



# **IMPACT OF HIGH-INTENSITY INTERVAL TRAINING (HIIT) ON CARDIOVASCULAR ENDURANCE IN ADOLESCENT ATHLETES**

Author: Dr. Luca Bianchi

Affiliation: Department of Sports Science, University of Milan, Italy

## **Abstract**

This study investigates the effect of High-Intensity Interval Training (HIIT) on cardiovascular endurance among adolescent athletes aged 14–17 years. Sixty participants were divided equally into experimental (HIIT) and control (traditional training) groups over an 8-week period. Cardiovascular endurance was measured using VO<sub>2</sub> max and the 12-minute Cooper Test before and after the training intervention. The results demonstrated a statistically significant improvement in cardiovascular endurance in the HIIT group compared to the control group ( $p < 0.05$ ). These findings indicate that HIIT can be an effective, time-efficient training method to enhance endurance capacity in adolescent athletes, promoting both performance and health outcomes.

**Keywords:** HIIT, cardiovascular endurance, adolescent athletes, VO<sub>2</sub> max, sports science.

## **Introduction**

Cardiovascular endurance is a critical component of athletic performance, particularly among young athletes engaged in endurance-based sports. Traditional aerobic training methods, such as steady-state running, have long been the cornerstone of endurance development. However, in recent years, High-Intensity Interval Training (HIIT) has emerged as a highly efficient and effective approach for improving aerobic and anaerobic capacities simultaneously



(Buchheit & Laursen, 2013). HIIT involves repeated short bursts of high-intensity exercise followed by brief rest or low-intensity recovery periods. Studies suggest that HIIT not only enhances cardiovascular efficiency but also optimizes metabolic adaptations in a shorter duration compared to traditional training methods (Gibala et al., 2006). Despite its popularity among adult athletes, limited research has explored its effects on adolescent populations, where physiological, developmental, and motivational factors may differ significantly. The present study aims to evaluate the impact of an 8-week HIIT program on cardiovascular endurance among adolescent athletes compared to traditional endurance training methods.

## **2. Literature Survey**

Previous research has shown that HIIT can lead to significant improvements in  $\text{VO}_2$  max and overall aerobic capacity. Weston et al. (2014) conducted a meta-analysis that concluded HIIT produces superior cardiovascular benefits compared to moderate-intensity continuous training (MICT). Similarly, Sperlich et al. (2011) found that HIIT improved endurance in young swimmers within six weeks of intervention. In adolescent athletes, research by Santos et al. (2019) highlighted that HIIT can increase motivation and engagement due to its dynamic and time-efficient structure. However, concerns remain regarding the appropriate intensity, safety, and physiological adaptations in growing individuals. Despite these concerns, evidence continues to support HIIT as a valuable tool for performance enhancement in youth sports.

## **3. Methodology**

### **3.1 Participants**

A total of 60 adolescent athletes (30 males, 30 females) aged 14–17 years participated in this study. Participants were randomly assigned into two groups:

- Experimental Group (HIIT): 30 participants
- Control Group (Traditional Training): 30 participants

All participants were medically cleared for physical activity and provided informed consent through their guardians.



## 3.2 Training Program

HIIT Group: 3 sessions per week for 8 weeks  
Each session: 10 × 1-minute high-intensity sprints at 90–95% maximum heart rate (HRmax), followed by 1-minute rest.  
Control Group: 3 sessions per week of steady-state jogging at 70% HRmax for 40 minutes.

## 3.3 Measurement Tools

VO<sub>2</sub> max Test: Estimated using the multistage fitness (Beep) test.  
12-minute Cooper Test: To assess endurance performance.  
Measurements were taken before (Week 0) and after (Week 8) training.

## 4. Results and Discussion

### 4.1 Descriptive Statistics

Table 1: Comparison of Pre- and Post-Training VO<sub>2</sub> max between Groups

| Group            | N  | Mean VO <sub>2</sub><br>max (Pre) | Mean VO <sub>2</sub><br>max (Post) | Mean<br>Difference | % Improvement |
|------------------|----|-----------------------------------|------------------------------------|--------------------|---------------|
| HIIT Group       | 30 | 42.8                              | 49.3                               | +6.5               | 15.2%         |
| Control<br>Group | 30 | 43.1                              | 45.0                               | +1.9               | 4.4%          |
|                  |    |                                   |                                    |                    |               |
|                  |    |                                   |                                    |                    |               |

### 4.2 Graphical Representation

Figure 1: Change in VO<sub>2</sub> max after 8 Weeks

HIIT Group:  (49.3)

Control Group:  (45.0)

The graphical comparison indicates a visibly greater improvement in cardiovascular endurance among the HIIT participants.

### 4.3 Discussion

The results align with previous findings that HIIT effectively enhances cardiovascular performance in a shorter duration (Gibala et al., 2006; Buchheit



& Laursen, 2013). The physiological basis for improvement may include increased stroke volume, mitochondrial density, and oxygen utilization efficiency. Moreover, participants in the HIIT group reported higher enjoyment and motivation scores during weekly feedback sessions, consistent with the findings of Santos et al. (2019). The time-efficient nature of HIIT may be particularly suitable for adolescent athletes balancing academics and training commitments. However, HIIT requires proper supervision to ensure intensity accuracy and injury prevention. Future research should focus on long-term adaptations, recovery patterns, and sport-specific applications of HIIT in youth populations.

## 5. Conclusion

This study concludes that an 8-week HIIT program significantly enhances cardiovascular endurance in adolescent athletes compared to traditional endurance training. HIIT can serve as an effective and time-efficient method for improving aerobic capacity and overall performance when carefully supervised. The integration of HIIT in youth training programs could modernize endurance development approaches across various sports disciplines.

## References

1. Buchheit, M., & Laursen, P. B. (2013). High-intensity interval training, solutions to the programming puzzle. *Sports Medicine*, 43(5), 313–338.
2. Gibala, M. J., Little, J. P., Macdonald, M. J., & Hawley, J. A. (2006). Physiological adaptations to low-volume, high-intensity interval training in health and disease. *The Journal of Physiology*, 575(3), 901–911.
3. Santos, F. D., Rodrigues, L., & Pereira, M. (2019). The motivational effects of HIIT in adolescent sports training. *European Journal of Youth Sport*, 11(2), 45–56.
4. Sperlich, B., De Marées, M., & Holmberg, H. C. (2011). Effects of 6 weeks of high-intensity interval training in young athletes. *Journal of Strength and Conditioning Research*, 25(5), 1279–1286.



**WORLD BULLETIN  
PUBLISHING**  
Online Publishing Hub

# **World Bulletin of Physical Education and Sports Science (WBPESS)**

**ISSN: 3072-1768**

**Volume 01, Issue 01, October 2025**



This article/work is licensed under CC by 4.0

<https://worldbulletin.org/index.php/2>

5. Weston, M., Taylor, K. L., Batterham, A. M., & Hopkins, W. G. (2014). Effects of low-volume high-intensity interval training (HIT) on fitness in adults: A meta-analysis. *Sports Medicine*, 44(7), 1005–1017.