VOLUME 10 (SPECIAL ISSUE 2) 2024

ISSN 2454 - 3055

Manuscripts under Special Issue are published under the theme "Modern Aspects of Applied Biology"

Guest Editor: Dr. S. Mohanasundaram

Department of Biochemistry and Crop Physiology, SRM College of Agricultural Sceices, SRM Institute of Science and Technolgy, Tamil Nadu, India

Assistant Guest Editors: Dr. Sunil Alphonse

Government College of Physical Education, Khozikode, Kerala, India

Dr. K. Geetha

Meenakshi Academy of Higher Education and Research, Kanchipuram, India

INTERNATIONAL JOURNAL OF ZOOLOGICAL INVESTIGATIONS

Forum for Biological and Environmental Sciences

Published by Saran Publications, India

International Journal of Zoological Investigations Vol. 10 (Special Issue 2), 83-87 (2024)

International Journal of Zoological Investigations
Contents available at Journals Home Page: www.ijzi.net
Editor-in-Chief: Prof. Ajai Kumar Srivastav
Published by: Saran Publications, Gorakhpur, India

ISSN: 2454-3055

Impact of High-Intensity Interval Training on Aerobic Capacity and Lipid Profile among Male Football Players

Amal C. H.[1]* and Bipin G.[2]

[1]Department of Physical Education, University of Calicut, Kerala, India
[2]Department of Physical Education, Sree Kerala Varma College, Thrissur, Kerala, India

**Corresponding Author*

Received: 14th September, 2024; **Accepted:** 5th October, 2024; **Published online:** 25th November, 2024

https://doi.org/10.33745/ijzi.2024.v10ispl2.014

Abstract: This study aimed to analyze the impact of High-Intensity Interval Training onthe aerobic capacity and lipid profile of football players. The study consisted of 20 male football players of mean age 20.95 ±2.14 (range 17–24) years, equally divided into two groups: experimental group and control group. Both groups comprised 10 subjects who actively engaged in regular football training programs and the experimental group underwent an additional intermittent (15-15) training program for twelve weeks. Pre-test and post-test were conducted. Height, weight, BMI, Vo2 Max, and Lipid profile such as High-density lipoprotein (HDL), Low-density lipoprotein (LDL), Triglyceride (TG), and Total cholesterol (TC) were measured using the appropriate methods. Independent sample t-test showed a significant ($P < 0.05$) difference in BMI and Vo2 Max and no difference in Lipid profile in the experimental group.

Keywords: High-intensity interval training, High-density lipoprotein, Low-density lipoprotein, Triglycerides, Total Cholesterol

Citation: Amal C. H. and Bipin G.: Impact of high-intensity interval training on aerobic capacity and lipid profile among male football players. Intern. J. Zool. Invest. 10(Special Issue 2): 83-87, 2024.

https://doi.org/10.33745/ijzi.2024.v10ispl2.014

Introduction

In the field of sports science and athletic performance enhancement, the pursuit of optimized training methods is a constant endeavour. As the demands placed on athletes continue to evolve, research into innovative training programs is essential to meet the ever-increasing challenges of competitive sports. One such paradigm that has gained prominence is High-Intensity Interval Training (HIIT), which is known for its effectiveness in improving aerobic capacity and metabolic function. Several studies have shown how HIIT improves lipid profiles, particularly in those who are overweight or obese (Lazzer *et al*., 2016; Da Silva *et al*., 2020).

The present study focuses on the impact of the HIIT program on the aerobic capacity and lipid

profile among male football players. Aerobic capacity, a basis of athletic endurance, and lipid profile, a key factor of cardiovascular health, are important components that influence an athlete's overall performance and well-being (Rankovic *et al*., 2010).

Football players need a distinctive combination of aerobic capacity and cardio-vascular endurance (Bahtra *et al*., 2023). It is important to understand how a targeted HIIT programme influences these physiological parameters. This study aims to contribute to the existing body of knowledge by providing empirical evidence on the potential benefits of structured HIIT programs for male football players.

Through a comprehensive investigation of aerobic capacity and lipid profile changes, this study aims to illuminate the nuanced impact of the proposed training programme and provide valuable implications for coaches, sports scientists, and players alike. As the sporting landscape continues to evolve, deciphering the intricacies of training methods is crucial to promoting progress that can lead to improved athletic performance and well-being.

The hypothesis of the study was - (i) There is a significant difference between the experiment group and the control group on the Vo2 Max of football players; and (ii) There is a significant difference between the experiment group and the control group on the Lipid profile of football players.

Materials and Methods

The study consisted of 20 male football players of mean age 20.95 ±2.14 (range 17–24) years, equally divided into two groups: experimental group and control group. Both groups comprised 10 trained subjects who actively engaged in regular football training programs and the experimental group underwent an additional intermittent (15-15) training for twelve weeks. The subjects were collegiate football players from Sree Keralavarmma College, Thrissur affiliated withthe University of Calicut, India. The football players were trained at least 12 h a week and had been playing football for 6–10 years. The subjects showed no physical abnormalities in the medical examination and provided informed consent to take part in the study.

The study took place within the competitive period from August to November 2023. Anthropometric measurements, HIIT program, and performance assessment were carried outon football grounds and blood tests were conducted in the laboratory.

Anthropometric measurements

The weight and height of the subjects were measured using a Digital weighing machine and stadiometer, respectively. Body mass index (BMI) was calculated as follow:

$$BMI\ (kg/m^2) = weight/height^2$$

Assessment of VO2 max

Maximal oxygen uptake (Vo2max) was assessed using the Yo-Yo intermittent recovery test (level 1). This test was conducted two times, i.e., before and after the training program for the two groups. The test (Bangsbo *et al*., 2008) consist of successive runs of 2×20 meters, back and forth between the start, turning point, and endpoint. The test is conducted in stages, with each stage consisting of a set running pattern and progressively increasing intensity based on computer-generated audio signals. Following each run, participants take a 10 sec active rest, covering 2×5 meters through jogging (Bangsbo *et al*., 2008). The evaluation concluded when participants fail twice to reach the finish line within the time.

Intermittent training

The experimental group participated in a 15-15 HIIT program twice a week over a period of 12 weeks, i.e. on Tuesdays and Thursdays, during the competition phase in addition to their normal training. During training, the Yo-Yo test was used to control and adjust the workload. Subjects rotated between 15 sec of work and 15 sec of

Table 1: Variations in the Height, Weight, BMI and Vo2 Max

Variables	Group	Pre- test	Post-test	P*	Intra-group Pre-test**
Height	Experimental	1.735±0.038	1.736±.0.037	0.343	0.812
	Control	1.730±0.038	1.732±0.036	0.168	
Weight	Experimental	71.260±2.707	64.994±3.378	0.000	0.001
	Control	71.130±2.678	70.656±3.004	0.309	
BMI	Experimental	23.840±0.347	21.558±0.624	0.000	0
	Control	23.767±0.543	23.554±0.761	0.185	
Vo2 Max	Experimental	52.5±5.300	56.0±4.710	0.000	0.001
	Control	50.2±2.600	50.5±2.910	0.251	

p<0.05, * Intra-group pre- and post-test, Paired samples t-test, ** Intra-group post-test, Independent samples t-test

Table 2: Variations of lipid levels

Variables	Group	Pre-test	Post-test	P*	Intra-group Pre-test**
HDL	Experimental	45.0±5.2	43.4± 3.2	0.221	0.107
	Control	47.8±9.8	47.9±10.0	0.339	
LDL	Experimental	96.5±17.9	93.0±25.4	0.427	0.246
	Control	97.5±17.9	104.0±21.1	0.166	
TC	Experimental	156.7±20.5	153.2±25.0±	0.189	0.448
	Control	154.2±21.5	155.0±20.1	0.21	
TG	Experimental	82.4±40.1	64.2±24.5	0.136	0.337
	Control	83.0±34.4	84.0±37.8	0.166	

p<0.05, * Intra-group pre- and post-test, Paired samples t-test, ** Intra-group post-test, Independent samples t-test

passive recovery (15-15). Two 10 min sets were performed per session, i.e. 20 work repetitions and 19 recovery periods for each set, and the recovery time between sets was 3 min.

Blood sample analysis

Blood samples were collected two times i.e. before and after the training. Blood samples were centrifuged at 3000 rpm for 5 min. The levels of High-density lipoprotein (HDL), Low-density lipoprotein (LDL), Triglyceride (TG), and Total cholesterol (TC) were tested in the fully automatic analyzer.

The statistical analysis was done using IBM SPSS version 20.0 software. The paired-samples t-test was performed for intra-group pre-test and post-test analyses, whilethe independent-samples t-test was performed for post-test comparisons between the experimental and control groups. The statistical significance level for all analyses was considered to be p <0.05.

Results and Discussion

Table 1 shows a significant difference in the Experimental group's Weight, BMI, and Vo2 Max in the intra-group analysis, but no difference in the control group. Weight, BMI, and Vo2 Max revealed statistically significant differences in intra-group analyses between the groups in the intra-group post-test comparisons (p<0.05).

Variation of the Lipid profile shown in Table 2 revealed that there was no statistically significant difference in the HDL, LDL, TC, and TG levels in

the intra-group pre- and post-test results of the participants ($p>0.05$).The study showed a significant difference in Vo2 Max after a twelve-week HIIT program in the experiment group. It also shows that there was no significant impact on the Lipid profile in the experimental group.

The aerobic capacity of the experimental group increased after twelve weeks HIIT program compared to the control group. It suggests the beneficial impact of the High-Intensity Interval Training program during the competitive phase of football players. The previous research showed that HIIT is a viable method for improving the aerobic fitness of football players at the national level when performed during the season (Jin, 2023). Ouerghi *et al*. (2014) suggest that it is important for football players to have a high aerobic capacity to attain their maximum performance and the HIIT program has a beneficial impact on aerobic capacity. Athletes can reduce the amount of lactic acid they produce and increase the amount of creatine phosphate they use when they exercise by following an interval training program. This shows that variations in body mass may also be connected to variations in aerobic capacity.

Lipid-profile of football players showed no statistically significant difference after the HIIT program. This study substantiates previous studies (Thomas *et al*., 1981; Tater *et al*., 1987). Kayatekin *et al*. (1998) noticed no discernible variation in plasma lipid levels after intensive training. From this result, they suggest that lipid profiles are more closely associated with sex than with exercise. However, some studies show intensive training has a significant impact on lipid profile (Ouerghi *et al*., 2014). The randomization method, race/ethnicity, diet, smoking, alcohol consumption, training intensity, timing of the post-exercise blood draw, and environmental factors could all account for this discrepancy in results. In summary, the results of intensive training may vary based on the characteristics of the subjects, environmental factors, the intensity and duration of the training, the timing of blood sample collection, diet, and other relevant factors.

Conclusion

In conclusion, the twelve-week HIIT program led to a significant increase in the experimental group's Vo2 Max, while no significant changes were observed in their lipid profile. The results of this study give persuasive evidence that High-Intensity Interval Training can result in appreciable improvements in aerobic capacity. Impact on Lipid profile, suggest that the results of any training may vary based on the relevant factor. Coaches and trainees should consider about such individual factors when providing training.

References

Bahtra R, Tohidin D, Andria Y, Dinata WW and Susanto N. (2023) Small-sided games 5v5: Improving aerobic endurance of youth football players. Physical Education Theory Methodology 23(5): 739-746.

Bangsbo J, Iaia FM AND Krustrup P. (2008) The Yo-Yo intermittent recovery test: a useful tool for evaluation of physical performance in intermittent sports. Sports Med. (Auckland, N.Z.) 38(1): 37-51.

Da Silva MR, Waclawovsky G, Perin L, Camboim I, Eibel B and Lehnen AM. (2020) Effects of high-intensity interval training on endothelial function, lipid profile, body composition and physical fitness in normal-weight and overweight-obese adolescents: A clinical trial. Physiol Behavior 213: 112728.

Jin M. (2023) Effects of aerobic exercise on body morphology in obese university students. Rev Bras Med Esporte 29. https://doi.org/10.1590/1517-8692202329012022_0221

Kayatekin BM, Semin I, Acarbay S, Oktay G and Selamoglu S. (1998) A comparison of the blood lipid profiles of professional sportspersons and controls. Indian J Physiol Pharmacol. 42(4): 479-484.

Lazzer S, Tringali G, Caccavale M, De Micheli R, Abbruzzese L and Sartorio A. (2017) Effects of high-intensity interval training on physical capacities and substrate oxidation rate in obese adolescents. J Endocrinol Invest. 40(2): 217-226.

Ouerghi N, Feki M, Kaabachi N, Khammassi M, Boukorraa S and Bouassida A. (2014) Effects of a high-intensity intermittent training program on aerobic capacity and lipid profile in trained

subjects. Open Access J Sports Med. 243. https://doi.org/10.2147/oajsm.s6870

Rankovic G, Mutavdzic V, Toskic D, Preljevic A, Kocic M, Nedin Rankovic G and Damjanovic N. (2010) Aerobic capacity as an indicator in different kinds of sports. Bosnian J Basic Med Sci. 10(1): 44-48.

Tater D, Leglise D, Person B, Lambert D and Bercovici JP. (1987) Lipoproteins status in professional football players after period of vacation and one month after a new intensive training program. Hormone Metabolic Res. 19(1): 24-27.

Thomas TR, Adeniran SB, Etheridge GL and Byrd PJ. (1981) Effects of different running programs on percent body fat and plasma lipids. Med Sci Sports Exercise 13(2): 106.