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The Antioxidant Enzymes Activities in Blood of Physical Education Students after Eccentric and Concentric Training Activities

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Abstract: Physical activity is well known to induce free radicals and reactive oxygen species (ROS). There are enzymatic and non-enzymatic defense systems against ROS in aerobic organisms. The aim of this study was to investigate the acute effect of eccentric and concentric training on activities of the antioxidant enzymes in physical education student's blood samples. Twenty four females students volunteers participated in the study who were randomly assigned to three groups: control (age 20.52 ± 0.18 year, BMI 21.15 ± 0.43 kg/m^2), eccentric training group (age 21.37±0.49 year, BMI 20.82±0.49 kg/m^2) and concentric training group (age 20.66±0.36 year, BMI 21.46±0.58 kg/m^2). Blood samples, collected 1h before and immediately after training and analyzed for activities of the antioxidant enzymes, glutathione peroxides (GPx), glutathione educates (GR). The results shows no significant differences were found in GR activities between the groups. There was an significant ($p<0.05$) increase in GPx activities compared to control group ($p<0.05$). However after concentric training, an significant ($p<0.05$) increase was observed in GPx activities compared to before training and total Hb levels increase after training compared with before training. In conclusion may the eccentric and concentric training show an improved in blood antioxidant enzyme activities.

Key words: Eccentric training · Concentric training · Glutathione peroxides · Glutathione educates

INTRODUCTION

Oxygen radicals derived from various biological processes in the body and the magnitude of generation in blood during energy metabolic stress. Physical activity results in an increased production of free radicals and reactive oxygen species (ROS) and it is well known to intense exercise [1], as evidenced by direct measurement of free radicals with the electron paramagnetic resonance technique [2] and by indirect determinations of products of free radical reactions [3]. Indications of exercise-induced oxygen radical generation in blood may also be obtained by studying the level of antioxidant enzymes with training. Antioxidant enzymes act directly or indirectly to remove reactive oxygen species (and thus an elevation of enzymes with training suggests and increased need for protection against free radicals). One of the most important physiological antioxidant systems is the glutathione system in which glutathione peroxides (GPx) utilizes reduced glutathione as a hydrogen donor for the removal of peroxides [4]. The produced oxidized from of glutathione may in the presence of NADPH be reduced to glutathione via glutathione educates (GR) [5-10]. Eccentric and concentric training in girls had been found to result in an elevated activity of GPx and no change significantly in activity of GR. The discrepancies in findings among studies [11] suggest that the type, frequency and intensity of exercise used in training may affect the response in the antioxidant systems [13]. The aim of this study was to investigate the acute effect of eccentric and concentric training on activities of the antioxidant enzymes in physical education students blood samples.

MATERIALS AND METHODS

Twenty four physical education women students, Alzahra university, Tehran, Iran, on 2009, participated in this study. Subjects had to have at least one year prior resistance training at a frequency of three times per week to be considered for this study. We selected healthy, non-smoker women who were not on any type of hormonal

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treatment during the previous 12 months and were not currently using lipid-lowering drugs, antidiabetic medications. The study protocol was approved by the Scientific Advisory Committee and Ethical Committee of, Alzahara University. A physical readiness questionnaire was completed to assess general health of the participant. Subjects were not currently (or in the past six months) taking dietary supplements containing creatine, glutamine, arginine, HMB and rostendione, thermogenics, or any other ergogenic supplement. All persons gave informed consent for their participation in the study after reading the protocol of this experiment.

Participants were instructed to refrain from exercise for 48 hours before each testing session and fast for 10 hours before donating blood. Height was measured using standard anthropometry and total body weight was measured using a calibrated electronic scale with a precision of ± 0.02 kg. The participants were randomly assigned to in three groups: n=8 as a control (C) without training, n=8 as a eccentric training (ET) with (intensity training 88.87% ± 1.38 MaxHR) and n=8 as a concentric training (CT) (training intensity 88.62% ± 2.78 MaxHR).

Eccentric training group to do ellestad test with reverse slope to fatigue, concentric training group to do ellestad test with straight slope to fatigue [13].

Biochemical Measurement: Fasting blood samples were collected by venipuncture and analyzed for GPx, GR activities and Hb Assay. Blood GPx and GR activity were estimated using kit supplied following established literature procedures by Randox, Co kit, UK, based on the method Kraus *et al.,* (1990) and Goldberg and Spooner (1983). The Hb assay was based on the method offering by ICSH (International committee for standardization in Hematology) according to the Ranney and Sharma (19991) method [14-16].

Statistical Analysis: All statistical analyses were performed with using SPSS 13 (Statistical Package for Social Science). Descriptive statistics including means and Sds for the outcome variables of interest were computed. one-way analysis of variance with repeated measures was used for comparison of dependent variables. T-test analysis was performed on values from blood sample obtained pre-and post training values. The p<0.05 were considered to be signifiant.

RESULTS

21.3±1.6 years and there were no significant relation and correlation between body weight (BW) changes in four groups of study in the 1 day before Ramadan, compared with 30th day of Ramadan month after the exercise protocol.

Analysis of 24 subjects enrolled, revealed that the mean age of respondents was 20.33 ± 1.7 Yrs and the mean BMI=22.79± 1.9 kg/m^2 (Table 1). Comparison of weight, BMI did not reveal any significant changes during different stage of study. The characteristic and anthropometric parameters of respondents shows in Table 1, for groups C, ET and CT respectively (0.52±0.18 year, BMI 21.15 ± 0.43 kg/m^2), (1.37 ± 0.49 years, BMI 20.82±0.49 kg/m^2 and (20.66±0.36 year, BMI 21.46 ± 0.58 kg/m^2. Table 2 showed the mean values of Gpx, GR activities (Iu/l) and Hb (g/dl) of the C and CT and ET groups. No significant differences were found between the groups with regard to GR activation. Eccentric and concentric training increased GPx activities compared to control group (p<0.05) (figure2). Hemoglobin level (Hb) was decreased after eccentric and concentric compared with before training (p<0.05) (Table 2).

Table 1: Physical characteristics in physical education students (n=24)

Groups	n	Age (year)	Height (cm)	Body mass (kg)	BMI (kg/m^2)	Work load (Max HR)
C	8	20.52 ± 0.18	161.87 ± 2.58	55.50 ± 1.96	21.15 ± 0.43	----
ET	8	21.37 ± 0.49	163.50 ± 2.17	55.62 ± 1.38	20.82 ± 0.49	88.87 ± 1.38
CT	8	20.66 ± 0.36	164.75 ± 2.12	58.37 ± 2.28	21.46 ± 0.58	88.62 ± 2.78

*Significant level was set at *P*< 0.05. Data are expressed as mean±SEM. (C) without training,(ET) as a eccentric training, (CT) concentric training.

Table 2: Sérum GR, GPx (IU/L) activation and Hb (gr/dl) in before (Pre) compared with after training (Post) in différent groups (n= 24)

	Plasma GR (Iu / l)		Blood GPx (Iu/l)		Hb (gr/dl) mean±SE	
	Pre	Post	Pre	Post	Pre	Post
C (n = 8)	82.75±7	82.45±8.03	147.21±13.76	157.72±19.06	12.79±1	12.50±0.96
ET (n = 8)	132.87±44.41	99.65±11.14	714.88±107.79	820.17±111.17*	13.80±1.34	11.69±0.86*
CT (n = 8)	159.45±61.83	164.43±59.79	315.45±68.83	1125.10± 45.73**	13.48±0.77	12.12±1.05*

*Significant level was set at *P*< 0.05. Data are expresse as mean±SEM. (C) without training,(ET) as a eccentric training, (CT) concentric training.

DISCUSSION

In the past decade, evidence has accumulated that unaccustomed and strenuous exercise may manifest an imbalance between ROS and antioxidant defense resulting an oxidatively stressful environment in the body. The extent of oxidative damage during physical exercise is determined not only by the level of free radical generation, but also by the defense capacity of antioxidants [17,18]. At the present study, we measured blood GPx activity and plasma GR activity after eccentric and concentric training. Our finding, indicated no significant change in plasma GR activity in eccentric and concentric training group after training to before training and with regard to control group. This result was consistent with the results some of the other studies [19,20]. On the other hand, decreased GR activity in plasma after 30 min of aerobic activity in young mend and women [21], and decrease GR activity after physical activity [22] have also been reported, so Sinha *et al.* [23] reported increase GR activity in plasma after practiced reutine physical training exercise for 6 months. Clearly, these result are mixed and likely depend on the time of sampling, as well as the duration and intensity of exercise, which has varied considerably across studies [24]. In the present study, dischange significant in plasma GR activity could be due to ensures plasma GSH by increased hepatic GSH efflux as a result of perform training.

In the present study, there was a significant increased in blood GPx activity between eccentric and concentric training group with control group and in concentric group, after training with regard to before training. Increased blood GPx activity after long term training [25], in athletes various sports [26], in untrained men after 12 week training [27] and young men and women after acute physical activity [21] have also been reported. On the other hand, decreased GPx activity after exhaustive exercise[28] and dischange GPx activity after strength or endurance exercise training in middle-aged men [2], have been reported. These equivocal results related to different in subject, duration and intensity of exercise [24]. At the present study, increased GPx activity in blood due to high concentration ROS especially H_2O in body, which probably to be higher in concentric group in regard to eccentric training.

CONCLUSION

Present study indicated that duration and especially intensity of exercise are important stimulus for creation prominent in body antioxidant system and eccentric and concentric training could have been follow-on antioxidant responses, which these responses more clear in concentric training group. In whole to regard of duration and intensity training in this study, indicated improvement in activity antioxidant enzymes.

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