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Research Article

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Oxidative stress reaction to exercise training, comparison of resistance, training exercises in men professional bodybuilders of Tehran City

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ABSTRACT

The aim of this study was to compare the effect of endurance training and oxidative stress reaction in men professional bodybuilders of Tehran city with traditional and cluster loading. For this purpose, 40 men aged 21.5 - 27.5 years were assigned to the following two training groups. They took part in this survey voluntary who never has had any especial diseases, metabolic or genetic problems and they had for 1month special exercises and far of smoking, drugs and doping by the uses of traditional and cluster protocols on plasma 8-OHdG and 4-HNE. For analyzing data, t-tests for independent and dependent samples were used. The results showed a significant difference between the effects of traditional and cluster protocols on plasma 8-OHdG and 4-HNE concentration. Thus, resistance exercise with traditional and cluster loading has a significant effect on the blood markers of oxidative stress, but the effect of cluster loading is significantly more great and it should be used carefully.

Keywords: Blood Markers, Oxidative Stress, Traditional and Cluster Loading, Resistance Exercises, Body Building.

INTRODUCTION

Physical exercise is recommended for the maintenance of well-being and as a means to reduce risk for several chronic diseases. The beneficial effects of exercise might also be related to homesick [1], and since long-term exposure to moderate exercise is able to affect antioxidant defenses either in young and old people [2]. Oxidative stress has mainly been studied in the context of aerobic exercise while the response to resistance exercise is less defined. Among the different type of exercises recommended for older adults, several studies have incorporated explosive-type resistance training in older adults to improve muscle power, as a fundamental muscle capacity for older adults well-functioning [3]. Fitness trainers should be aware of the suitable type and intensity of exercise in order to achieve a correct balance between the improvement of health-related fitness capacities, exercise-related ROS production and antioxidant induction. Oxidative stress is a biological phenomenon marked by an imbalance between reactive free radicals (FR) and the antioxidant defense system [4]. Many studies have reported that acute exercise increases FR production, intensifies oxidative stress, and causes cellular damage [5]. Conversely, it has been shown that aerobic or anaerobic (resistance) exercises performed regularly decrease oxidative stress and attenuate lipid peroxidation levels while significantly increasing antioxidant enzyme activity [6-7]. This may be explained by a well-adapted antioxidant defense system in physically active people [8] Moreover, most studies on oxidative stress and antioxidant responses to exercise have been performed using prolonged endurance exercise protocols [9-10]. In this respect, the physiological load of intermittent exercise, such as resistance exercise (RE), differs from a continuous steady-state exercise.

RE training or strength training is the preferred form of exercise for increasing an individual's physical fitness [10], Intensity, volume, and frequency are basic components of RE training. The intensity in RE training is often quantified as a function of the maximum weight that can be lifted once (one-repetition maximum, 1RM), and the

number of repetitions is limited for a given intensity. It has been reported that regular RE training decreases oxidative stress in some patient groups (e.g. Parkinson's, rheumatoid arthritis, and obesity) [7]. Additionally RE has been suggested as an alternative to improve the physical fitness status of individuals, especially when it is considered that long-term performance of aerobic exercises is generally unsuccessful under conditions such as obesity. Therefore, RE grows in importance every day. Conflicting results associated with oxidative stress and some exercise components of RE (e.g. intensity, exercise volume) influenced the design of this study. Additionally, it has been shown that oxidative stress markers may respond differently in various conditions [11], Understanding how oxidative stress and the antioxidant defense system respond to the exercise intensity during RE in trained and untrained men may therefore provide new information on the physiological effects of RE training. Also body building(Weightlifting) is the practice of performing regular exercises designed to make the muscles of the body conspicuous which has many fans who adores this sport which managers of sport should provide the facility to develop in and control doping and all the drugs related.

The inconsistent information about the effect of exercise on oxidative stress may be due to the amount of stress induced by the exercise, the strength of the antioxidant system, and exercise intensity and duration. Morillas-Ruiz et al. (2005) examined the effects of an antioxidant supplementation on exercise-induced oxidative stress during a 90-minute constant-load test on a bicycle ergo meter at 70% VO2max.The urinary excretion of 8-OHdG increased significantly by 21% in the placebo group. The results suggested that in moderately trained cyclists, antioxidant supplementation counters oxidative stress induced by a 90 min exercise at 70% VO2 max [3].

Orhan et al. (2004) evaluated the biomarkers of exercise-induced oxidative damage in man, including increased urinary excretion of lipid, protein, and DNA oxidation products .The subjects exercised 60 min at 70% of maximal O2 uptake on a cycle ergometer, and urine 8-OHdG was analyzed using the ELISA method before, 24 hours after, and 72 hours after the exercise. The results indicated a significant increase in post-exercise 8-OHdG levels [12].

Bloomer et al. (2007) examined the independent and combined effects of antioxidant supplementation and prior eccentric exercise in attenuating markers of oxidative stress (blood protein carbonyls and peroxides) in resistance trained men. They found that eccentric exercise results in minimal blood oxidative stress in resistance trained men [13].

Deminice et al. (2011) examined the responses of oxidative stress biomarkers to an acute session of that showed resistance training and reported significant increases in post-exercise oxidative stress biomarkers [14].

Azizbeigi, Stannard and Atashak (2014) Antioxidant enzymes and oxidative stress adaptation to exercise training: Comparison of endurance, resistance, and concurrent training in untrained males. The results showed that SOD significantly increased by 21.85% (p ¼ 0.020), 9.54% (p ¼ 0.032), and 14.55% (p ¼ 0.038) in the ET, RT, and CT groups, respectively. Furthermore, the activity of erythrocyte GPx significantly increased in the ET (p ¼ 0.018) and CT (p ¼ 0.042) groups. The TAC increased significantly in the ET (p ¼ 0.040) and CT (p ¼ 0.049) groups compared with the pretest values. The MDA level significantly decreased in the ET group by 32.7% (p ¼ 0.028), by 32% in the RT group (p ¼ 0.025), and by 29.1% (p ¼ 0.047) in the CT group. However, there was no significant difference in the interaction of time and group between variables of SOD and GPx enzymes and TAC of plasma and MDA in the ET, RT, and CT groups ($p < 0.05$) [15].

Atabek (2015) examined Oxidative stress and antioxidant responses to progressive resistance exercise intensity in trained and untrained males. The results indicated that there was no significant training status x intensity interaction for examined variables ($p>0.05$) [11].

Standardized volume of RE increased oxidative stress responses, so this survey compare the effect of endurance training and oxidative stress reaction in professional bodybuilders of Tehran city with traditional and cluster loading.

EXPERIMENTAL SECTION

This research was quasi-experimental, RE trained (traditional group, n=20) and (cluster males group, n=20) participated in this study. Inclusion criteria were: non-tobacco user, free of any antioxidant supplements for at least six weeks before the start of this study, maximal oxygen consumption (VO2max) less than 60 ml· kg-1· min-1 [5], no RE experience for UT group, and minimum of one year continuous whole body RE experience for RET group at body building, the men aged 21.5-27.5 years were assigned to the following two training groups. They took part in this survey voluntary who never has had any especial diseases, metabolic or genetic problems and they had for 1month special exercises and far of smoking, drugs and doping by the uses of traditional and cluster protocols on plasma 8-OHdG and 4-HNE. F. In fact participants completed a health history questionnaire before enrolment to

ensure that there were no existing health risks and to quantify each subject's physical activity status .Written informed consent was obtained from each participant. All participants were completely informed about the study. The variables included traditional-loading protocol (TLP), cluster-loading protocol (CLP), and plasma 8-OHdG, 4-HNE, and UA concentrations. Exercise sessions consisted of back squat, chest press, pull-down, and push up and bodyweight walking lunges .The markers of oxidative stress (8-OHdG and 4-HNE were), were measured using a special kit. EDTA was used as anticoagulant. Descriptive statistics and t-tests for independent and dependent samples were used for data analysis.

RESULTS AND DISCUSSION

Our data indicated: The demographic data of the sample are provided in Table 1.

Table 1. Demographics data

Items	N	Min.	Max.	Mean	SD
Age (yrs.)	40	21.5	27.6	23.5	1.29
Weight (kg)	40	71.9	110.00	88.21	3.8
Height (m)	40	1.69	1.87	1.74	1.21
BMI (kg/m^2)	40	19.1	25.3	21.54	0.92

Resistance exercise with traditional loading had no significant effect on plasma 8-OHdg concentration. The results of t-test showed no significant difference between the pre-test and post-test values of this variable (t = 7.12; p=0.5) (Table 2).

Table 2. Plasma 8-OHdG concentration before and after resistance exercise with traditional loading

Variable	Pre-test	Post-test	t-value	P
8-OHdG	9.1100 ± 9.5	18.1200 ± 10.5	7.12	0.5

Resistance exercise with traditional loading had no significant effect on plasma 4-HNE concentration. The results of t-test showed no significant difference between the pre-test and post-test values of this variable (t = 11.31; p = 0.1) (Table 3).

Table 3. Plasma 4-HNE concentration before and after resistance exercise with traditional loading

Variable	Pre-test	Post-test	t-value	P
4-HNE	353.1890±98.6	366.0741±103.5	11.31	0.1

Resistance exercise with cluster loading had no significant effect on plasma 8-OHdG concentration. The results of t-test showed no significant difference between the pre-test and post-test values of this variable (t = 2.72; p = 0.06) (Table 4).

Table 4. Plasma 8-OHdG concentration before and after resistance exercise with cluster loading

Variable	Pre-test	Post-test	t-value	P
8-OHdG	61.14±11.12	66.14±11.12	2.72	0.06

Resistance exercise with cluster loading had no significant effect on plasma 4-HNE concentration. The results of t-test showed no significant difference between the pre-test and post-test values of this variable (t = 4.12; p = 0.001) (Table 5).

Table 5. Plasma 4-HNE concentration before and after resistance exercise with cluster loading

Variable	Pre-test	Post-test	t-value	P
4-HNE	479.68±152.21118	539.54±170.08298	4.12	0.001

The results of t-test for independent samples showed that there was a significant difference between the effects of resistance exercise with traditional and cluster loading on plasma 8-OHdG concentration (t = 13.8; p = 0.01) (Table 6).

Table 6. Comparison of plasma 8-OHdG concentrations after resistance exercise with traditional and cluster loading

Variable	Traditional Loading	Cluster Loading	t-value	Mean Difference	P
8-OHdG	19.54 ± 9.21	53.61 ± 10.33	13.8	-34.07	0.01

The results also showed a significant difference between the effects of resistance exercise with traditional and cluster loading on plasma 4-HNE concentration (t = 5.66; p = 0.001) (Table 7).

Table 7. Comparison of plasma 4-HNE concentrations after resistance exercise with traditional and cluster loading

Variable	Traditional Loading	Cluster Loading	t-value	Mean Difference	P
4-HNE	377.13 ± 105.068	532.12 ± 89.11	5.66	-154.99	0.001

DISCUSSION AND CONCLUSION

The present research is the first to examine the responses of the blood markers of oxidative stress to resistance exercise with both traditional and cluster loading. The results showed that resistance exercise with traditional and cluster loading had significant effect on plasma 8-OHdG concentration.

Excretion of 8-OHdG is a marker of oxidative DNA damage. Various studies have shown that exercise-induced oxidative stress does not have a constant effect on oxidative DNA damage. A single bout of intensive exercise did not have a significant effect on urinary excretion of 8-OHdG [12]. Our results are consistent with those of Sumida et al. (1997). Research has also shown the effect of regular aerobic exercise on 8-OHdG activity. Higher intensity (≥80% of 1RM) was required to enhance protein oxidation. During the test, DNA damage (8-OHdG) increased in both groups but these increases were not significant. Furthermore, the results showed that regular RE training increases the antioxidants, which defends the system against oxidative damage. However, there were no significant group differences or group (training status) x intensity (time) interaction for oxidative stress biomarkers .In fact The exercise section which based on power will increase blood pressure, stroke volume ,resistance vessels so their heart became huge also their will suffer from Anemia .But in the endurance training is different. This adaptation has also been observed in the trained subjects of the present research. Lack of a significant increase in this oxidative stress marker can be attributed to the time of sampling, low exercise intensity, or the time was not enough to effect on it and adjustment in the protective mechanism against oxidative DNA damage. In the present research, samples were collected near the end of exercise and the resistance exercise protocols with traditional and cluster loading had no significant effect on plasma 8-OHdG concentration. This survey is similar to Atabek (2015) [11] and against Deminice et al. (2011) [14], Orhan et al. (2004) [12]. We suggest to Future researcher to measure the markers of oxidative stress in Endurance training and women in other sports.

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