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The effectiveness of sports programs in improving adolescent health outcomes (a review study)

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Abstract

Background and goal: sports programs offer numerous benefits for adolescent health outcomes and can play a valuable role in promoting overall well-being and healthy development in this age group. Therefore, the aim of the present study was the effect effectiveness of sports programs in improving adolescent health outcomes
Method: A review was conducted using Google Scholar, Scopus, Pub Med, Web of Science, and EBSCO databases to search for articles in English from 2018 to 2024 on the effectiveness of exercise programs in improving adolescent health outcomes. Key words such as physical activity, school health, sports programs and adolescent health improvement were used to extract related articles.
Findings: Exercise has numerous benefits for children and adolescents, improving body composition, cardiopulmonary function, blood pressure, and muscle health. These interventions enhance overall health-related quality of life by impacting physical, mental, and social well-being. Youth sports participation and physical activity outcomes in rural communities vary based on factors like age, gender, and family income. School-based physical activity programs can help bridge these gaps, though their effectiveness may differ. Aerobic and resistance exercises are particularly effective for obese children, improving body composition, metabolic profiles, and inflammatory status. Implementing physical activity interventions in schools can also reduce anxiety, boost resilience, enhance well-being, and support positive mental health in young people.
Conclusion: indicated that the inclusion of sports in the life of teenagers can have a significant effect on their health and well-being. Sports programs provide tremendous benefits for this age group by increasing physical fitness, mental well-being and overall quality of life.

Keywords: school health, physical activity, sports programs, adolescent health improvement

Introduction

Adolescence is a crucial stage in life where individuals undergo significant physical, emotional, and cognitive development as they transition from childhood to adulthood. It is a period marked by changes in hormone levels, brain structure, and social relationships. Recent studies have shown that adolescence extends beyond the traditional definition of ages 10 to 19, and now includes young adults up to age 24. This extended period of adolescence reflects the complexity of the transition from youth to full maturity, and emphasizes the importance of providing support and resources to individuals during this crucial stage of development (1, 2).

Adolescence is a critical stage in human development, marked by rapid physical, cognitive, and emotional changes. During this period, many individuals establish lifestyle habits that can have a lasting impact on their overall health and well-being. Regular physical activity is one such habit that has been shown to be crucial for promoting optimal health outcomes in adolescents (3). Exercise is essential for adolescents as it not only improves physical health but also has a profound impact on mental well-being. Engaging in regular physical activity can help reduce feelings of anxiety and depression, boost self-confidence, and enhance mood. By incorporating exercise into their daily routine, adolescents can experience improved overall well-being and a greater sense of vitality. The benefits of exercise extend beyond the physical, promoting mental and emotional health in young individuals (4, 5). Given the importance of physical activity for adolescent health, many schools, community organizations, and healthcare providers have implemented exercise programs specifically designed for this age group. These programs aim to promote physical fitness, educate adolescents about the importance of regular exercise, and instill healthy lifestyle habits that can be maintained throughout their lives (6). The impact of exercise programs on adolescent health remains a topic of ongoing research, with much yet to be understood about their effectiveness in promoting positive health outcomes. While the benefits of physical activity for adolescents are widely acknowledged, there is still a need to further investigate which specific components of exercise programs are most effective in improving the overall health of this age group (7, 8). In this article, we will explore the current research on the effectiveness of exercise programs in improving adolescent health outcomes. We will examine the impact of different types of exercise programs on physical fitness, mental health, and overall well-being in adolescents, and discuss the implications of these findings for

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policymakers, healthcare providers, and educators. By gaining a better understanding of how exercise programs can benefit adolescent health, we can work towards developing more effective interventions that promote a lifetime of health and wellness for this important population.

Materials And Methods

The present study was a review type. Google Scholar, Scopus, Pub Med, Web of Science and EBSCO database were used to search for articles in English from 2018 to 2024. Articles were extracted using the keywords of physical activity, school health, sports programs, and adolescent health improvement. Inclusion and exclusion criteria included factors such as effectiveness of exercise programs in improving adolescent health outcomes, availability of full-text studies, exclusion of articles older than 2018, exclusion of articles read for adults. At the end, 64 article titles were searched based on the keywords used, and after reviewing the articles according to the entry and exit criteria and removing duplicate articles, 15 relevant quality articles were found. and analyzed. In addition, Figure 1 shows the process of selecting articles for the present research.

Figure 1- The process of selecting articles.

Results

The findings indicated that exercise has a significant positive effect on body composition, cardiopulmonary function, blood pressure and muscle health in children and adolescents. This type of intervention can improve overall health-related quality of life (HRQoL) by affecting physical, mental, and social health outcomes. However, there are differences in rural communities regarding youth sports participation and physical activity outcomes, which are influenced by factors such as age, gender, and family income. School-based physical activity interventions can help address these disparities, but the effectiveness of such programs may vary. A combination of aerobic and resistance exercise is particularly beneficial for obese children, leading to improved body composition, metabolic profiles, and inflammatory status. Overall, implementing physical activity interventions in schools can reduce anxiety, increase resilience, improve well-being, and promote positive mental health in children and adolescents. It is important for school staff and public health professionals to carefully consider the implementation of these interventions to ensure optimal outcomes.

Table 1. The effectiveness of sports programs in improving adolescent health outcomes

names	year of publication and journal	Structure of the study	The variable under consideration	Conclusion
Zhou et al. (9)	2024 researchsquare	This study employed a systematic search strategy across four online databases (PubMed, Scopus, EBSCO, and Web of Science). Intervention studies that met the inclusion criteria underwent a thorough screening process, and their methodological quality was assessed utilizing the PEDro scale.	Effects of different types of exercise	findings indicate that high-intensity exercise training exerts significant positive effects on body composition, cardiopulmonary function, blood pressure, and muscle health in children and adolescents. Therefore, we suggest that schools should focus on high-intensity sports in their physical education curriculum, which can further improve the students' physical fitness and health.
Santos et al. (10)	2023 American Journal of Health Promotion	The electronic databases considered in this systematic review were PubMed, Scopus, and Web of Science	Health Interventions	Most interventions employed a school's multidisciplinary/multi-component approach to promoting physical

		were searched for relevant records on the 30th of April 2021. The following terms were searched in the title: "physical activity" OR sport* OR exercise OR fitness OR sedentary OR "motor skill* AND school AND intervention* OR program* OR protocol* OR RCT OR "randomized controlled trial" OR experimental AND health*.		activity, nutrition, and general education for healthier lifestyle behaviours. The impact of school-based interventions involving families on youth's physical activity levels is still a relatively emerging theme. Further research is needed given the diversity of the intervention's characteristics and the disparity in the results' efficacy.
Bermejo-Cantarero et al. (11)	2023 Sports health	Random-effects models were used to calculate pooled effect size (ES) for total HRQoL score and its dimensions. Subgroup analyses were conducted to examine the effect of PA program characteristics.	Physical Activity Interventions	Exercise interventions are an effective strategy for improving overall HRQoL and its most significant domains in children and adolescents.
Ramires et al. (12)	2023 Journal of Physical Activity and Health	We performed a scoping review with searches in 8 databases and institutional websites to find systematic reviews or meta-analyses that answered this review's research question. Data charting form included the identification of the study, health outcomes, and PE classes' strategies (policies and environment, curriculum, appropriate instructions, and evaluation). An interactive process was performed to build the evidence summary	Physical Education	These elements were detailed in the evidence summary, which may be considered to guide researchers, teachers, and practitioners to define research and practice priorities on PE class interventions for health in the school context.
Kemel et al. (13)	2022 Health Promotion Journal of Australia	Main databases were searched using MeSH terms for the population of interest (young adult, adolescent), intervention (physical activity) and outcome (wellbeing). Upon screening papers of eligibility, quality appraisal was completed through the	physical activity	This review supports the encouragement of adolescent and young adult physical activity, noting the improvements seen across the physical, mental and social wellbeing outcomes. Future research is still required to further understand the benefits

		Critical Appraisals Skills Programme (CASP).		of lower intensity exercise within the adolescent and young adult population.
Kellstedt et al. (14)	2021 Archives of public health	Children (n = 418 3rd–6th graders) living in two rural communities completed the online Youth Activity Profile as part of Wellscapes, a type 3 hybrid implementation-effectiveness community randomized trial. Mixed models with community as a random effect examined main effects and interactions of grade, sex, and family income on youth sport participation and these factors and youth sport participation on moderate-to-vigorous physical activity.	Youth sport participation and physical activity	While a fairly high percentage of children participate in youth sports, there are disparities in rural communities on youth sport participation and physical activity outcomes based on age, sex, and family income.
Neil-Sztramko et al. (15)	2021 Cochrane Database of Systematic Reviews	We searched CENTRAL, MEDLINE, Embase, CINAHL, PsycINFO, BIOSIS, SPORTDiscus, and Sociological Abstracts to 1 June 2020, without language restrictions. We screened reference lists of included articles and relevant systematic reviews. We contacted primary authors of studies to ask for additional information.	physical activity	Given the variability of results and the overall small effects, school staff and public health professionals must give the matter considerable thought before implementing school-based physical activity interventions. Given the heterogeneity of effects, the risk of bias, and findings that the magnitude of effect is generally small, results should be interpreted cautiously.
Wynters et al. (16)	2021 Psychology of Sport and Exercise	Thirty-three adolescent males (12–15 years old) who had recently participated in Help Out a Mate took part in six focus groups. Inductive thematic analysis was used to analyse focus group data, and a number of strategies were employed to enhance the trustworthiness of this account, including peer debrief, grounding in examples, and	sports	These findings identify important insights into adolescent males' perspectives of the effectiveness and importance of Help Out A Mate as a sports-based mental health literacy intervention, and suggest a number of strategies for improving participation and engagement.

		prolonged engagement.		
Andermo et al. (17)	2020 Sports medicine-open	Scientific articles published between January 2009 and October 2019 fulfilling the following criteria were included: general populations of children and adolescents between age 4 and 19, all types of school-related efforts to promote physical activity or reduce sedentary behaviour. Study selection, data extraction and quality assessment were done by at least two authors independently of each other. Data were analysed with a random effects meta-analysis and by narrative moderator analyses.	physical activity	School-related physical activity interventions may reduce anxiety, increase resilience, improve well-being and increase positive mental health in children and adolescents. Considering the positive effects of physical activity on health in general, these findings may reinforce school-based initiatives to increase physical activity. However, the studies show considerable heterogeneity. The results should therefore be interpreted with caution.
García-Hermoso et al. (18)	2020 JAMA pediatrics	For this systematic review and meta-analysis, studies were identified through a systematic search of Ovid MEDLINE, Embase, Cochrane Controlled Trials Registry, and SPORTDiscus databases (from inception to October 10, 2019) with the keywords physical education OR PE OR P.E. AND fitness AND motor ability OR skills. Manual examination of references in selected articles was also performed.	Physical Fitness	The findings suggest that quality-based PE interventions are associated with small increases in both student health-related physical fitness components and FMSs regardless of frequency or duration of PE lessons. Because PE aims to improve more than health, high levels of active learning time may need to be balanced with opportunities for instruction, feedback, and reflection.
Dong et al. (19)	2020 Journal of Adolescent Health	Global and domestic policies and strategies relating to adolescent health were reviewed. Data from the Global Burden of Disease Study (1990–2016) and the Chinese National Survey on Students' Constitution and Health (1985–2014) were used to analyze time trends	Health	Many long-standing health problems of adolescents have improved, but new problems related to noncommunicable disease risks have emerged and should be a prominent focus for policy action under HC2030.

		and geographical distributions of health indicators for adolescents aged 10–19 years in China.		
Whitley et al. (20)	2019 BMC public health	A comprehensive search of databases, peer-reviewed journals, published reviews, and both published and unpublished documents yielded 10,077 distinct records. Title and abstract screening, followed by full-text screening using 6 criteria, resulted in 56 distinct studies (coalescing into 10 sport-based youth development intervention types) included in the synthesis. These studies were then independently assessed and critically appraised.	Sport-based youth development interventions	The evidence base does not yet warrant wide-scale implementation of sport-based youth development interventions for public health goals within the U. S., although there is promising research that identifies areas for further exploration.
García-Hermoso et al. (21)	2018 British journal of sports medicine	Data sources Computerised search of 3 databases (MEDLINE, EMBASE, and Cochrane Controlled Trials Registry).	Concurrent aerobic plus resistance exercise	Summary Concurrent aerobic plus resistance exercise improves body composition, metabolic profiles, and inflammatory state in the obese paediatric population.
Smith et al. (22)	2018 Mental Health and Physical Activity	Resistance Training for Teens was evaluated using a cluster RCT in 16 schools located in New South Wales, Australia. Adolescents (N = 508; 14.1 ± 0.5 years; 49.6% female) completed measures of global self-esteem, subjective well-being, and hypothesized mediators (i.e., perceived fitness, resistance training self-efficacy, and autonomous motivation) at baseline (April–June, 2015) and post-intervention (October–December). The school-based physical activity program was delivered	Intervention and mediators of well-being	Overall, Resistance Training for Teens did not improve adolescents' self-esteem or subjective well-being. However, our mediation findings lend support to resistance training self-efficacy as a mechanism explaining the positive effect of resistance training on self-esteem.

		by teachers over 10-weeks via Physical Education, co-curricular school sport, or an elective subject known as Physical Activity and Sport Studies, and involved once-weekly fitness sessions and additional lunch-time sessions.		
Marker et al. (23)	2018 Health Psychology	A systematic review of PubMed, PsycINFO, and ProQuest identified 33 studies of physical activity and HRQOL in youth, including descriptive and prepost intervention designs	Physical activity	Findings supported the primary hypothesis that physical activity was related to better HRQOL in youth, although the magnitude of these effects did not represent a minimal clinically important difference (MCID) in most studies.

Discussion

The aim of the present study The effectiveness of sports programs in improving adolescent health outcomes. In this paper, we have explored the efficacy of exercise programs in enhancing the health outcomes of adolescents. The research indicates that engaging in regular physical activity can lead to improvements in both physical and mental health among young individuals. From boosting physical fitness levels to enhancing mood and reducing stress, exercise has been shown to have a multitude of benefits for adolescent well-being.

Regular physical activity has been found to enhance the physical fitness of adolescents, resulting in improved cardiovascular health, increased muscle strength, and greater flexibility. This has been consistently supported by research studies that have demonstrated a positive correlation between engaging in exercise routines and experiencing enhancements in fitness levels among adolescents (24, 25). Furthermore, engaging in physical activity has been proven to boost mental health in teenagers. Studies have shown that regular exercise can help alleviate symptoms of depression and anxiety, elevate mood, and promote a sense of overall mental wellness. This is particularly significant in light of the high rates of mental health challenges facing adolescents in today's society (26). In addition, exercise programs play a crucial role in preventing and managing chronic diseases like obesity and diabetes among adolescents. By advocating for a balanced lifestyle and fostering consistent physical activity, these programs can mitigate the likelihood of developing such conditions and enhance general health and well-being (27, 28). However, it is important to note that the effectiveness of exercise programs in improving adolescent health outcomes may vary depending on various factors, such as the type and intensity of the exercise, the duration of the program, and individual differences in health status and motivation. Additionally, barriers such as lack of access to facilities, time constraints, and social stigma may also affect the effectiveness of exercise programs in this population. exercise programs have the potential to play a significant role in improving adolescent health outcomes. By promoting physical activity, schools, communities, and healthcare providers can help adolescents build healthy habits that can last a lifetime. It is important to recognize the multiple benefits of exercise programs for physical, academic, social, and emotional well-being, and to work towards removing barriers to participation in physical activity. With a coordinated effort, we can help adolescents lead healthier and more fulfilling lives (29).

Conclusion

The results indicated that the inclusion of sports in the life of teenagers can have a significant effect on their health and well-being. Sports programs provide tremendous benefits for this age group by increasing physical fitness, mental well-being and overall quality of life. While more research is needed to determine the most effective ways to introduce and maintain physical activity among adolescents, it is clear that encouraging regular exercise is important to promote a healthy lifestyle and reduce the risk of future health problems.

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References

1. Desch J, Bakour C, Mansuri F, Tran D, Schwartz S. The association between adverse childhood experiences and insomnia symptoms from adolescence to adulthood: Evidence from the Add Health study. Sleep Health. 2023;9(5):646-53.
2. Sawyer SM, Azzopardi PS, Wickremarathne D, Patton GC. The age of adolescence. Lancet Child Adolesc Health. 2018;2(3):223-8.
3. Nota MH, Nicolas S, O'Leary OF, Nolan YM. Outrunning a bad diet: interactions between exercise and a Western-style diet for adolescent mental health, metabolism and microbes. Neuroscience & Biobehavioral Reviews. 2023:105147.
4. Kramer A. An Overview of the Beneficial Effects of Exercise on Health and Performance. Adv Exp Med Biol. 2020;1228:3-22.
5. Sun Y-L, Wang J, Yao J-X, Ji C-S, Dai Q, Jin Y-H. Physical exercise and mental health: cognition, anxiety, depression and self-concept. Sheng li ke xue jin zhan [Progress in physiology]. 2014;45(5):337-42.
6. Hansen K, Tierney S. Every child with congenital heart disease should be exercising. Curr Opin Cardiol. 2022;37(1):91-8.
7. Kemel PN, Porter JE, Coombs N. The benefit and limitations of an online physical activity program in response to the COVID-19 pandemic: A quantitative analysis of the virtual Latrobe Streetgames program. Health Promot J Austr. 2023.
8. Selamet Tierney ES. The benefit of exercise in children with congenital heart disease. Curr Opin Pediatr. 2020;32(5):626-32.
9. Zhou X, Li J, Jiang X. Effects of different types of exercise intensity on improving physical health in children and adolescents: A systematic review. 2024.
10. Santos F, Sousa H, Gouveia ER, Lopes H, Peralta M, Martins J, et al. School-based family-oriented health interventions to promote physical activity in children and adolescents: a systematic review. American Journal of Health Promotion. 2023;37(2):243-62.
11. Bermejo-Cantarero A, Sánchez-López M, Álvarez-Bueno C, Redondo-Tébar A, García-Hermoso A, Martínez-Vizcaino V. Are physical activity interventions effective in improving health-related quality of life in children and adolescents? A systematic review and meta-analysis. Sports health. 2023:19417381231190885.
12. Ramires VV, Dos Santos PC, Barbosa Filho VC, da Silva Bandeira A, Tenório MCM, de Camargo EM, et al. Physical education for health among school-aged children and adolescents: a scoping review of reviews. Journal of Physical Activity and Health. 2023;20(7):586-99.
13. Kemel PN, Porter JE, Coombs N. Improving youth physical, mental and social health through physical activity: a systematic literature review. Health Promotion Journal of Australia. 2022;33(3):590-601.
14. Kellstedt DK, Schenkelberg MA, Von Seggern MJ, Rosenkranz RR, Welk GJ, High R, Dzewaltowski DA. Youth sport participation and physical activity in rural communities. Archives of public health. 2021;79:1-8.
15. Neil-Sztramko SE, Caldwell H, Dobbins M. School-based physical activity programs for promoting physical activity and fitness in children and adolescents aged 6 to 18. Cochrane database of systematic reviews. 2021(9).
16. Wynters R, Liddle SK, Swann C, Schweickle MJ, Vella SA. Qualitative evaluation of a sports-based mental health literacy program for adolescent males. Psychology of Sport and Exercise. 2021;56:101989.
17. Andermo S, Hallgren M, Nguyen T-T-D, Jonsson S, Petersen S, Friberg M, et al. School-related physical activity interventions and mental health among children: a systematic review and meta-analysis. Sports medicine-open. 2020;6:1-27.
18. García-Hermoso A, Alonso-Martínez AM, Ramírez-Vélez R, Pérez-Sousa MÁ, Ramírez-Campillo R, Izquierdo M. Association of physical education with improvement of health-related physical fitness outcomes and fundamental motor skills among youths: a systematic review and meta-analysis. JAMA pediatrics. 2020;174(6):e200223-e.
19. Dong B, Zou Z, Song Y, Hu P, Luo D, Wen B, et al. Adolescent health and healthy China 2030: a review. Journal of Adolescent Health. 2020;67(5):S24-S31.
20. Whitley MA, Massey WV, Camiré M, Boutet M, Borbee A. Sport-based youth development interventions in the United States: A systematic review. BMC public health. 2019;19:1-20.

21. García-Hermoso A, Ramírez-Vélez R, Ramírez-Campillo R, Peterson MD, Martínez-Vizcaíno V. Concurrent aerobic plus resistance exercise versus aerobic exercise alone to improve health outcomes in paediatric obesity: a systematic review and meta-analysis. British journal of sports medicine. 2018;52(3):161-6.
22. Smith JJ, Beauchamp MR, Faulkner G, Morgan PJ, Kennedy SG, Lubans DR. Intervention effects and mediators of well-being in a school-based physical activity program for adolescents: The 'Resistance Training for Teens' cluster RCT. Mental Health and Physical Activity. 2018;15:88-94.
23. Marker AM, Steele RG, Noser AE. Physical activity and health-related quality of life in children and adolescents: A systematic review and meta-analysis. Health Psychology. 2018;37(10):893.
24. Barbieri E, Agostini D, Polidori E, Potenza L, Guescini M, Lucertini F, et al. The pleiotropic effect of physical exercise on mitochondrial dynamics in aging skeletal muscle. Oxid Med Cell Longev. 2015;2015:917085.
25. Chen L, Wang S, Xu JC. Survey on Physical Fitness and Cardiovascular Function of the City Elderly in Different Regular Physical Activities in China. J Nutr Health Aging. 2018;22(9):1107-11.
26. Hu S, Li X, Yang L. Effects of physical activity in child and adolescent depression and anxiety: role of inflammatory cytokines and stress-related peptide hormones. Front Neurosci. 2023;17:1234409.
27. Paley CA, Johnson MI. Physical Activity to Reduce Systemic Inflammation Associated With Chronic Pain and Obesity: A Narrative Review. Clin J Pain. 2016;32(4):365-70.
28. Ponticelli C, Favi E. Physical Inactivity: A Modifiable Risk Factor for Morbidity and Mortality in Kidney Transplantation. J Pers Med. 2021;11(9).
29. Banspach S, Zaza S, Dittus P, Michael S, Brindis CD, Thorpe P. CDC Grand Rounds: Adolescence - Preparing for Lifelong Health and Wellness. MMWR Morb Mortal Wkly Rep. 2016;65(30):759-62.