INNSPUB

International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print) 2222-5234 (Online)
http://www.innspub.net
Vol. 3, No. 9, p. 222-233, 2013

RESEARCH PAPER OPEN ACCESS

Effects of eight weeks continuous and intermittent resistance trainings on relaxation levels and in response to exercise levels of GH and IGF-1 serums of active young women

Masume Naser Bigdeli[1], Maghsoud Peeri[1], Abdol Ali Banaeifar[2], Mohammad Ali Kohanpour[3], Mohammad Hassan Boostani[4], Amir Hamzeh Zare[5], Elham Ghanbarpanah[6]

[1]Department of Exercise Physiology, Faculty of Physical Education and Sports Sciences, Islamic Azad University, Central Tehran Branch, Tehran, Iran
[2]Islamic Azad University, South Tehran Branch - Department of Sport Physiology, Faculty of Physical Education, Islamic Azad University, South Tehran Branch, Tehran, I. R. Iran
[3]Islamic Azad University, Central Tehran Branch – Young Researchers Club, Tehran, Iran
[4]Education Organization of Fars Province, Fars, Iran
[5]Shiraz University, Fars, Iran
[6]Islamic Azad University, Arsanjan Branch – Young Researchers Club, Arsanjan, Fars, Iran

Key words: GH, IGF-1, continuous and intermittent exercises, resistance exercise.

doi: http://dx.doi.org/10.12692/ijb/3.9.222-233 Article published on September 20, 2013

Abstract

In attention to researches shortage about influence of various types of resistance exercises on growth factors, the purpose of the present study was determination and comparison of two types of continuous and intermittent resistance trainings on relaxation levels and in response to exercise levels of GH and IGF-1 serums of active young women. Twenty one 20-28 year old active young women were randomly divided to three groups of continuous training, intermittent training and control groups. Two experimental groups participated in 8 weeks progressive resistance trainings. Blood samples were taken from the subjects, before, immediately then and 2 hr after first test (48 hr before trainings beginning) and final one (48 hr after trainings ending). Control group gave blood samples, only at the beginning and ending of the 8 weeks period. In order to investigate variations of under study variables in both continuous and intermittent training groups, variance analysis test with repeated measurements was used. In attention to presence of control group, to compare between continuous and intermittent training groups at step of before activity independent one-way variance analysis test was utilized, and independent T test was plied at steps of immediately then and after activity. In order to investigate changes of under study variants in control group, T paired test was used. Both continuous and intermittent eight weeks resistance trainings would cause increase in GH and IGF-1 serums of active young women. Continuous resistance exercises would cause larger increment of GH than intermittent ones, though there wasn't observed any difference between continuous and intermittent types of resistance exercises, in IGF-1. Considering larger increment of GH in continuous training group in comparison to intermittent one, there's a probability that anabolic processes following continuous resistance trainings are more than ones following intermittent resistance trainings. However, there wasn't observed such a similar difference in IGF-1 serum between the 2 types of trainings. So, rather investigations are required to acquire an accurate conclusion.

* **Corresponding Author:** Mohammad Hassan Boostani ✉ boostani_mh@yahoo.com

Introduction

Resistance exercises have been noticed by many people, especially women, in purposes of fitness, recently. These exercises, which contain various types like concentric, eccentric, isometric and even continuous and intermittent, would cause physiologic changes and consistencies, which most prominent of them could appear in growth factors. Following muscle damages, consequent on resistance exercises or independent of those exercises, growth remedial variations are activated, which anabolic hormones and growth factors are from these changes, that they're effective in almost growth aspects of tissue (Cappon *et al.*, 1994; Ohlsson *et al.*, 2000; Weltman *et al.,* 2008; Weltman *et al.,* 2006), Insulin-like Growth Factor (IGF-1 or Somatomedin C) and Growth Hormone (GH) are from these growth factors, which affect on tissue growth aspects (Charles, 2006). Growth hormone, which is also named Somatotropic or Somatotropin, is a tiny protein molecule containing 191 amino acids in a simple chain with molecular mass of 22005 Dalton. This hormone causes growth in cells sizes and increment of Mitose in company with cells proliferation and specific cells separation, like bone growth cells and primary muscle cells (Cappon *et al.*, 1994; Ohlsson *et al.*, 2000; Weltman *et al.,* 2008; Weltman *et al.,* 2006). Somatomedin-C or Insulin-like Growth Factor, which known as affirmative stimulant of muscle growth, is produced in liver and skeletal muscles and has endocrine and autocrine-paracrine roles (Boostani *et al.,* 2007; Borst *et al.,* 2001).

Molecular weight of somatomedin-C is about 7500 Dalton. This hormone has a strong influence in increment of growth aspects. Plasma concentration of somatomedin-C follows excretion speed of Growth Hormone (Cappon *et al.*, 1994; Ohlsson *et al.*, 2000; Weltman *et al.,* 2008; Weltman *et al.,* 2006). Growth Hormone and Insulin-like Factor are very important parameters which would cause growth generation and hypotrophy in muscles. So, it appears GH and IGF-1 have prominent operational roles in response and consistency of resistance exercises (Charles, 2006). Measurement of these influencing parameters following various training schedules, could aid superior understanding of acute and chronic effects of resistance exercises. A number of researches have been performed about variations of IGF-1 and GH levels following resistance exercises, that some of those studies show increase in levels of these hormones (Cappon *et al.*, 1994; Charles, 2006; Weltman *et al.,* 2008; Weltman *et al.,* 2006), some others didn't indicate any change in mentioned hormones (Kraemer *et al.,* 1995; Nindle *et al.,* 2001; Walker *et al.,* 2004). Considering incongruous information, and importance and influences of IGF-1 and GH in strength increment, and notice that relations of various types of resistance exercises (especially continuous and intermittent ones) with IGF-1 and GH haven't been investigated well, and it hasn't been cleared which strength exercise is a stronger stimulant to stimulate growth elements and strength increment, hence rather researches in this field are necessary.

Therefore, the purpose of the present study is determination and comparison of effects of 8 weeks continuous and resistance trainings on relaxation levels and in response to exercise levels of GH and IGF-1 serums of active young women.

Material and methods

Subjects

Thirty six 20-28 years old sport student girls of Tehran city declared their readiness to participate in the study after an announcement in universities of Tehran city. They were randomly divided to 2 experimental groups (each group consisted of 14 persons) and a control one (8 persons). Only 7 persons remained in each group, after ending of trainings period. The other subjects were eliminated, because of their personal reasons. According to examination and approval of physician, all of the subjects had perfect physical healthiness. The subjects are homogenized (except in hereditary objects) to reduce probability of impressionability of dependent variables by disturbing variants, as much as possible. The subjects' properties have been represented in Table 1.

Data collecting method

The subjects were become familiar with trainings protocol in justification meeting, one week before research execution. Beside introduction of the subjects with resistance movements, anthropometric properties, height, weight, body fat percentage and also IRM were measured, in justification session. Then, the subjects attended in test session, 48 hr before trainings beginning and blood samples were taken from training groups, before, immediately then and 2 hr after a continuous or intermittent resistance exercise session. This session was conducted with 20% of a maximal repetition. Then, the subject performed their trainings schedules in span of 8 weeks and with progressive manners. After ending of 8 weeks trainings and after a rest, which was proportional to the interval between the first samples collecting day and trainings beginning (48 hr), last session of resistance activities was conducted just like the first day and with the same 20% of a maximal repetition. Blood samples were taken from the subjects, before, immediately then and 2 hr after the last session. Control group gave blood samples without any exercise.

Trainings schedule

Resistance trainings schedule consisted of 8 weeks (3 exercises days in each week) and span of each session was 63 min (including 10 min warm-up, 47 min main exercise and 6 min cool-down). In this schedule, a percentage of a maximal repetition and speed execution considered as intensity and mass of training. Exercises loads were the same for continuous and intermittent resistance exercises. The progressive implemented load was in a manner that during these 8 weeks, the subject performed their training with 20%, 25%, 30%, 35%, 40%, 45%, 50% and 55% of a maximal repetition for the first week to the last one, respectively. The resistance trainings were designed in circular figures and 2 schemes of continuous and intermittent procedures. Each circle contained chest press, feet press, fore-arm, fore-feet, rear-arm, rear-feet and sidelong tension or length, which order of execution was the same as what mentioned. Duration of each station considered as 2 min and 30 sec, which executed with different speeds in continuous and intermittent exercises. The continuous training group performed 2 min and 30 sec of each station with speed of V, continuously. And, the intermittent one carried out 10 sec with speed of 2V and 20 sec with speed of $^{1}/_{2}$V intermittently, to the ending of 2 min and 30 sec of each station. Speeds of movements were been controlling by metronome. Rest intervals between 2 successive stations and circles considered as 1 min and 2 min, respectively. Two circles were considered in each exercise session. Both of before and after the trainings period resistance activities, which counted as the test session and samples collecting one, respectively, were done in the same mentioned figures and with 20% of a maximal repetition. Each person started and finished her entire activity sessions in particular times. These times are the same for all of her exercise sessions. The subjects of control group didn't performed any sport and physical exercise and proceeded their daily and usual activities.

Blood samples collecting and analysis

Blood samples were taken from middle vein of the subjects in amounts of 5 cc, before, immediately then and 2 hr after the first test (48 hr before trainings beginning) and the final one. Control group gave blood samples, only at the beginning and ending of the 8 weeks training period in company with the 2 experimental groups and without any exercise activity. It should be noticed, in order to compensate lost liquids, enough drink was considered to drink by participants. The gathered samples were poured in pipes, which contain K3EDTR. The heparin pipes and EDTR were placed in ice and then remain in room temperature, for some minutes. Thereafter, serum separated from plasma by centrifuge pump in duration of 10 min and with revolution of 3500 RPM. All of the blood samples preserved in frigid forms and at temperature of -20°C, and were used at times of Lab examinations. It should be mentioned, the participants were wanted to avoid consuming cigarette, alcohol and caffeine at the last nights of samples collecting days and generally during the study stages. All of samples collecting steps are done

in the same condition for the whole participants. Growth Hormone (GH) serum was measured by Elisa method using LDN (Labor Diagnostica Nord GMBH2Co) kit with sensitivity of 0.2 (ng/ml), for each sample. Insulin-like Growth Factor 1 (IGF-1) serum was measured by Elisa method utilizing IdS (Immundiagnostiv System) with sensitivity of 3.1 (μg/l), for each sample.

Statistical methods

At first, values of whole under study variables were described using mean and standard deviation. Then, Kolmogorov–Smirnov test was utilized to investigate naturalness of distributions and usage of parametric or non-parametric tests. Because data have natural distributions, so variance analysis test with repeated measurements was applied, to investigate variation of under study variants in both continuous and intermittent groups. Also, data sphericity was investigated, simultaneously with execution of variance analysis test, to implement Greenhouse-Giggs modification on degree of freedom, in necessary cases. Besides, in order to compare values of collected samples, in each time and concern to under study variables, between continuous and intermittent groups, and with considering the presence of control group, independent one-way variance analysis test was used for step of before the activity and independent T test was implemented for steps of immediately then and 2 hr after the activity. T paired test was utilized to investigate changes of the control group, too. Also, for inter-groups comparison and inner-group investigation of anthropometric properties, independent one-way variance analysis test and T paired test were used, respectively. Level of significance was considered as 0.05, for the whole statistical tests and SPSS v.16 was used for statistical calculations.

Results

Statistical descriptions of GH and IGF-1 values and anthropometric properties have been represented in tables 2 and 3, respectively. The values have been reported as mean and standard deviation. Table 4 represents statistical results of one-way variance analysis test which has compared relaxation levels of before and after the training period between the three continuous and intermittent resistance training and control groups. Table 5 shows results of Tukey's post hoc test concern to the observed post exercise significant differences from independent one-way analysis test (table 4). Table 6 indicates results of independent T test which has compared post exercise values of the under study variables of before and after the trainings period between the two continuous and intermittent training groups. Table 7 presents results of variance analysis test with repeated measurements that has investigated variations of the under study variants in the 2 groups. Table 8 represent results of LSD post hoc test concern to the observed significant differences in both training groups from the variance analysis test with repeated measurements (table 7). Table 9 shows results of dependent T test which has investigated changes of the control group, during 8 weeks.

Table 1. Properties of the subjects.

Variable	Continuous Group	Intermittent Group	Control Group
Number	7	7	7
Age (years old)	22.28±2.13	22.14±2.47	25.14±2.34
Height (cm)	165.34±4.39	165.86±2.19	166.29±6.65
Weight (Kg)	56.52±13.63	59.6±8.08	67.34±9.59

There wasn't any significant difference in GH serums of the three groups, before the trainings period (P=0.09). The differences between the groups were significant, after the trainings period (P=0.03). However the difference between the continuous and intermittent groups weren't significant (P=0.057). At the step of before the trainings period, values of GH in the continuous group were significantly more than its values in the intermittent one, immediately then and 2 hr post exercise, in response to sport (P<0.05).

Also, at the step of after the trainings period, the values of GH in the continuous group were significantly rather than its values in the intermittent one, 2 hr post exercise, in response to sport (P<0.05). Levels of GH serum increased significantly in the whole three continuous, intermittent and control groups, during the research period (P<0.05).

Table 2. Statistical descriptions of GH and IGF-1.

Variables	Sampling Times	Continuous Groups	Intermittent Groups	Control Groups
GH (ng/ml)	Pre	2.98±0.99	2.15±0.36	2.83±0.59
	Post 1	3.22±0.71	2.34±0.47	
	Post 2	3.53±0.74	2.74±0.51	
	Post 3	3.75±0.89	2.83±0.43	3.77±0.66
	Post 4	3.88±0.88	3.13±0.51	
	Post 5	4.15±0.63	3.31±0.54	
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	

Table 3. Measured anthropometric properties before and after the trainings period.

Variable	Group	Before 8 weeks trainings	After 8 weeks training
Weight (Kg)	Continuous	56.52±13.63	57.51±12.81
	Intermittent	59.6±8.08	62.92±7.70
	Control	67.34±9.59	66.53±8.99
Around back (mm)	Continuous	70.37±9.02	69.9±8.54
	Intermittent	74.14±7.31	72.67±.7.70
	Control	81.42±11.42	80.91±11.53
Around hips (mm)	Continuous	92.6±10.33	91.27±10.16
	Intermittent	95.94±4.6	93.7±3.33
	Control	99.21±6.12	99.84±7.33
Trident fat (mm)	Continuous	13.28±5.21	11.85±3.33
	Intermittent	12.75±4.75	12.42±4.39
	Control	15.42±2.76	15.57±1.13
Upper pelvis fat (mm)	Continuous	11.85±4.29	8.71±2.92
	Intermittent	10.28±3.03	8.14±2.11
	Control	14.14±2.67	13.85±1.46
Thigh fat (mm)	Continuous	21.28±5.49	20.28±4.85
	Intermittent	22±4.12	23±6.40
	Control	21±4.08	20.71±4.02
Around thigh (mm)	Continuous	55.17±7.68	52.90±6.60
	Intermittent	56.81±4.31	56.95±2.63
	Control	60.21±4.48	60.14±4.14
Arm thigh (mm)	Continuous	24.38±3.23	25.11±3.92
	Intermittent	25.6±1.92	26.52±1.88
	Control	27.14±2.52	26.85±2.41

There wasn't any significant difference in IGF-1 between the 3 groups, before the trainings period (P=0.60). There wasn't any significant difference in IGF-1 between the 3 groups, after the trainings period, too (P=0.69). Also, at the steps of before and after the trainings period, there wasn't any significant difference in values of IGF-1 between the two training groups, immediately then and 2 hr post exercise, in response to sport (P>0.05). Levels of IGF-1 serum increased significantly in the whole three continuous and intermittent training and control groups, during the study period (P<0.05).

In the continuous resistance training group, around hips (P=0.007), upper pelvis fat (P=0.01) and around thigh (P=0.004) significantly decreased, from before to after 8 weeks trainings, though there wasn't observed any significant difference in other measured anthropometric variants (P>0.05). In the intermittent resistance training group, weight increased significantly, from before to after 8 weeks trainings

(P=0.004) and around hips (P=0.02) and upper pelvis fat (P=0.006) significantly decreased, from before to after 8 weeks trainings. But, there wasn't seen any significant difference in other gauged anthropometric variables (P>0.05). There wasn't observed any significant difference in the control group (P>0.05). About inter-groups comparison of measured anthropometric variables of the study, significant differences between the three groups only seen in after 8 weeks trainings values of upper pelvis fat (P=0.000) and around thigh (P=0.03). However, there wasn't observed any significant difference in both concerned values of continuous and intermittent groups (P=0.88 for upper pelvis fat and P=0.27 for around thigh). After 8 weeks trainings, values of upper pelvis fat in both the two training groups were more than the concerned values in the control one (P=0.001 for the continuous group in comparison with the control one, and P=0.000 for the intermittent group in comparison with the control one). After 8 weeks trainings, values of around thigh in the continuous group were significantly less than the control one (P=0.02), though there wasn't any significant difference between the intermittent and control groups, in this issue (P=0.43). There wasn't any difference among the three groups, about other measured anthropometric variants (P>0.05).

Table 4. Statistical results of independent one-way variance analysis test to compare relaxation levels of under study variable among the three groups.

Variables	Time of Sampling		Sum of Squares	df	Mean Square	F	P-value
GH	Before Training	Between Groups	2.68	2	1.34	2.71	0.09
		Within Groups	8.91	18	0.49		
		Total	11.60	20			
	After Training	Between Groups	3.99	2	1.99	4.22	0.03 *
		Within Groups	8.51	18	0.47		
		Total	12.50	20			
IGF-1	Before Training	Between Groups	714.66	2	357.33	0.52	0.60
		Within Groups	12219.14	18	678.84		
		Total	12933.81	20			
	After Training	Between Groups	690.66	2	345.33	0.37	0.69
		Within Groups	16593.14	18	921.84		
		Total	17283.81	20			

** The mean difference is significant at the 0.05 level.*

Table 5. Results of Toki's post hoc test concern to observed significant differences of GH relaxation levels post exercise from independent one-way variance analysis test.

Comparison of Between Groups	Mean Difference	Std. Error	P-value
Continuous Groups - Intermittent Groups	0.91	0.36	0.057
Continuous Groups - Control Groups	0.02	0.36	0.99
Intermittent Groups - Control Groups	0.93	0.36	0.050 *

** The mean difference is significant at the 0.05 level.*

Discussion

According to founds of the present study, the difference between the continuous and intermittent group, among GH serum relaxation levels of before and after the trainings period, wasn't significant. Though, GH relaxation levels were a bit more in the continuous group. Also, in response to sport, values of GH in the continuous training group were rather than its values in the intermittent one, immediately then and 2 hr after exercise, before the trainings period. And, in response to sport, values of GH in the continuous training group were more than its values in the intermittent one, 2 hr after exercise, after the trainings period. Intensity of activity is one of the most important exercise variables in hormonal response, and also duration of exercise is another

influencing substantial parameter, after exercise intensity (Kraemer, 1988). Indeed. Intensity and duration of exercise of both types of resistance exercises were the same in the present research, and their difference was in continuous and intermittent execution of a similar exercise for both groups of the subjects. The continuous groups showed rather GH levels in the whole stages of samples collecting, which indicates rather body growth response to trainings in active young women. The continuous trainings use rather lipid acids than the intermittent ones to produce energy, and it has been determined that GH associates with summoning lipid acids (Wilmore and Costill, 2004). The issue that, active young women, which have performed continuous exercises, had rather relied on metabolism of fat acids, might be a probable reason for having more GH serums than their duplicates in intermittent group. Of course, the recent subject is only a supposition in attention to fundamentals of sport physiology, and there's only one way to achieve accurate results and solve existing ambiguities, and it's carrying out rather controlled researches in this field. In contrast, Weltman *et al.,* (2008) showed both types of aerobic continuous and intermittent resistance exercises have the same effect on increment of growth hormone secretion in young adult persons.

Table 6. Statistical results of independent T test to compare post exercise values of under study variables between the two training groups.

Variables	Time of Training	Time of Exercise	T	df	P-value
GH	Before Training	Immediately After Exercise	2.69	12	0.01 *
		2 Hours After Exercise	2.31	12	0.03 *
	After Training	Immediately After Exercise	1.93	12	0.07
		2 Hours After Exercise	2.65	12	0.02 *
IGF-1	Before Training	Immediately After Exercise	0.09	12	0.92
		2 Hours After Exercise	0.10	12	0.91
	After Training	Immediately After Exercise	0.25	12	0.80
		2 Hours After Exercise	0.34	12	0.73

** The mean difference is significant at the 0.05 level*

Table 7. Statistical results of variance analysis test with repeated measurements to investigate variations of under study variants in the two training groups.

Group	Variables	Sum of Squares	df	Mean Squares	F	P-value
Continuous Groups	GH	6.55	5	1.31	22.10	0.000 *
	IGF-1	14838.4	5	2967.68	36.68	0.000 *
Intermittent Groups	GH	6.87	5	1.37	26.06	0.000 *
	IGF-1	16641.54	5	3328.31	25.02	0.000 *

** The mean difference is significant at the 0.05 level.*

Also, Murphy and Hardman (1998), Jakicic *et al.*, (1999) and Donnelly *et al.*, (2000) observed increment of growth hormone and weight reduction in both aerobic continuous and intermittent resistance exercises. Averages body Weights of both training groups increased, in the present study, which was significant, in the intermittent training one. Perhaps, the reason of different results concerns to differences in implemented training protocols. However, previous founds are negligible about this matter and rather researches should be executed, yet. Base on the understandings of the present study, GH serums levels of both the continuous and intermittent groups increased significantly, during the research period. Weltman *et al.*, (2008) found out both the continuous and intermittent exercise trainings would lead to increase in GH hormone excretion. Daniel *et al.*, (2010) investigated two types of resistance exercises, which one of them included fore-arm movement and the other involved fore-open and fore-feet, on twelve 21 year old persons in duration of 15 weeks. There wasn't occurred any GH increment in

the first type of trainings, but a significant increase was observed, immediately after 15 to 30 min, in the second one. Muscles cross sections increased 12% and 10% in the first and the second types of trainings, respectively. Marx *et al.*, (2001) investigated consistency in resistance exercises with low masses versus the ones with high masses, among women and in duration of 4 weeks. Their results indicated GH remained invariant. Niklas *et al.*, (1995) investigated GH responses to 16 week resistance trainings, in thirteen 60 years men, and showed GH doesn't change after exercises execution. Their trainings schedule caused 37% increase in upper organ power and 39% increment of lower organ power. Net body mass increased considerably, whereas fat percentage decreased.

Table 8. Statistical results of LSD post hoc test concern to observed significant difference in both training groups from variance analysis test with repeated measurements.

	Continuous Groups		Intermittent Groups	
	GH	IGF-1	GH	IGF-1
Pre - Post 1	P = 0.15	P = 0.007 *	P = 0.10	P = 0.02 *
Pre - Post 2	P = 0.002 *	P = 0.003 *	P = 0.007 *	P = 0.03 *
Pre - Post 3	P = 0.000 *	P = 0.003 *	P = 0.002 *	P = 0.002 *
Pre - Post 4	P = 0.002 *	P = 0.000 *	P = 0.001 *	P = 0.001 *
Pre - Post 5	P = 0.001 *	P = 0.000 *	P = 0.001 *	P = 0.000 *
Post 1 - Post 2	P = 0.008 *	P = 0.03 *	P = 0.003 *	P = 0.14
Post 1 - Post 3	P = 0.001 *	P = 0.01 *	P = 0.001 *	P = 0.000 *
Post 1 - Post 4	P = 0.012 *	P = 0.001 *	P = 0.002 *	P = 0.003 *
Post 1 - Post 5	P = 0.000 *	P = 0.000 *	P = 0.001 *	P = 0.000 *
Post 2 - Post 3	P = 0.04 *	P = 0.11	P = 0.22	P = 0.29
Post 2 - Post 4	P = 0.04 *	P = 0.005 *	P = 0.003 *	P = 0.01 *
Post 2 - Post 5	P = 0.001 *	P = 0.000 *	P = 0.001 *	P = 0.001 *
Post 3 - Post 4	P = 0.39	P = 0.24	P = 0.02 *	P = 0.04 *
Post 3 - Post 5	P = 0.01 *	P = 0.004 *	P = 0.007 *	P = 0.002 *
Post 4 - Post 5	P = 0.07	P = 0.000 *	P = 0.01 *	P = 0.006 *

** The mean difference is significant at the 0.05 level.*

In the present research, only upper pelvis fat decreased significantly, in both groups. Understandings of Nicklas *et al.*, (1995) showed an acute resistance exercise would cause GH responses in elder people, though 16 weeks resistance trainings haven't any influence on basic concentration of this anabolic hormone. McCall *et al.*, (1999) investigated acute and chronic effects of resistance trainings on hormones. Eleven male students carried out exercises, in duration of 12 weeks. GH hadn't any variation in their results. A considerable relation was shown between increment of GH average and increases in muscle fibers of #1 and #2 types. Their understandings indicated resistance exercises haven't any effect on serum and relaxation concentrations of this hormone. Perhaps, disagreement of these founds hides in various trainings protocols or different exercises spans. Also, difference in under study societies shouldn't be ignored.

Beside general effects of growth hormone in growth generation, GH has also many exclusive metabolic effects, which they're particularly increase in amount of protein synthesis in entire body cells by means of heightening amine acid transition from cells membranes, accentuation of RNA translation for protein synthesis through Ribosome and increase in RNA formation via DNA copying increment and catabolism reduction, increase in fat acid calling to produce energy, and decrease in amount of glucose in the whole body. In these manners, growth hormone actually increases body protein, consumes fat storages and preserves carbohydrates (Guyton and Hall, 2011). So, it seems both continuous and intermittent resistance trainings cause desirable growth and metabolic influences on active young women.

Therefore, these women could ply those exercises. Of course, concerning to understandings of the present study, it appears these effects are rather in continuous resistance trainings. However, more researches should be done to present an unfailing conclusion in various research conditions. There're many unclear details about GH responses to various types of resistance exercises.

According to founds of the present study, there isn't any significant difference in IGF-1 serum between continuous and intermittent exercises, before and after the trainings period. Also, there wasn't observed any significant differences in IGF-1 between before and after the trainings period of continuous and intermittent exercises. Though, in order to distinguish the results well, rather accomplished investigations are required, but when in the present study, intensities and durations of exercises have been kept the same and in contrast, the resistance exercises were executed in manners of continuous and intermittent, there wasn't any significant differences on variations of IGF-1 serums, between the two types of trainings.

Table 9. Statistical results of dependent T test concern to changes of the control during 8 weeks.

Variables	T	df	P-value
GH	3.88	6	0.008 *
IGF-1	2.58	6	0.04 *

** The mean difference is significant at the 0.05 level.*

Also, base on understandings of the present research, levels of IGF-1 serums increased significantly among both continuous and intermittent resistance training groups, during the trainings period. Daniel *et al.*, (2010) investigated two types of resistance exercises, which one of them included fore-arm movement and the other involved fore-open and fore-feet, on twelve 21 years old men, in duration of 15 weeks. There wasn't any increment in IGF-1 but a significant increased was observed, immediately after 15 to 30 min. Muscles cross sections increased 12% and 10% in the first and the second exercise, respectively. Orsatii *et al.*, (2008), investigated variations of body compositions, muscular strength and plasma hormones after resistance exercise among menopausal nerveless women. Fourteen-three 45 to 70 years old subjects were divided to two control and resistance training groups. Their exercise involved 2 to 3 movements for big muscular groups and 1 movement for small ones. Each movement included 3 sets with 8 to 12 repetitions for each set. The trainings continued for 16 weeks. Training group showed higher IGF-1 than control one. Walker *et al.*, (2004), investigated effects of 10 weeks strength exercises on IGF-1. Volunteers carried out intense strength exercises in 2 groups of body big muscles and elbow bender muscles and in duration of 10 weeks (2 sessions for each week). Outcome issue indicated that there wasn't observed any change in IGF-1. Parkhouse *et al.*, (2000), investigated possibility of rest status IGF-1 access increment in elder women who infected to low destiny mineral skeleton. Resistance exercise leads to significant increase in maximal repetitions of entire sports. Amount of IGF-1 increased significantly by resistance exercises. These researchers concluded IGF-1 might role in significant obtainment of observed strength by resistance exercise, in their study society. Borst *et al.*, (2001) studied effects of resistance exercises on IGF-1. Their trainings schedule involved 25 weeks trainings (3 sessions, weekly). Results of their study showed circulating IGF-1 increased almost 20%, during first 13 weeks. There wasn't shown more increment between 13^{th} to 15^{th} weeks, and these researchers concluded increment of circulating IGF-1 might job, at least, a part of increase in strength under resistance exercises and affect on it, indirectly. Marx *et al.*, (2001) investigated consistency to light mass resistance exercises versus heavy mass one in women, in duration 4 weeks. Their results indicated that IGF-1 increased. Nicklas *et al.*, (1995) investigated IGF-1 response to 16 weeks resistance trainings among thirteen 60 years old men, and showed IGF-1 wouldn't change after exercise execution. Whereas,

their trainings schedule caused 37% increment of upper organ and 39% increase in lower one. Also, in their research subjects' pure body mass increased considerably, while fat percentage decreased. In the present study, only upper pelvis fat decreased in both training groups, significantly. Kraemer *et al.,* (1999) compared endocrine system consistency to resistance exercises between young and elder men and deduced IGF-1 didn't vary, after 10 weeks trainings. McCall *et al.*, (1999) investigated acute and chronic effects of 10 weeks exercises on hormones. Eleven male students were doing exercises, for 12 weeks. Results of their research represented IGF-1 hadn't any variation. Their understandings indicated resistance trainings haven't any influence on IGF-1 serum and relaxation concentrations.

In order to determine reasons of rising incongruous results, further investigations are needed. However, expectation of observing anabolic response following resistance exercises couldn't be simplistic. Results mightn't possibly same, in various research conditions. Training protocols probably play major roles, in observation of different founds. Kraemer (1988) stated a collection of several variables affects on hormonal acute and chronic response. He rated intensity, mass, span and training rest period and also engaged muscular mass in company with subjects' characteristics like; age, fitness level and training situation, important. The growth hormone has a week connection to blood plasma proteins. So, this hormone set free into tissues rapidly and its half-life in blood is less than 20 min. In contrast, IGF-1 builds a strong link to a carrier protein in blood. Likewise somatomedin C, this carrier protein is generated in response of GH, too. Therefore, somatomedin C set free from blood to tissues, slowly and in some references a half-life of about 20 hr was reported for it. This matter elongates progressive effects of GH patchy growth, largely (Guyton and Hall, 2011). Pseudo-insulin growth factors have connected to carrier proteins and circulate in blood current. This issue creates some variations in their half-life and extends them. These factors have anabolic effects. It could be mentioned amine acid transportation, DNA and RNA centesis, proteins centesis, chondroitin sulfate production, collagen centesis (to stimulate cartilages and muscular tissues), amine acids transportation, glucoses transportation, glycogen generation (pseudo-insulin activity) and also in lipid tissue; glucoses transportation, lipolysis process regulation and cells copying stimulation (Guyton and Hall, 2011), among influences of these factors (Guyton and Hall, 2011). So, it seems both continuous and intermittent resistance trainings cause demonstrations of such consistencies. However, rather studies with consideration of other affecting variables.

Conclusion

According to the founds of the present study, it's concluded 8 weeks continuous and intermittent resistance trainings (both) cause increase in GH and IGF-1 serums of active young women. This matter leads to provide desirable physiologic consistencies and anabolic medium in body. Besides, in comparison between continuous and intermittent resistance trainings (Which was the most important purpose of the present study), it was determined continuous resistance exercise cause rather increment of GH compare to intermittent one. Although, there wasn't observed any significant difference about the mentioned result of resistance trainings for IGF-1. Hence, it appears anabolic activities are dominant, after resistance exercises, and though there isn't any relation about IGF-1, whether resistance activity is continuous or intermittent, but continuous resistance trainings cause greater anabolic effects in comparison to intermittent one. However, regarding to shortage of study in this field, it's simplistic a bit, to conclude without rather researches with more subjects, confidently and insist on it.

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