



EFFECT OF HIGH INTENSITY INTERVAL TRAINING ON ANTIOXIDANTS OF MALE PHYSICAL EDUCATION STUDENTS

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ABSTRACT

The purpose of this study is to find out the efficiency of high intensity interval training on antioxidants of male physical education students. To achieve the purpose thirty (30) male physical education students were selected from Swami Vivekanand Subharti University, Department of Physical Education, Meerut, Uttar Pradesh. These subjects were tested on antioxidants before and after eight weeks of high intensity interval training (HIIT). The mean maximal aerobic speed 4.21 m/s was used as a criterion velocity to set running paces for high-intensity interval training. Statistical technique used in the present study was 2×2 ANOVA with repeated measures on last two factors. The result of the study revealed that eight weeks of high intensity interval training resulted in 32.65% of increase in Superoxide dismutase (SOD) ($F_{(1,28)} = 4.663, p < 0.05$) and 8.86% on Glutathione peroxidase (GPx) ($F_{(1,28)} = 14.88, p < 0.05$). However, 4.92% of reduction is noticed in Catalase (CAT) ($F_{(1,28)} = 14.88, p < 0.05$). It is concluded that high intensity interval training for eight weeks resulted in significant alterations in antioxidants and which indirectly lowered the lipid peroxidation of male physical education students.

Keywords: SOD, GPx, CAT, maximal aerobic speed, ANCOVA, Physical education Students.

Introduction

Exercise has long been accepted as an intervention to improve physical health and well being or, in the professions of athletic training or physical therapy, to help an injured individual regain physical ability following an injury. Simultaneously athletes quest for excellence, have to cope with tough training programmes and perform well in competitions on a regular basis. Physical education students who undergo training, tapering and compete in competitions. However, athletes busy schedule of training

and competing which might push athletes beyond their physiological and psychological limits. To recuperate the physiological and psychological parameters of athletes they concentrate on recovery patterns with optimal level which might enhance human performance [1].

Coaches and endurance athletes have long recognized the importance of high-intensity interval training in enhancing endurance performance. High-intensity interval training may be defined as repeated bouts of short- to moderate-duration exercise (30 seconds to 5 minutes) completed at a



‘high’ intensity. Recovery between efforts may be active or passive, but not of sufficient duration to facilitate full recovery.

Regular physical activity, associated with a balanced diet, is known as an important factor for health. However, exhaustive and/or intense physical activity can induce diseases, injuries and chronic fatigue, which can lead to the overtraining syndrome, partially because of the toxicity of free radicals. Free radicals, which are highly produced during physical exercise, are involved in muscular fatigue, many diseases and aging. However, they exert positive effects on the immune system and essential metabolic functions. Antioxidants are components that suppress free radicals and their harmful effects. If the production of free radicals is large than antioxidant activity, there is an oxidative stress state with cell damages [2]. The purpose of this study is to find out the efficiency of high intensity interval training on antioxidants of male physical education students.

Methods

Subjects

Thirty (30) male physical education students selected from Swami Vivekanand Subharti University, Department of Physical Education, Meerut, Uttar Pradesh. The age of these subjects range between 21 to 26 years, the selected subjects gave willingness to participate in this study. These selected subjects were classified into two groups namely Group I: High intensity interval training and Group II: Control group. These subjects were randomly selected and equally divided into two groups. These subjects were free from diseases.

Variables and Test

Blood samples were collected by venous arm puncture into heparinised tubes and the plasma and serum was separated by centrifugation at 3000 rpm for 15 minutes. The method adopted to measure SOD, GPx and CAT was presented in Table 1.

Table 1
Test used for criterion variables

Sl. No.	Variables	Methods/test/ equipment	Unit of measurements
1	SOD	Kakkar, <i>et al.</i> , (1984) [3]	U/mg of Hb
2	GPx	Rotruch, <i>et al.</i> , (1973) [4]	U/g of Hb
3	CAT	Sinha (1972) [5]	Nmol/min/ml

Training intervention

Aerobic training was given for 4 days per week (Monday-Morning (07:00 to 08:00 am, Tuesday-Evening (17:00-18:00, Thursday-Morning (07:00 to 08:00 am, Friday-Evening (17:00-18:00) for eight weeks. The formula proposed by Gerbeaux *et al.* (1991) [6] was used to calculate Maximal aerobic speed (MAS). The MAS of 4.21 m/s

was used as a criterion velocity to set running paces for high-intensity short intermittent exercises. They performed series of sprints lasting 10, 15 and 20 second for given distance. The training group performed training at 1:1 work rest ratio.

Statistical technique

The data collected from the HIT and CON group on antioxidant were statistically analysed to examine the changes. The experimental design used for the present investigation was 2×2 ANOVA with repeated measures on last two factors. In which, the first factor denotes groups (HIT and CON) and the second factor indicated testing conditions (Pre and Post test), whenever the interaction is significant, simple effect was used as a follow up test. Since two groups are involved Scheffé S test was not applied as post hoc test to determine the significant paired mean differences. The level of confidence was fixed at 0.05 to test the significance. The data was analysed in

computer system by using statistical package for social science (SPSS) version 17.

Results

Table 1 clearly shows that there was significant in interaction of SOD ($F = 4.663$, $p < 0.05$), GPx ($F = 14.88$, $p < 0.05$) and CAT ($F = 4.92$, $p < 0.05$). Since the obtained F ratio of interaction effect is greater than the required table value of 4.195 at $\alpha = 0.05$ for the df of 1 and 28, demonstrates that there is statistically a significant difference for the interaction of groups at different tests. Since interaction is significant simple effect was applied and presented in Table 2.

Table 2
Simple effect test on antioxidants

Variables	Conditions	SS	df	MS	F ratio
SOD	Groups at Pre test	2.61075	1	2.61075	5.675*
	Groups at Post test	13.66875	1	13.66875	29.71*
	Test of HIT Group	7.05675	1	7.05675	15.34*
	Test of CON Group	0.33075	1	0.33075	0.719
	Error	12.892	28	0.46	
GPx	Groups at Pre test	8.26875	1	8.26875	4.78*
	Groups at Post test	18.96075	1	18.96075	10.97*
	Test of HIT Group	68.403	1	68.403	39.60*
	Test of CON Group	1.083	1	1.083	0.627
	Error	48.358	28	1.727	
CAT	Groups at Pre test	0.048	1	0.048	0.037
	Groups at Post test	11.163	1	11.163	8.74*
	Test of HIT Group	56.71875	1	56.71875	44.45*
	Test of CON Group	15.76875	1	15.76875	12.35*
	Error	35.735	28	1.276	

*Significant at 0.05 level of confidence

It is clear from Table 2 that HIT group on CAT changed significantly before and after eight weeks of high intensity interval training as the obtained F ratio SOD, GPx and CAT was 29.71, 39.60 & 44.45 is greater than the required table value of 4.195 at $\alpha = 0.05$ for the df of 1 and 28. This clearly showed that SOD, GPx and CAT recorded 32.65% and 8.86% of increase and 12.18% of decrease in HIT group is elicited. It is inferred that SOD and GPx had increased but CAT activity was decreased as a result of high intensity interval training for eight weeks in male physical education students.

Discussion

High-intensity interval training has been shown to be an effective method for improving endurance performance [7-9]. The antioxidant enzymes may be activated selectively during an acute bout of strenuous exercise depending on the oxidative stress imposed on the specific tissues as well as the intrinsic antioxidant defense capacity. Skeletal muscle may be subjected to a greater level of oxidative stress during exercise than liver and heart due to increased ROS production. Therefore, the muscle needs greater

antioxidant protection against potential oxidative damage occurring during and/or after exercise. SOD, GPx and CAT provide the primary defense against ROS generated during exercise and activities of these enzymes are known to increase in response to exercise in both animal and human studies [10-12]. In the present study SOD, GPx and CAT improved due to eight weeks of high intensity interval training. SOD activity in skeletal muscle has been reported to increase after endurance training [13-17]. Further, GPx also underwent adaptation to endurance training which are reported earlier by Oh-Ishi *et al.* (1997) [18]; Leeuwenburgh *et al.* (1994) [14] and Powers *et al.* (1994) [17]. In addition, CAT activities have been reported to change with endurance training. This finding is in line with previous studies as Leeuwenburgh *et al.* (1999) [19]; Miyazaki *et al.* (2001) [20].

Conclusion

It is concluded that 8 weeks of high intensity interval training on physical education students showed increase in antioxidants which indirectly lowered the lipid peroxidation.

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