



Plyometric Exercises as intervention on Metabolic Health, Motor, Performance and Postural Control in Obese Children and Adolescents

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(Received: 25 October 2025 Revised: 27 November 2025 Accepted: 16 December 2025)

KEYWORDS

plyometric exercise, childhood obesity, postural control, foot posture, metabolic health, cardiovascular function, and motor performance

ABSTRACT:

Background:

Childhood obesity is a growing global concern, linked to reduced physical fitness, poor postural control and metabolic abnormalities. Engaging in physical activity combined with dietary modifications has been proven effective in managing obesity. Among various exercise interventions, plyometric training has shown promise in improving these parameters. However, its full impact on childhood obesity and overall physical function remains underexplored.

Objective: to explore effects of plyometric exercise on metabolic health, motor performance and Postural Control in Obese Children and Adolescents

Methods: A literature review of randomized controlled trials (RCTs) and experimental studies published from 2014 was conducted to examine the effects of plyometric exercise on obese children and adolescents. Using keywords such as plyometric exercise, childhood obesity, postural control, foot posture, metabolic health, cardiovascular function, and motor performance, seven studies were selected based on the inclusion of overweight and obese participants aged 7–16 years. Interventions involved plyometric training alone or combined with other exercise modalities, with outcomes assessing postural control, metabolic health, cardiovascular function, motor performance, and inflammatory responses. Data extraction included sample size, intervention duration, exercise protocols, and key findings.

Results:

Plyometric exercises offer significant health benefits for obese children and adolescents across multiple domains. It reduces BMI, enhances postural stability, functional mobility, and foot posture in children with flexible flatfeet. Additionally, plyometric training leads to greater reductions in plasma glucose, insulin resistance, and the leptin/adiponectin ratio, along with significant decreases in blood pressure, resting heart rate, and skinfold thickness. Improvements in muscle strength, flexibility, endurance, agility, and motor coordination have also been observed in overweight boys. These findings highlight the role of plyometric exercises in enhancing musculoskeletal, metabolic, cardiovascular, and motor health in obese children.



1. Introduction

Childhood obesity is a growing public health concern worldwide, with rising prevalence across both developed and developing nations. (1) India, as a rapidly expanding economy, has witnessed significant lifestyle shifts due to economic growth, urbanization, and technological advancements.

One of the key contributors to this issue is the increase in disposable income among families, which has led to greater access to processed and packaged foods. (2,3) These foods, often high in refined sugars, unhealthy fats, and preservatives, have replaced traditional, home-cooked meals. The easy availability of fast food, coupled with aggressive marketing targeted at children, has further exacerbated the problem. (4)

Additionally, technological advancements have significantly altered children's daily activities. The widespread use of smartphones, tablets, gaming consoles, and other electronic devices has led to a more sedentary lifestyle. (5) Many children now prefer screen-based entertainment over outdoor play, reducing their physical activity levels. With the rise of online education and social media engagement, the time spent indoors has increased considerably, limiting opportunities for active play and exercise. (6)

The combination of poor dietary habits, reduced physical activity, and increased screen time has resulted in an alarming rise in childhood obesity. (7) This condition not only affects a child's physical health, leading to risks of diabetes, cardiovascular diseases, and musculoskeletal problems, but also impacts mental well-being, increasing the likelihood of anxiety, depression, and low self-esteem. (8) Traditional weight loss strategies often emphasize on decreasing intake calories. Recent researches are indicating cooperation of physical activities along with dietary to be an effective strategy to enhance functional mobility, postural control, and metabolic efficiency in obese children. (9) Plyometric exercises, characterized by explosive, high-intensity movements, have been shown to improve muscle strength, balance, and neuromuscular coordination. (10) However, their role in postural stability, metabolic regulation, and cardiovascular function in overweight and obese children remains underexplored. This study reviews existing literature on the effects of plyometric

exercises in obese children, focusing on postural control, metabolic health, and motor performance.

2. Objectives

to explore effects of plyometric exercise on metabolic health, motor performance and Postural Control in Obese Children and Adolescents

3. Methods

Data survey and selection:

This scoping review was conducted in accordance with the PRISMA guidelines and checklist. A comprehensive literature search was performed using Google Scholar, PubMed, and ResearchGate to identify relevant studies published between 2014 and 2024. Studies were included based on the following criteria:

Inclusion Criteria

1. Language: Published in English.
2. Participants: Overweight and obese children and adolescents aged 7–16 years.
3. Interventions: Plyometric training alone or in combination with other exercise modalities.
4. Outcomes: Postural control, metabolic health, cardiovascular function, motor performance, and inflammatory responses.

Keywords such as plyometric exercise, childhood obesity, postural control, foot posture, metabolic health, cardiovascular function, and motor performance were used for the search.

A total of 328 articles were initially identified. After removing duplicates and excluding studies that involved adult participants or had irrelevant outcome measures, only 7 studies met the inclusion criteria and were selected for final review.

Data Extraction

The selected studies primarily consisted of randomized controlled trials (RCTs) and experimental studies assessing the impact of plyometric exercise on obese children and adolescents. Extracted data included: Sample size, Intervention, duration, exercise protocol and key findings

4. Results



Plyometric exercises have demonstrated significant benefits across various health domains in obese children and adolescents. Plyometric training improved postural stability, functional mobility, and foot posture in children with flexible flatfeet. (11,12) Combining plyometric exercises with high-intensity interval training (P+HIIT) led to greater reductions in plasma glucose, insulin resistance, and leptin/adiponectin ratio compared to HIIT alone, enhancing metabolic health. Significant reductions in blood pressure, resting heart rate, and skinfold thickness following a 12-week plyometric intervention, highlighting its positive impact on cardiovascular function. (13,14) Plyometrics has demonstrated improvements in muscle strength, flexibility, endurance, agility, and motor coordination in overweight boys after plyometric training. These findings collectively support the role of plyometric exercises in improving musculoskeletal, metabolic, cardiovascular, and motor health in obese children. (15,16,17)

5. Conclusion:

The results of this review suggest that plyometric exercise is a highly effective intervention for improving postural control, metabolic health, cardiovascular function, and motor performance in obese children and adolescents. The significant improvements in foot posture and balance suggest that plyometric training can be integrated into rehabilitation programs for children with flexible flatfeet. Additionally, its role in reducing insulin resistance and cardiovascular risk factors highlights its potential in obesity management.

While these findings are promising, certain limitations exist. Most studies focused on short-term interventions (8–12 weeks), and there is limited research on the long-term effects of plyometric training. Additionally, variations in training protocols and exercise intensities make direct comparisons challenging. Future research should explore:

- The long-term impact of plyometric exercise on metabolic and cardiovascular health.
- Optimal training frequency and intensity for obese children.
- The combination of plyometric exercises with other training modalities.

References

1. Childhood obesity: trends and potential causes. Anderson PM, Butcher KE. *Future Child*. 2006; 16:19–45. doi: 10.1353/foc.2006.0001
2. Childhood obesity: causes and consequences. Sahoo K, Sahoo B, Choudhury AK, Sofi NY, Kumar R, Bhadoria AS. *J Family Med Prim Care*. 2015; 4:187–192. doi: 10.4103/2249-4863.154628
3. Abarca-Gómez L, Abdeen ZA, Hamid ZA, Abu-Rmeileh NM, Acosta-Cazares B, Acuin C, Adams RJ, Aekplakorn W, Afsana K, Aguilar-Salinas CA, Agyemang C. Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: a pooled analysis of 2416 population-based measurement studies in 128·9 million children, adolescents, and adults. *The Lancet*. 2017 Dec 16;390(10113):2627–42.
4. Bhattacharjee, P., Mukhopadhyay, S., Joshi, P., & Singh, S. (2017). Food habits and obesity: a study in adolescents. *International Journal of Contemporary Pediatrics*, 4(2), 336–340. <https://doi.org/10.18203/2349-3291.ijcp20170526>
5. Ford C, Ward D, White M. Television viewing associated with adverse dietary outcomes in children ages 2-6. *Obes Rev*. 2012;13(12):1139–1147
6. Stiglic N, Viner RM. Effects of screentime on the health and well-being of children and adolescents: a systematic review of reviews. *BMJ Open*. (2019) 9(1):e023191. 10.1136/bmjopen-2018-023191
7. De Oliveira RG, Guedes DP. Physical activity, sedentary behavior, cardiorespiratory fitness and metabolic syndrome in adolescents: systematic review and meta-analysis of observational evidence. *PLoS One*. (2016) 11(12):e0168503. 10.1371/journal.pone.0168503
8. Smith JD, Fu E, Kobayashi MA. Prevention and Management of Childhood Obesity and Its Psychological and Health Comorbidities. *Annu Rev Clin Psychol*. 2020 May 07;16:351-378
9. Hills AP, Andersen LB, Byrne NM. Physical activity and obesity in children. *Br J Sports Med*. 2011;45(11):866-870. doi:10.1136/bjsports-2011-090199
10. Deng, N., Soh, K.G., Abdullah, B.B. *et al*. Effects of plyometric training on health-related physical fitness in untrained participants: a systematic review and meta-analysis. *Sci Rep* 14, 11272 (2024). <https://doi.org/10.1038/s41598-024-61905-7>



11. Allam, H. H., et al. (2021). Effects of Plyometric Exercises versus Flatfoot Corrective Exercises on Postural Control and Foot Posture in Obese Children with a Flexible Flatfoot. *Applied Bionics and Biomechanics*.
12. I.Asadi A. Plyometric type neuromuscular exercise is a treatment to postural control deficits of volleyball players: A case study. *Revista Andaluza de Medicina del Deporte*. 2016 Jun;9(2):75–9.
13. Racil, G., et al. (2016). Plyometric exercise combined with high-intensity interval training improves metabolic abnormalities in young obese females more than interval training alone. *Applied Physiology, Nutrition, and Metabolism*.
14. Leandro, C. G., et al. (2021). Post-exercise hypotension effects in response to plyometric training of 7- to 9-year-old boys with overweight/obesity: A randomized controlled study. *Journal of Sports Medicine and Physical Fitness*.
15. Nobre, G. G., et al. (2017). Twelve Weeks of Plyometric Training Improves Motor Performance of 7- to 9-Year-Old Boys Who Were Overweight/Obese. *Journal of Strength and Conditioning Research*.
16. Kurgan, N., et al. (2020). Cytokines, Adipokines, and Bone Markers at Rest and in Response to Plyometric Exercise in Obese vs Normal Weight Adolescent Females. *Frontiers in Endocrinology*.
17. Almeida MB, Leandro CG, Queiroz DDR, et al. Plyometric training increases gross motor coordination and associated components of physical fitness in children. *Eur J Sport Sci*. 2021;21(9):1263-1272.
doi:10.1080/17461391.2020.1838620