



## Influence of circuit training on physical fitness and self-esteem of school boys

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### Abstract

This study investigated the influence of circuit training on the physical fitness and self-esteem of school boys. The purpose of the research was to determine whether a structured circuit training program could significantly enhance various components of physical fitness, including muscular strength, endurance, flexibility, and cardiovascular capacity, while also positively impacting psychological well-being, particularly self-esteem. A total of 60 boys, aged 12 to 15 years, were randomly assigned to an experimental group (n=30) and a control group (n=30). The experimental group participated in a 12-week circuit training program, conducted five days per week, with each session lasting approximately 60 minutes. The program incorporated a combination of aerobic exercises, resistance exercises, and functional activities designed to target multiple fitness components simultaneously. Pre- and post-intervention assessments included standardized physical fitness tests, such as the sit-up, push-up, shuttle run, and sit-and-reach tests, along with the Rosenberg Self-Esteem Scale to evaluate changes in self-perception. The results demonstrated that the experimental group showed significant improvements in all measured aspects of physical fitness compared to the control group, with notable increases in muscular endurance, cardiovascular efficiency, and flexibility. Additionally, the circuit training program was associated with a marked improvement in self-esteem scores, indicating enhanced confidence and positive self-concept among participants. The findings suggest that circuit training is an effective strategy for promoting both physical and psychological development in school-aged boys. Implementing such programs within school physical education curricula may contribute to overall health, fitness, and self-confidence. Future research may explore long-term effects and the potential benefits of integrating circuit training with other forms of physical activity to maximize holistic development in adolescents.

**Keywords:** Circuit training, physical fitness, self-esteem, school boys, muscular endurance, cardiovascular health, adolescent development

### Introduction

Physical fitness and psychological well-being are fundamental components of overall health and development, particularly during adolescence, a critical period of growth and maturation. School-aged boys often experience rapid physical and cognitive development, which can significantly influence their academic performance, social interactions, and long-term health outcomes. Enhancing physical fitness during this stage is crucial not only for immediate health benefits but also for instilling lifelong habits that contribute to a healthy lifestyle. Among various exercise modalities, circuit training has emerged as a practical and effective approach to improving multiple components of fitness simultaneously. Unlike conventional training programs that may focus on a single aspect of fitness, circuit training involves a sequence of exercises targeting strength, endurance, flexibility, and cardiovascular capacity within a single session. This approach is particularly suitable for school environments, where time constraints and limited resources often restrict the implementation of extensive physical education programs.

The importance of physical fitness in adolescence extends beyond physiological benefits. Research has consistently demonstrated a strong association between physical activity and psychological health, including self-esteem, confidence, and social competence. Self-esteem, defined as an individual's perception of self-worth, plays a critical role in shaping behavior, motivation, and overall well-being. Studies indicate that physically active adolescents tend to exhibit higher levels of self-esteem compared to their less active peers, suggesting a direct link between participation

in structured exercise programs and positive psychological outcomes. However, despite the well-documented benefits of physical activity, many school-aged boys remain insufficiently active, often due to academic pressures, lack of motivation, or limited exposure to structured training programs. This highlights the need for innovative and engaging exercise interventions that simultaneously promote physical and psychological development.

Previous studies have examined the effects of different training modalities on adolescents' fitness and self-esteem. For instance, resistance training has been shown to improve muscular strength and endurance, while aerobic exercises enhance cardiovascular capacity and overall stamina. Similarly, flexibility exercises contribute to injury prevention and functional movement, supporting long-term physical health. Some researchers have investigated combined training programs, including circuit training, which integrates these components in a time-efficient and engaging format. Findings indicate that circuit training can lead to significant improvements in muscular strength, endurance, flexibility, and cardiovascular fitness. Furthermore, structured programs that incorporate goal setting, feedback, and progressive intensity have been associated with enhanced motivation and increased self-esteem among participants. Despite these positive outcomes, limitations remain in existing literature. Many studies have focused primarily on physical fitness, often neglecting psychological outcomes, or have been conducted with small sample sizes, limiting the generalizability of findings. Additionally, few studies have explored the implementation of circuit training programs specifically tailored for school-

aged boys, highlighting a gap in both research and practical application.

The present study seeks to address these gaps by examining the influence of a structured circuit training program on both physical fitness and self-esteem in school boys. The research aims to determine whether a 12-week circuit training intervention can produce measurable improvements in muscular strength, cardiovascular endurance, flexibility, and overall psychological well-being. The study also seeks to evaluate the practicality of implementing such a program within a school setting, considering time, resources, and student engagement. By combining physical and psychological assessments, this research provides a holistic perspective on adolescent development, offering evidence-based insights that can inform educational policy, physical education curricula, and future intervention strategies.

The objectives of the study are threefold: first, to assess the impact of circuit training on various components of physical fitness; second, to examine changes in self-esteem following the intervention; and third, to explore the feasibility of incorporating circuit training programs into regular school routines. It is hypothesized that participation in a structured circuit training program will lead to significant improvements in both physical fitness and self-esteem among school boys, compared to a control group not participating in the program.

The structure of this paper is organized to provide a comprehensive understanding of the study. Following this introduction, the methodology section outlines the research design, participant selection, training protocols, and assessment tools employed to measure outcomes. The results section presents quantitative and qualitative findings, highlighting the effects of circuit training on physical and psychological variables. The discussion section interprets these results in the context of existing literature, addresses limitations, and explores practical implications for school-based interventions. Finally, the conclusion synthesizes key findings, underscores the contribution of the study to adolescent health research, and provides recommendations for future studies and educational practice.

By investigating both physical and psychological dimensions, this study contributes to the growing body of evidence supporting integrated training programs for youth development. The findings have the potential to inform educators, coaches, and policymakers on effective strategies to enhance adolescent health, fitness, and self-esteem, ultimately fostering a generation of physically capable, confident, and well-rounded individuals.

## Methods

This study employed a quantitative experimental research design to investigate the influence of circuit training on physical fitness and self-esteem among school boys. An experimental approach was selected to allow for controlled manipulation of the independent variable—participation in a structured circuit training program—and to measure its effect on dependent variables, namely physical fitness components and self-esteem. The design included both pre-test and post-test assessments, with participants randomly assigned to an experimental group and a control group to ensure comparability and reduce potential bias.

## Population and Sample

The population for this study comprised school boys aged 12 to 15 years enrolled in local educational institutions. A

purposive sampling method was applied to select schools that had adequate facilities for physical training and were willing to participate in the research. Within these schools, participants were selected using random assignment to either the experimental group ( $n=30$ ) or the control group ( $n=30$ ), yielding a total sample size of 60. Inclusion criteria required participants to be medically fit, as confirmed through a preliminary health screening, and to have no history of chronic illness or musculoskeletal injury that could impede participation in physical activity. The sample size was determined based on statistical power considerations, ensuring sufficient sensitivity to detect meaningful changes in the measured variables.

## Intervention and Data Collection Procedures

The experimental group participated in a 12-week circuit training program, conducted five days per week, with each session lasting approximately 60 minutes. The circuit training program was structured to include a combination of aerobic exercises (e.g., shuttle runs, jumping jacks), resistance exercises (e.g., push-ups, squats, lunges), and functional activities (e.g., agility drills, medicine ball throws) performed in a sequential format with short rest intervals. The intensity of exercises was progressively increased over the 12-week period to accommodate improvements in fitness and to ensure continued physiological adaptation. The control group continued with their routine physical education activities without participating in the structured circuit training program.

Physical fitness was assessed using standardized performance tests, including the sit-up test for muscular endurance, push-up test for upper body strength, sit-and-reach test for flexibility, and 20-meter shuttle run for cardiovascular endurance. Self-esteem was evaluated using the Rosenberg Self-Esteem Scale, a widely validated instrument for measuring global self-worth in adolescents. Both assessments were conducted at baseline (pre-test) and immediately following the 12-week intervention (post-test) to quantify changes attributable to the circuit training program.

## Data Analysis

Collected data were coded and analyzed using SPSS version 25. Descriptive statistics, including mean, standard deviation, and range, were calculated to summarize participant characteristics and baseline measurements. Inferential statistical analyses were performed to determine the significance of observed differences between the experimental and control groups. Paired sample t-tests were used to assess within-group changes in physical fitness and self-esteem, while independent sample t-tests were applied to compare post-test differences between groups. Additionally, analysis of variance (ANOVA) was conducted to examine the interaction effects of age and baseline fitness levels on outcome measures. A significance level of  $p < 0.05$  was adopted for all statistical tests.

## Ethical Considerations

Ethical approval for the study was obtained from the institutional research ethics committee prior to commencement. Written informed consent was obtained from the parents or guardians of all participants, and verbal assent was obtained from the boys themselves. Confidentiality was strictly maintained by assigning

identification codes to participants, and all data were stored securely in password-protected files accessible only to the research team. Participants were informed of their right to withdraw from the study at any time without penalty, and any adverse events during the training sessions were recorded and addressed promptly to ensure safety.

By adopting a rigorous experimental design, standardized assessment tools, and comprehensive statistical analysis, this study provides a methodologically sound framework for evaluating the effectiveness of circuit training on enhancing physical fitness and self-esteem in school-aged boys. The integration of both physiological and psychological measures ensures a holistic understanding of the intervention's impact, providing valuable insights for educators, coaches, and health professionals.

## Results

**Table 1:** Muscular Endurance (Sit-Up Test) Pre-Test and Post-Test Scores

| Group               | Pre-Test Mean $\pm$ SD | Post-Test Mean $\pm$ SD | t-value | p-value |
|---------------------|------------------------|-------------------------|---------|---------|
| Experimental (n=30) | 18.4 $\pm$ 4.2         | 28.6 $\pm$ 3.8          | 12.45   | <0.001  |
| Control (n=30)      | 18.7 $\pm$ 4.0         | 19.2 $\pm$ 4.3          | 1.21    | 0.235   |

Table 2 displays the results for upper body strength, measured using the push-up test. Participants in the

The present study evaluated the effect of a 12-week circuit training program on physical fitness and self-esteem among school boys. Data were collected from 60 participants, with 30 boys assigned to the experimental group and 30 boys to the control group. Pre-test and post-test assessments were conducted to measure muscular endurance, upper body strength, flexibility, cardiovascular endurance, and self-esteem. Statistical analysis was performed using SPSS, and the results are presented below.

### Physical Fitness Outcomes

Table 1 presents the pre-test and post-test scores for muscular endurance, as measured by the sit-up test. The experimental group demonstrated a notable increase in sit-up repetitions after the 12-week intervention, whereas the control group showed minimal change.

**Table 2:** Upper Body Strength (Push-Up Test) Pre-Test and Post-Test Scores

| Group               | Pre-Test Mean $\pm$ SD | Post-Test Mean $\pm$ SD | t-value | p-value |
|---------------------|------------------------|-------------------------|---------|---------|
| Experimental (n=30) | 14.2 $\pm$ 3.5         | 23.4 $\pm$ 4.1          | 11.62   | <0.001  |
| Control (n=30)      | 14.5 $\pm$ 3.2         | 15.0 $\pm$ 3.4          | 1.34    | 0.190   |

experimental group showed significant improvement compared to the control group.

Flexibility was assessed using the sit-and-reach test, and the results are shown in Table 3. The experimental group

displayed a significant increase in flexibility, whereas the control group's scores remained largely unchanged.

**Table 3:** Flexibility (Sit-and-Reach Test) Pre-Test and Post-Test Scores

| Group               | Pre-Test Mean $\pm$ SD | Post-Test Mean $\pm$ SD | t-value | p-value |
|---------------------|------------------------|-------------------------|---------|---------|
| Experimental (n=30) | 20.8 $\pm$ 5.1         | 28.3 $\pm$ 4.7          | 9.84    | <0.001  |
| Control (n=30)      | 21.0 $\pm$ 4.9         | 21.5 $\pm$ 5.2          | 0.92    | 0.361   |

Cardiovascular endurance was measured using the 20-meter shuttle run test. Table 4 illustrates the pre- and post-test performance of both groups. The experimental group

exhibited a significant increase in the number of shuttles completed, indicating improved aerobic capacity.

**Table 4:** Cardiovascular Endurance (20-Meter Shuttle Run) Pre-Test and Post-Test Scores

| Group               | Pre-Test Mean $\pm$ SD | Post-Test Mean $\pm$ SD | t-value | p-value |
|---------------------|------------------------|-------------------------|---------|---------|
| Experimental (n=30) | 32.5 $\pm$ 6.8         | 48.1 $\pm$ 7.2          | 13.29   | <0.001  |
| Control (n=30)      | 33.0 $\pm$ 7.0         | 34.2 $\pm$ 6.9          | 1.48    | 0.147   |

### Self-Esteem Outcomes

Self-esteem scores, measured using the Rosenberg Self-Esteem Scale, are presented in Table 5. Participants in the

experimental group demonstrated a significant increase in self-esteem after the intervention, while the control group's scores showed no statistically meaningful change.

**Table 5:** Self-Esteem Scores Pre-Test and Post-Test

| Group               | Pre-Test Mean $\pm$ SD | Post-Test Mean $\pm$ SD | t-value | p-value |
|---------------------|------------------------|-------------------------|---------|---------|
| Experimental (n=30) | 22.4 $\pm$ 3.6         | 28.7 $\pm$ 3.9          | 10.21   | <0.001  |
| Control (n=30)      | 22.6 $\pm$ 3.8         | 23.0 $\pm$ 4.0          | 0.88    | 0.386   |

## Summary of Findings

The results consistently indicate that participation in the 12-week circuit training program led to significant improvements in all measured components of physical fitness—muscular endurance, upper body strength, flexibility, and cardiovascular endurance—as well as in self-esteem among school boys. Conversely, the control group,

which continued regular physical education activities without structured circuit training, did not demonstrate significant changes in any of the assessed variables. These findings provide empirical evidence supporting the effectiveness of circuit training as a comprehensive intervention for enhancing both physiological and psychological outcomes in adolescents.

## Discussion

The present study investigated the influence of a 12-week circuit training program on physical fitness and self-esteem among school boys aged 12 to 15 years. The results indicated significant improvements in all components of physical fitness, including muscular endurance, upper body strength, flexibility, and cardiovascular endurance, as well as a marked enhancement in self-esteem among participants in the experimental group. These findings underscore the effectiveness of circuit training as a comprehensive exercise modality capable of simultaneously addressing physiological and psychological dimensions of adolescent development.

The observed improvements in muscular endurance and upper body strength are consistent with previous research demonstrating that circuit training, which integrates resistance exercises with minimal rest periods, effectively enhances muscle performance. Exercises such as push-ups, squats, and lunges, when performed in a structured sequence, provide both strength and endurance benefits by promoting muscular overload and adaptation. The significant gains in cardiovascular endurance, as evidenced by the 20-meter shuttle run, reflect the aerobic component of the circuit training program, which challenges the cardiorespiratory system through continuous movement and dynamic exercises. Similarly, flexibility improvements observed in the sit-and-reach test are attributable to the incorporation of stretching and mobility exercises within the training circuits, supporting findings from prior studies that highlight the multifaceted benefits of integrated training programs in youth populations.

Psychologically, the increase in self-esteem among participants aligns with existing literature emphasizing the positive impact of structured physical activity on adolescent well-being. Self-esteem, a critical component of psychological health, can be influenced by perceived competence, body awareness, and achievement of personal goals. The circuit training program likely contributed to enhanced self-efficacy, as participants were able to monitor progress, complete challenging exercises, and experience a sense of accomplishment. These outcomes reinforce theoretical frameworks linking physical activity with psychological development, suggesting that interventions promoting skill mastery and regular engagement can foster a positive self-concept in adolescents.

Comparing the findings to previous studies, the magnitude of improvements observed in both fitness and self-esteem is notable. While earlier research has demonstrated benefits of aerobic or resistance training separately, this study highlights the advantage of combining multiple modalities into a cohesive circuit training program. The integrated approach not only optimizes time efficiency—a critical consideration in school settings—but also ensures simultaneous development of multiple fitness components, which may explain the broad range of positive outcomes observed.

Despite these encouraging results, certain limitations should be acknowledged. The sample size, although sufficient to detect statistically significant changes, was relatively small and drawn from a limited geographical area, which may affect the generalizability of the findings. Additionally, the intervention period was restricted to 12 weeks, and long-term retention of physical fitness gains and self-esteem improvements was not assessed. Adherence and motivation

levels, which can vary among adolescents, were controlled through structured supervision, but individual differences in baseline fitness or psychological traits may have influenced results. Future research should consider longitudinal designs, larger and more diverse populations, and follow-up assessments to evaluate the sustainability of training effects. An unexpected observation was the minimal change in self-esteem scores among a few participants in the experimental group, despite improvements in physical fitness. This suggests that psychological outcomes may be influenced by factors beyond physical performance, including social support, academic pressures, or personal temperament. Such findings highlight the complexity of psychosocial development and the need for multifactorial approaches when designing interventions aimed at enhancing self-esteem.

Overall, the study provides strong empirical evidence that circuit training is an effective and practical strategy for improving both physical fitness and psychological well-being in school boys. The findings carry significant implications for physical education programs, suggesting that structured, time-efficient, and engaging training modalities can foster holistic development during adolescence. Incorporating circuit training into school curricula may enhance not only physical health but also confidence, motivation, and overall self-concept.

Future research should explore variations in program intensity, duration, and exercise composition to identify optimal strategies for maximizing benefits. Additionally, studies could investigate the integration of circuit training with cognitive or social development interventions to further support comprehensive adolescent growth. By addressing these avenues, subsequent research can build upon the current findings and provide deeper insights into the mechanisms through which structured physical activity contributes to both physiological and psychological development in youth populations.

## Conclusion

The present study demonstrates that a 12-week circuit training program significantly enhances both physical fitness and self-esteem among school boys aged 12 to 15 years. Participants in the experimental group exhibited marked improvements in muscular endurance, upper body strength, flexibility, and cardiovascular endurance compared to the control group, which maintained regular physical education activities. Additionally, the intervention positively influenced psychological well-being, as reflected in increased self-esteem scores, highlighting the dual benefits of circuit training for adolescent development.

These findings contribute to the growing body of evidence supporting structured, multi-component exercise programs as effective strategies for promoting holistic health in youth populations. By integrating aerobic, resistance, and functional exercises in a time-efficient and engaging format, circuit training offers practical applications for school-based physical education, enabling educators to enhance both physical and psychological outcomes among students.

Given the positive effects observed, it is recommended that schools consider incorporating structured circuit training into their regular curricula. Future research should examine long-term outcomes, explore variations in training intensity and duration, and assess the integration of circuit training with other interventions targeting cognitive and social

development. Such investigations can provide further insights into optimizing adolescent health and well-being, fostering physically capable, confident, and well-rounded individuals.

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