Effect of High-Intensity Interval Training on Cardiovascular Endurance in College Athletes

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ABSTRACT

The study aimed to examine the effect of High-Intensity Interval Training (HIIT) on cardiovascular endurance among college athletes. Thirty male and female athletes (aged 18–22 years) from various sports disciplines were selected and divided into two groups: experimental (HIIT group) and control. The experimental group underwent an 8-week HIIT program, while the control group followed their regular training schedule. Cardiovascular endurance was assessed using the **Cooper 12-Minute Run Test** before and after the intervention. Data were analysed using paired *t*-tests and independent *t*-tests. The results indicated a significant improvement ($p < 0.05$) in the experimental group's mean endurance score compared to the control group. The study concludes that HIIT is an effective method for improving cardiovascular endurance in collegiate athletes and can be incorporated into athletic conditioning programs.

Keywords: High-Intensity Interval Training, Cardiovascular Endurance, College Athletes, VO_2 Max, Physical Education

INTRODUCTION

Cardiovascular endurance is a vital component of athletic performance, directly influencing oxygen delivery, energy utilization, and overall stamina. With the increasing demands of competitive sports, efficient and time-effective training methods have gained attention among coaches and exercise scientists.

High-Intensity Interval Training (HIIT) involves alternating periods of short, intense exercise with intervals of active recovery. Studies (Gibala & McGee, 2008; Milano Vic et al., 2015) have shown that HIIT can produce similar or superior improvements in aerobic capacity compared to traditional endurance training, despite shorter durations.

However, research specifically examining HIIT's effects on **college-level athletes** remains limited. Therefore, this study aimed to evaluate the impact of an 8-week HIIT program on cardiovascular endurance in college athletes.

METHODOLOGY

Thirty (n = 30) college athletes (15 male, 15 female) aged 18–22 years from [University Name] volunteered for this study. Participants were free from cardiovascular or metabolic disorders and had at least one year of competitive sports experience. Participants were randomly assigned to **Experimental Group (n = 15):** Received HIIT training. **Control Group (n = 15):** Continued routine sports training without additional intervention. The experimental group followed an **8-week HIIT program**, three sessions per week. Each session included:

- 5-min warm-up (light jogging, dynamic stretching)
- **8 × 30-second sprints** at 85–90% maximum heart rate, each followed by **90 seconds of active recovery (walking/jogging)**
- 5-min cool-down

Heart rates were monitored using Polar heart rate sensors to ensure intensity accuracy.

Measurement of Cardiovascular Endurance

Endurance was assessed using the **Cooper 12-Minute Run Test**, with VO_2 Max estimated using the formula: VO2 Max= (distance in meters−504.9)/44.73VO_2 \text {Max} = (distance\ in\ meters - 504.9) / 44.73VO2max= (distance in meters−504.9)/44.73 both groups completed pre-test and post-test evaluations under similar conditions.

Statistical Analysis

Data were analysed using **SPSS 26.0**. Descriptive statistics (mean, SD) were calculated. Paired *t*-tests compared pre- and post-test results within groups, and independent *t*-tests compared the post-test means between groups. Significance was set at $p < 0.05$.

Group	Test	Mean Distance (m)	Mean VO_2 Max (ml/kg/min)	t-value	p-value
Experimental	Pre-test	2400 ± 120	42.4 ± 2.1	—	—
Experimental	Post-test	2650 ± 130	47.8 ± 2.4	5.12	0.001*
Control	Pre-test	2380 ± 110	42.0 ± 2.0	—	—
Control	Post-test	2405 ± 115	42.6 ± 2.1	1.04	0.31

*Significant at $p < 0.05$.

The experimental group showed a **13% increase in VO_2 Max**, whereas the control group showed no significant change.

DISCUSSION

The findings support previous research indicating HIIT's efficiency in improving cardiovascular performance (Helgerud et al., 2007). The improvement in VO_2 Max suggests enhanced oxygen utilization and stroke volume efficiency due to the high-intensity nature of the training.

Unlike traditional endurance training requiring long durations, HIIT provides comparable benefits in less time — a crucial advantage for student-athletes balancing academics and sports. The results are consistent with studies by Tabata et al. (1996) and Buchheit & Laursen (2013), who found that short bouts of maximal exertion lead to significant aerobic adaptations.

CONCLUSION

High-Intensity Interval Training significantly improves cardiovascular endurance in college athletes. Coaches and physical education professionals are encouraged to incorporate HIIT protocols into training schedules to enhance aerobic capacity efficiently.

RECOMMENDATIONS

1. Future research should include a larger sample size and different sports disciplines.

2. Monitoring biochemical markers (e.g., lactate threshold) can provide deeper insight into HIIT adaptations.

3. Long-term studies could evaluate sustained effects of HIIT on athletic performance.

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