 2022). School-based interventions that integrate physical education and physical activity promotion have been shown to reduce the prevalence of childhood obesity, a study conducted in China found that multifaceted interventions in primary schools are effective in preventing the increase in obesity by increasing physical activity, controlling diet, and providing health education (Liu et al., 2021)

Another systematic review confirms that school-based interventions have a significant impact on obesity prevention, particularly when they involve intensive and consistent physical activity in the curriculum (Yuksel et al., 2020). These results are reinforced by research conducted by Alhelal et al., (2024) which shows that physical activity-based programs not only lower body mass index, but also improve overall physical fitness, however, the effectiveness of physical education interventions is not always consistent in various contexts, research by Lund et al., (2025) shows that socioeconomic status can moderate the impact of physical education on childhood obesity prevention, A child from a family with low socioeconomic status tends to have difficulty maintaining the results of the intervention compared to a child from a family with high socioeconomic status.

Education policy factors also influence the success of interventions, in the United States it was found that legislation requiring more physical activity in primary schools was able to contribute to a reduction in childhood obesity rates, although the impact was not uniform in all regions (Von Hippel & Frisvold, 2023). This suggests that policy support has an important role in strengthening the effectiveness of physical education, from the perspective of long-term interventions, the effectiveness of physical education in reducing the prevalence of obesity still needs to be studied further, for example the Lekker Fit Program in the Netherlands, designed to evaluate the long-term impact of school-based interventions, but the results of retrospective research show the need for additional research to assess the sustainability of the impact positive (Smit et al., 2021)

Systematic reviews and other meta-analyses emphasize that school-based interventions targeting physical activity, fitness, as well as sedentary behaviors all have some effectiveness in preventing obesity, but there is still debate about which interventions are most effective for primary school age groups (Podnar et al., 2021). This reinforces the need for further research to identify the best strategies. Research in middle-income countries also provides compelling evidence, research conducted by Singhal et al. (2020) confirms that school-based interventions can prevent obesity among children aged 4 to 12 years, but their effectiveness varies greatly between countries. This variation reflects the importance of considering cultural, social, and educational policy factors in designing appropriate interventions.

Most of the research emphasizes more on the combination of nutrition and physical activity, while the specific role of physical education in school curricula has not been studied in depth, and there is also little research that reviews the long-term effects of physical education interventions, so its effectiveness over a period of more than one

year is still uncertain, this study focuses on physical education as the main instrument of obesity prevention in school-age children. Basically, this study not only assesses the effectiveness of physical education on weight control, but also explores how physical education is able to shape long-term healthy living behaviors, as well as considering the role of social factors, school environment, and educational policies in determining the success of the program, the purpose of this study is to analyze the role of physical education in preventing obesity in elementary school-age children, examine the factors that affect the effectiveness of physical education in the context of obesity prevention, as well as provide a new perspective on how physical education can be integrated in a sustainable manner in school curricula to reduce the prevalence of obesity in children..

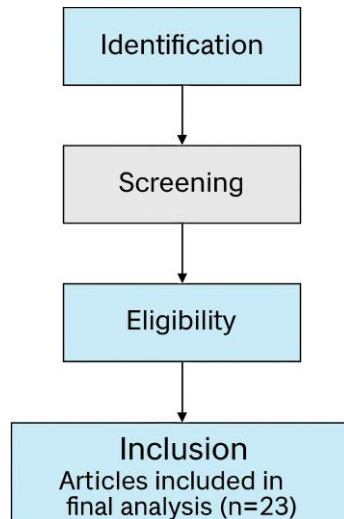
METHODOLOGY

This study uses the Systematic Literature Review (SLR) approach as the main method to examine the role of physical education in the prevention of obesity in elementary school children, SLR is relevant because it is able to present a comprehensive synthesis of previous research, identify the effectiveness of interventions, as well as find unanswered research gaps. According to Buchanan et al. (2022), systematic reviews based on school diet and physical activity interventions provide strong scientific evidence to support public health policy formulation, in line with which Denova-Gutiérrez et al. (2023) affirm that systematic reviews are essential for mapping effective obesity prevention strategies, while Hassan et al. (2024) show that school-based meta-analyses are able to compare the effectiveness of different programs in a systematic manner more objective, so that the SLR method is suitable to answer the questions of this research.

The literature search strategy was carried out on reputable national and international databases, namely PubMed, google scholar, Scopus, and Web of Science, the keywords used were "physical education", "school-based intervention", "childhood obesity prevention", and "elementary school children", the range of publication years was set between 2020–2025, taking into account global research recommendations that emphasized the importance of using current data to assess the effectiveness of programs Prevention of childhood obesity

The inclusion criteria used include: (1) articles published in peer-reviewed journals, (2) involving elementary school-age children (4–12 years old), (3) discussing school-based interventions, particularly physical education, in the context of obesity prevention, and (4) using quantitative, qualitative, systematic review, or meta-analysis research designs, while articles that do not focus on primary school, do not involve physical education, or do not present empirical data excluded from the study (Podnar et al., 2021; Yuksel et al., 2020)

The selection of articles is carried out in several stages: identification, screening, full review, and determination of the final article, the identification stage begins with the screening of titles and abstracts, then the appropriate articles proceed to the full review stage to ensure eligibility, only articles that meet all the inclusion criteria are included in the final analysis, this selection process follows the flow in the SLR as described by Liu et al. (2021) and Jang et al. (2020), which emphasizes the importance of systematic procedures to maintain the credibility of the results.



The PRISMA diagram above illustrates the systematic flow in the literature review process carried out in this study, starting from the stage of article identification through a scientific database, then screening is carried out to remove duplication and assess suitability based on titles and abstracts, then eligible articles are fully reviewed at the eligibility stage, until finally 23 relevant articles are obtained and meet the inclusion criteria for further analysis. This diagram confirms that this research was conducted in a transparent and structured manner according to PRISMA reporting standards, so that the results obtained have a strong methodological basis..

RESULTS AND DISCUSSION

This study found that physical education is a fundamental factor that affects the success of obesity prevention in elementary school-age children, from the results of the review of 23 selected articles, the majority of the research emphasizes that physical education not only improves physical health through weight control, but also forms long-term healthy living habits. These results support research by Buchanan et al. (2022) which confirms that school-based interventions that combine physical activity and healthy eating provide more effective results in reducing the prevalence of childhood obesity than a single intervention, this study is also in line with the systematic review of Denova-Gutiérrez et al. (2023) which emphasizes the importance of integrating physical education in school curricula to achieve more consistent prevention impacts and sustainable.

The results of further analysis show that there are differences in the effectiveness of physical education programs depending on the design, duration, and consistency of implementation, this study found that physical education programs that are carried out intensively every day in elementary schools tend to be more effective in reducing the prevalence of childhood obesity than programs that are only carried out once or twice a week, the results of this study support the study of Bednar and Rouse (2020) which stated that increasing physical education hours not only contributes to weight control, but also increases children's human capital, including social skills and academic achievement.

Effectiveness of Formal Physical Education

This study found that formal physical education is the most consistent variable that affects the reduction of the prevalence of obesity in elementary school children, the results of this study show that the implementation of structured physical education, with

sufficient frequency and duration, is able to reduce the body mass index while improving children's physical fitness. These findings support research by Greier et al. (2020) which affirms that daily physical education has a positive effect on the physical fitness of primary school children and reduces the risk of obesity. This result is also in line with the research of Bednar and Rouse (2020) which shows that physical education not only affects health indicators, but also has a long-term effect on children's academic achievement, so this analysis strengthens the conclusion that formal physical education is a very influential variable in the prevention of obesity in elementary school children.

However, the study also found that the effectiveness of physical education was strongly influenced by the quality of implementation, programs that were less intensive, poorly planned, or unattractive to students tended to produce smaller impacts. These results support the research by Jang et al. (2020) who affirm that the success of physical education is highly dependent on the sustainability of the program and adequate policy support from the government and schools, based on this study shows that physical education is the main variable, but its effectiveness is also greatly influenced by supporting factors such as program quality and policy support.

Integration of Physical Education with Nutrition

This study found that physical education will be more effective if integrated with nutritional interventions, the results of this study show that multifaceted interventions that combine physical activity with nutrition education are more consistent in reducing the prevalence of childhood obesity than a single intervention. These results support research by Buchanan et al. (2022) which confirms that the combination of nutritional interventions and physical activity provides better results in lowering childhood obesity, these findings are also in line with the systematic review of Denova-Gutiérrez et al. (2023) which showed that a multifaceted approach produces more sustainable impacts.

This study also found that a single nutrition education program tends to be less effective when it is not accompanied by physical activity, this result supports research by Kenney et al. (2024) who assessed that nutrition education programs alone are not cost-effective because changes in children's eating behavior are difficult to achieve without physical activity. Based on the findings of the analysis, it was found that integrating physical education with nutrition programs had a stronger influence on reducing obesity in children, while the implementation of nutrition programs alone showed a relatively lower level of influence.

Child Awareness and Behavior Change

This study found that increasing children's awareness of obesity and a healthy lifestyle is an important variable that affects the effectiveness of physical education programs, the results of this study show that children who have a higher awareness of the dangers of obesity tend to be more disciplined in participating in physical education programs and more motivated to adopt healthy behaviors. These findings support research by Aktaş and Özçelik (2023) which proves that awareness-raising interventions in primary schools are able to change children's perceptions of obesity. These results are also in line with the research of Jakobovich et al. (2023) which affirms that interventions from an early age, even from kindergarten, can shape long-term healthy behaviors.

However, the study also found that increased awareness alone is not enough to reduce obesity rates if not followed by physical activity, this result supports the research of Kenney et al. (2024) who stated that limited interventions without physical education

tend to fail to have a significant impact. So this study concludes that children's awareness is a very influential variable when combined with physical education, but less influential when standing alone.

Socio-Economic Factors and Disparity in Outcomes

This study found that socio-economic status is a variable that affects the effectiveness of physical education inconsistently, the results of this study show that children from families with low socio-economic status tend to have lower levels of physical activity and less healthy diets, so that the results of physical education interventions are uneven. These findings support the research of Martinovic et al. (2021) which states that socio-economic background affects children's nutritional status and activity level, the analysis of this study shows that socio-economic status is a moderation variable that can strengthen or weaken the impact of physical education.

The results of this study also found that access to sports facilities and family support also influenced the success of the intervention, children from middle-to-upper families tended to have better access to additional exercise, healthy food, and parental motivation, making it easier to obtain positive outcomes from physical education, while children from resource-constrained families faced barriers that made interventions less optimal. Therefore, this study concludes that socio-economic variables have an inconsistent influence on the effectiveness of physical education.

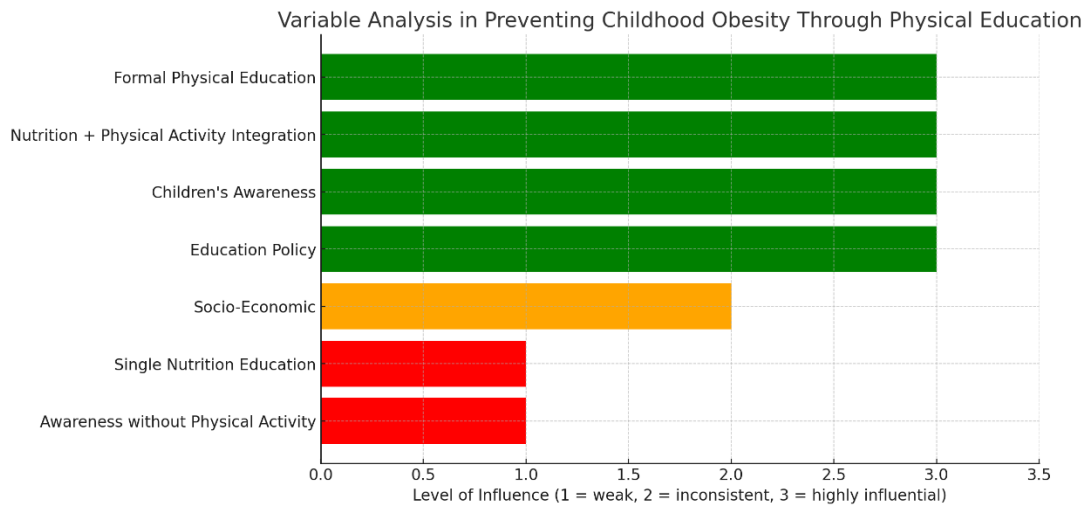
Education Policy and School Environment

This study found that education policies and school environmental support are variables that greatly determine the success of physical education interventions. The results of this study support the research by Jang et al. (2020) which found that multi-year policies in the United States contribute significantly to reducing the rate of childhood obesity through increasing physical education hours, this study is also in line with Koletzko et al. (2020) who affirm the importance of global standards in the prevention of childhood obesity, one of which is through the obligation of physical education in elementary schools.

The analysis of this study confirms that education policy is a very influential variable because without policy support, physical education programs are difficult to implement consistently, this study found that schools with strong policy support are more successful in reducing the prevalence of childhood obesity than schools with weak policies, so that education policy is an external variable that can strengthen or weaken the impact of physical education to the prevention of obesity.

Grouping of High-Impact Variables and Variables That Show Inconsistency

This study found that the variables that were highly influential in the prevention of childhood obesity through physical education were formal physical education, integration with nutrition programs, child awareness, and education policy support. The results of this study support a meta-analysis by Hassan et al. (2024) who assert that school-based obesity programs with structured physical education are more effective than community-based interventions or nutrition education alone, and also this study found that variables with inconsistent effects include socio-economic status, single nutrition education, and awareness without physical activity. These results support research by Kenney et al. (2024) as well as Aktaş and Özçelik (2023) which stated that limited interventions without physical education tend to fail to significantly reduce obesity rates.



The graph shows that the variables of formal physical education, integration of nutrition with physical activity, child awareness, and education policy are very influential factors, characterized by the highest position in the visual category, while socio-economic factors show inconsistent influences because the results differ between groups of children, while single nutrition education and awareness without physical activity appear to have less effect

CONCLUSION

This study found that physical education is the main factor in preventing obesity in elementary school children, formal physical education that is carried out regularly and with quality has been proven to be effective in reducing the prevalence of obesity while improving children's physical fitness. Its effectiveness is stronger when integrated with nutrition education and children's awareness improvement programs, while socio-economic factors show inconsistent influences. Single nutrition education and awareness without physical activity are considered less influential, so it cannot be used as the main strategy, education policy support and the school environment are proven to be very influential in ensuring the success of the program, the results of this study confirm that the prevention of childhood obesity must be based on a holistic approach, physical education is the main pillar strengthened by nutrition, awareness, and education policy factors.

The implication of this research is the need for primary schools and policymakers to make physical education the foundation of the curriculum, strengthen it by providing healthy food, as well as programs to increase children's awareness about healthy lifestyles, the government needs to ensure that there are sustainable policies that support minimum physical education hours according to health standards, while teachers can develop interesting physical learning methods so that children are motivated actively, For

further research, it is recommended that there be longitudinal studies that assess the long-term impact of physical education, as well as cross-border comparative research to understand the influence of different cultural and policy factors on the effectiveness of childhood obesity prevention programs.

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