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Intensive and chronic impacts of continuous and alternative 8-week stamina exercises on IGF-1 and interleukin in young women

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ABSTRACT

Background: The main purpose of this study is to compare chronic and intensive impacts of two kinds of continuous and alternative stamina exercises on IGF-1 and IL-15 in active young women. Objective: For this purpose 21 women were randomly divided into three groups of continuous, alternative, and control. The two experimental groups participated in 8 weeks of incremental stamina exercise. Before that immediately after and two hours after the first test (48 hours before the exercises commence) and the final test (48 hours after the exercises finish) blood samples were taken from the participants. Continual measurement variance analysis was used to study the changes of variables of interest in the two groups of continuous and alternative exercises. To compare continuous and alternative groups regarding the presence of the control group, independent one-way variance analysis was conducted and immediately after and two hours after activity independent T-test was conducted. Results: To make sure that variables under study do no change in the control group paired T-test was used. The results show that both continuous and alternative 8-week stamina exercises increase the level of IGF-1 and IL-15 in young women's serum. Conclusion: It seems that these exercises lead to anabolic effects in young women's bodies and this may not be the matter of the exercise being continuous or alternative.

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INTRODUCTION

Nowadays stamina exercises are common amongst people and recently, girl have started to use these exercises as well to get in shape. These exercises lead to physiological changes and adaptations [1]. Quasi-insulin growth factor causes hypertrophy and growth in muscles. In skeletal muscle cells,IL-15 makes an aggregation of a heavy protein chain of myosin in separated myogenic and therefore it is an anabolic factor in muscle growth[2]. IL-15 may cause the difference under conditions in which the intensive effects of quasi-insulin growth factor (IGF-1) recover. The role of IGF-1 is clear in stamina exercises and IL-15 could be of a drastic effect regarding the role it has on protecting protein from getting destructed[3]. There are numerous researches about the changes in IGF-1 level following stamina exercises, some are supportive and some are against the idea. Regarding the drastic effects IGF-1 has on power and regarding the fact that there is no clear view about the effects of exercise on IGF-1 level and it is not clear yet which exercise is a better stimulator, conducting this kind of study was of a great importance[5].

Methodology:

Participants:

The population in this study included female PE students in Tehran universities. A sum of 36 girls between the ages of 20 to 28 were chosen intentionally and were randomly divided into two experiment groups (14 girls each)and one control group (8 girls). In the end of exercises 8 girls remained in continuous exercise group and 7 remained in alternative exercise group. One girls was removed from control group too. In the day of final exam a sampling was conducted after the exercise period and one girl from continuous group quit having personal reasons. Then there were 21 participants in three groups of 7. According to the examination by a doctor, all participants were in complete physical health. Participants' properties are shown in table 1.

Table 1: Participants' properties.

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Control group	Alternative group	Continuous group	Variable
7	7	7	No.
25.14±2.34	22.14±2.47	22.28±2.13	age(year)
166.29±6.65	165.86±2.19	165.43±4.39	Height (centimeter)
67.34±9.59	59.6±8.08	56.52±1363	weight(Kg)

Data gathering method:

A week before the tests all participants were explained to about the whole protocol of the test and their maximum power was determined. Then 48 hours before the exercises commence there gathered in a session and blood samples were collected from the continuous and alternative groups immediately after and two hours after activity sessions and control groups were subjected to blood-sample collection without exercise. This session was started with 20% of maximum power. Then the two groups continued their exercises during 8 weeks incrementally. The exercise were thrice a week and the incremental growth of the power in exercises was as the following, 20, 25, 30, 35, 40, 45, 50, and 55%. After those 8 weeks and after the appropriate rest (48 hours after the last session) a session just like the first one was conducted. Before, immediately after and two hours after this session blood samples were collected and for the control group blood samples were collected without any exercise.

Training program:

Training program was as the following; 8 weeks, 3 days a week, 63 minutes each session including 10 minutes warm-up, 47 minutes main training, and 6 minutes cool-down. In this program a fraction of maximum repeats and performance velocity were chosen as training intensity and mass. The training load was the same for the two groups of experiment. Stamina exercises were designed with a cycle shape was conducted in two methods of continuous and alternative. Each cycle consisted of bench press, leg press, biceps, foot forward, triceps, instep, and side stretch ballet in the same order, the duration of each station was 2 minutes and a half with different velocities for continuous and alternative exercises. The break time between each station was 1 minute and between the two cycles 2 minutes. In each session two cycles were worked on. In continuous group exercises were conducted in 2 minutes and a half with the velocity of V (=75bpm) and for alternative group the velocity was 2V with the duration of 10 second and 1/2V for 20 seconds[6].

Blood sampling:

Before, immediately after and two hour after the first test (48 hours before the exercises commence) and after the final test (48 hours after the end of exercises) 5 cc of middle vein (basilica) blood was taken. The control group was only subjected to blood sampling in the beginning and at the end of the 8-week period. Samples were poured in sterile pipes containing K3EDTR. Hepatize pipes and EDTR were put in ice and then in room temperature for a few minutes. Then using centrifuge for ten minutes with 3500 rpm, serum was segregated from plasma. All sampling steps were the same for all participants.

Analyses of variables:

IGF-1 was determined for each serum sample using Eliza method and IDS kit (Immune-diagnosis system) with sensitivity level of 3.1 micro gram per liter. IL-15 was also measured using Eliza method and Elizaba kit with sensitivity level of 1 Pico gram per milliliter.

Statistical methods:

To test normality of distribution Kolmogorov- Smironov test and to study the changes in the variables of interest in both continuous and alternative exercise groups, continual measurement variance analysis was used. At the same time curvet of data was measured so that necessary adjustments of Greenhouse-Gazer could be conducted on the degrees of freedom. Also to compare the values measured in each sampling time for each group, one-way variance analysis was conducted before the activity and for two hours after activity independent T-test was used. Also to make sure that the variables in the control group are not changing paired T-test was used. For all statistical tests significance level was set at 0.05. SPSS16 software was used for statistical test and EXCEL 2003 was used for plotting purposes.

Findings:

Between rest values of IGF-1 in serum before and after 8 week of exercise in the three groups there was no significant difference ($p>0.05$).There was no significant difference between IGF-1 level in serum between alternative and continuous training groups ($p=0.05$).After-activity-IGF-1 level in serum after 8 weeks of exercisewas dramatically increased for both groups of continuous training and alternative training ($p=0.000$). IGF-1 level was increased in control group ($p=0.04$).

Between rest values of IL-15 in serum before and after 8 week of exercise in the three groups there was no significant difference ($p>0.05$).There was no significant difference between IL-15 level in serum between

alternative and continuous training groups (p=0.05). After-activity-IL-15 level in serum after 8 weeks of exercise was dramatically increased for both groups of continuous training and alternative training (p=0.003 and p=0.001). IL-15 level was increased in control group (p=0.45).

Table 2: Statistical descriptions for IGF-1 and IL-15.

Variables	Sampling Times	Continuous Groups	Intermittent Groups	Control Groups
IGF-1 (mg/L)	Pre	128.14±29.23	129.86±28.90	116.71±18.60
	Post 1	148.71±30.78	147.29±23.01	
	Post 2	156.14±34.20	157.71±20.26	
	Post 3	166.43±31.76	163.29±22.23	153±35.51
	Post 4	173±29.76	176.57±23.02	
	Post 5	187.43±28.20	192±21.32	
IL-15 (mg/dL)	Pre	19.91±1.51	19.95±1.58	19.91±1.60
	Post 1	20.47±1.79	20.41±1.58	
	Post 2	20.91±1.77	20.71±1.62	
	Post 3	20.01±1.45	20.17±1.47	19.97±1.61
	Post 4	20.60±1.78	20.35±1.60	
	Post 5	21.01±0.72	20.84±1.58	

Table 3: Statistical results of independent one-way variance analysis to compare rest levels between the variables of three groups.

Variables	Time of Sampling	F	P
IGF-1	Before Training	0.52	0.60
	After Training	0.37	0.69
IL-15	Before Training	0.003	0.99
	After Training	0.51	0.95

Table 4: Independent T-test results to compare the values after activity between the two experiment groups.

Variables	Time of Training	Time of Exercise	T	P
IGF-1	Before Training	Immediately After Exercise	0.09	0.92
		One Hours After Exercise	0.10	0.91
	After Training	Immediately After Exercise	0.25	0.80
		One Hours After Exercise	0.34	0.73
IL-15	Before Training	Immediately After Exercise	0.063	0.95
		One Hours After Exercise	0.22	0.83
	After Training	Immediately After Exercise	0.26	0.79
		One Hours After Exercise	0.19	0.85

Table 5: Statistical results of continual measurement variance analysis to study the changes in variables of interest in the two experiment groups.

Group	Variables	F	P
Continuous Groups	IGF-1	36.68	0.000 *
	IL-15	15.36	0.003 *
Intermittent Groups	IGF-1	25.02	0.000 *
	IL-15	10.29	0.001 *

Table 6: Dependent T-test results related to the changes of control groups during these 8 weeks.

Variables	T	P
IGF-1	2.58	0.04 *
IL-15	0.79	0.45

Discussion:

According to the findings, there is no difference between continuous and alternative groups in rest IGF-1 level in serum after the exercises were finished. Also there was not a significant difference between IGF-1 levels for continuous and alternative exercises after the period of study. In addition, there was no significant difference between IGF-1 levels in response to activities of continuous and alternative form. According to the results the level IGF-1 was dramatically increased after continuous and alternative stamina exercises.

Walker *et al* [7], studied the effects of 10-week stamina exercised on IGF-1 level and observed no change, which is inconsistence with our findings[7]. Urso *et al* [2] also, studied the impacts of a 10-week stamina exercises on muscular plasticity markers and density of IGF-1 receptors [2]. Muscular biopsy of 5 men and women showed that the density of IGF-1 receptors increased after the program which is consistence with our findings. In the study of Parkhouse *et al* [9], rest IGF-1 level was increased dramatically through stamina exercises, and it was concluded that IGF-1 can be effective in obtaining power through stamina exercises [9]. Borst *et al* [10] studied the impacts of stamina exercises on IGF-1 too[10]. Their main goal was to determine the effects of stamina exercises on current IGF-1 and the two attached proteins in the blood. Their program consisted of 25 weeks of training, three sessions a week. The results showed that during 13 weeks of stamina

exercises the level of circulating IGF-1 increased by 20%. Mac Call *et al* [12] studied the chronic and intensive impacts of stamina exercises on hormones. 11 male students exercised for 12 weeks. The results showed no change. Razmjo *et al* [13] reported that IGF-1 level decreased after a pyramid and an inverse pyramid stamina activity session but the change was not significant [13]. Rahimi *et al* [14] set a training session with 1RM 85% which included 4 sets of scot and pres sine, break time between the sets was 60, 90, and 120 seconds[14]. They found that IGF-1 level increases after the training session with 60 seconds of break time which is consistence with our results and against the results of Razmjo *et al* [13]. Kramer [15] suggested that a set of variables affect intensive and chronic responses of hormones. They mentioned some of the important factors namely; intensity, laod, duration, muscle mass involved along with characteristics of participants like age, height, health level, and training conditions. However anabolic responses following stamina exercises are not out of expectation, and we know that IGF-1 is the most important hormone causing hypotrophy after stamina exercises. But under different conditions researches may lead to different results. In the current study both groups of continuous and alternative exercises showed the increase in IGF-1. IGF-1 develops a very strong bind to a carrier protein in the blood, the protein itself, for instance somatomedine C, is made in response to GH. As a result somatomedine C slowly gets to the perimeter from the blood and a half-age of 20 hours is suggested for it. This causes linger indiscontinuous growth of GH. IGF-1 are attached to carrier proteins and circulate in the body through the blood, which leads to some changes in their half-age and prolongs it.

According to the findings the difference between IL-15 in serum was not significant between the two groups of continuous and alternative. Also there was no significant difference between IL-15 in response to continuous and alternative stamina exercises. In addition no significant difference was observed IL-15 levelin the response to two activity kinds of alternative and continuous before the test. According to the results of the current study, IL-15 level was dramatically increased during the period of both continuous and alternative stamina exercises. However, there was no change in rest levels before and after the 8 weeks. The adjuster role of muscle contraction is not clear regarding IL-15. The level of IL-15 mRNA in skeletal muscles was measured immediately and two hours after training courses which was reported to be the same as basic level, while a study showed the increase in IL-15 protein plasma immediately after intensive stamina activities. It is also suggested that IL-15 mRNA level in skeletal muscles increase following power trainings. However there are not many researches in the fields of impacts of different exercises on IL-15. In the study of Richman et al, participants exercised thrice a week with 75% of maximum power in three sets with 6-10 repeats in 13 stamina sports. Plasma IL-15 protein increases significantly immediately after intensive stamina trainings but it does not change with training and it is not associated with the change in muscular response. The level of IL-15 mRNA in skeletal muscles was measured immediately and two hours after the exercises and it was reported that there was no difference in the level of IL-15 and the basic level. Nevertheless in this study IL-15 plasma protein was increased immediately after intensive exercises of stamina. In another study it was suggested that IL-15 mRNA levels in skeletal muscles adjust in response to power exercises. Since the performance and adjustment of IL-15 and IL-15 R alpha are complicated, there is a need for more basic researches in this field. In human myogenic cells, IL-15 causes a heavy chain aggregation of protein in different muscular cells. It is also suggested that IL-15 causes the segregation between common myogenic and IGFs. Additionally, in contrast to IGF-1, IL-15 effects the integrity of myoblasts. This means that IL-15 can fight against protein resolution.

Conclusion:

Regarding the results of this study, it is concluded that 8 weeks of continuous and alternative training both lead to higher levels of IGF-1 and IL-15 in young females' serum which provides physiological and metabolic adaptations in the body. On the other hand, in the terms if difference between stamina exercises of continuous and alternative kind, which was the main incentive for this study, no significant difference was found. According to the findings of this study, it seems that after stamina exercises in young women anabolic processes are dominant, and it probably has nothing to do with the exercise being continuous or alternative. Anyhow regarding the lack of enough studies in this field, the call for more research seems inevitable and insisting on the findings of one or two studies or jumping to a conclusion is irrational. There is a need for more research.

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