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The acute and chronic effects of continuous and intermittent resistance trainings on levels of GH and IGF-1 serums in active young men

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Abstract

The aim of the present research was determination of acute and chronic effects of continuous and intermittent resistance trainings on levels of GH and IGF-1, in active young males. For this purpose, twenty-one men were randomly divided to three continuous training, intermittent training and control groups. Two experimental groups participated in eight weeks progressive resistance trainings. Blood samples were taken from the subjects, before, immediately then and 2 hrs after first test (48 hrs before the trainings beginning) and final one (48 hrs after the 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 groups, variance analysis test with repeated measurements, was used. Considering the presence of the control group and at stage of before activity, independent one-way analysis of variance was implemented, to compare between continuous and intermittent training groups. And, independent T test was applied, at steps of immediately then and 2 hrs after activity, for that comparison. Also, T paired test was utilized, to confide nonbeing change of under study variables, in the control group. Results indicated that the eight weeks both continuous and intermittent trainings would cause increase in GH and IGF-1 serums of active young men. In the other hand, there wasn't observed any difference between continuous and intermittent resistance trainings, about increments of GH and IGF-1 serums. It seems resistance trainings would generate acute and chronic anabolic influences in bodies of active young males, and these effects don't have any relation to the type of resistance trainings (whether continuous or intermittent). However, in order to achieve an accurate conclusion, further investigations with more subjects and measurement of other effective variants are required.

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Introduction

Recently, the resistance trainings have been noticed by many people, especially men, with the purposes of healthiness. These trainings, which involve various kinds like; concentric, eccentric, isometric and even the continuous and intermittent types, would cause generations of physical consistencies and changes, that the most prominent of these generations could appear in growth factors. Various growing remedial changes would be activated, following muscular damages from resistance trainings or independent from those trainings. Anabolic hormones and growing factors are some of these variations, which are effective on increases in most growing aspects of tissues (Ohlsson *et al.*, 2000; Cappon *et al.*, 1994; Weltman *et al.,* 2008; Weltman *et al.*, 2005). Pseudo-insulin growth factor or IGF-1 or somatomedin C and growth hormone or GH, are some of these parameters, which are effective on growth aspects of the tissues (Tipton, 2006). The growth hormone, which is called somatotropin or somatotropic hormone, is a small protein molecule, containing 191 amine acids in one chain with molecular weight of 22005 Dalton. This hormone would cause enlargement of sizes of cells and increment of mitose, in company with proliferations of cells and exclusive separation of some types of cells, like gowning bones cells and primary muscular ones (Ohlsson *et al.*, 2000; Cappon *et al.*, 1994; Weltman *et al.,* 2008; Weltman *et al.*, 2005). Somatomedin C or pseudo-insulin factor, which is recognized as affirmative stimulant of muscular growth, is generated in liver and skeletal muscles, and has endocrine and autocrine-paracrine roles (Ohlsson *et al.*, 2000). Molecular weight of somatomedin C is about 7500 Dalton. This hormone has a strong influence on increment of growing aspects. Concentration of this hormone in plasma follows the secretion speed of the growth hormone (Ohlsson *et al.*, 2000; Cappon *et al.*, 1994; Weltman *et al.,* 2008; Weltman *et al.*, 2005). The growth hormone and pseudo-insulin growth factor are some of vital parameters, which would cause generation of growth and hypotrophy in muscles. So, it seems GH and IGF-1, have important applicable parts in responses and consistencies to resistance trainings (Tipton, 2006). Measurement of these effective variables, following various resistance trainings schedules, could aid to superior understanding of acute and chronic effects of resistance trainings. Some researchers have been done about GH and IGF-1 levels variations, following resistance trainings, and some of them showed increments of the levels (Cappon *et al.*, 1994; Weltman *et al.,* 2008; Weltman *et al.*, 2005; Borst, 2001), and some others didn't indicate any change (Kraemer *et al.*, 1995; Nindle *et al.*, 2001; Walker *et al.*, 2004). Considering the existence of incongruous information and the importance and influences that GH and IGF-1 have on strength increment, and notice to the matter that the relations of various kinds of trainings (especially continuous and intermittent ones) with GH and IGF-1 haven't been seen, well, and it hasn't been cleared that what kind of strength trainings are stronger stimulants to stimulate growth structures and strength increment, further researches are necessary in this field. So, the purpose of the present study was determination and comparison of 8 weeks continuous and intermittent effects on relaxation and in response to sport levels of GH and IGF-1 serum, in active young males.

Material and methods

Subjects

Statistical society of this research consisted of entire active male students of Shiraz city. Twenty-one 24-30 years old active male students of Shiraz (Iran) announced their readiness to participate in the research, and were purposefully chosen as subjects and were divided to two experimental groups and one control team (7 persons in each groups). The whole subjects had perfect healthiness, based on examination and approval of physician. The researcher decreased the probability of dependent variables' impressibility from disruptive variants, as possible, by homogenizing the subjects (except the heredity matters).

The subjects' properties have been represented in Table 1.

Data collecting method

One week before the research execution, the subjects were become familiar with the trainings protocol, in justification meeting. In addition of introduction of the subjects with resistance movements, their properties and a maximal repetition for each sport execution were measured. Then, the subjects attended in test session, 48 hrs before the trainings beginning, and blood samples were taken from the training groups, immediately then and 2 hrs after one continuous or intermittent activity session, and also were gathered from the control team, which didn't carry out any exercise. This first continuous or intermittent activity session was held with 20% of a maximal repetition. Thereafter, the subjects performed their training schedule in a progressive manner, during 8 weeks. They practiced 3 weekly sessions. Also, the implemented progressive overload was in a manner that the subjects performed their trainings with 20%, 25%, 30%, 35%, 40%, 45%, 50% and 55% of a maximal repetition for the first to the eighth weeks, respectively. After ending of the 8 weeks trainings, and thereafter a proportional rest to the first samples collecting day and trainings beginning (48 hrs), the last activity session was held, just like the first day and with 20% intensity of a maximal repetition. Also, before, immediately then and 2 hrs after this session, blood samples were taken, and the without exercise control group gave its blood samples, too.

Trainings schedule

The resistance trainings schedule involved 8 weeks (3 weekly sessions), and span of each session was 68 min and contained 10 min warm up, 52 min main exercise and 6 min cold down. In this schedule, a percentage of a maximal repetition and execution speed were considered as intensity and mass of training. The training load was the same in the resistance continuous and intermittent trainings. The resistance trainings were designed in circular figures and two schemes of continuous and intermittent. Each circle consisted of chest press, feet press, fore-arm, fore-feet, rear-arm, rear-feet and sidelong tension (or length), which the order of movements' executions was the same with that of the recent mentioned movements. The span of each station considered as 3 min, which done with different speeds in the continuous and intermittent trainings. The rest intervals between each two stations and each two circles were considered as 1 min and 2 min, respectively. Two circles were considered in each training session. The continuous training group performed the 3 min of each station with speed of V (V was considered as 75 BPM). The intermittent training group carried out 10 sec and then 20 sec with speeds of $2V$ and $^1/_2\,V$, respectively, till finishing of the 3 min of each station. Because speeds of the movements were controlled by metronome, number of movements in each set was same for the whole movements and with increment of exercise intensity.

Collecting and analysis of blood samples

Before, immediately then and 2 hrs after the first test (48 hr before trainings beginning) and the final one (48 he after trainings ending), blood samples were taken from the middle veins (basilic) of the subject, in amount of 5 cc. The control group gave blood samples at the beginning and ending of the 8 weeks period (in company with the two experimental groups), and its members avoided any physical training and were doing their usual and ordinary activities, in this research period. It should be mentioned, to compensate lost liquid of the body, adequate drinks were prepared for the participants, after each activity session. The collected samples were poured in sterile pipes, containing K3EDTR. Heparin and EDTR pipes were placed inside ice and then remained at environment (room) temperature, for few minutes. Then, serum separated from plasma by centrifuge, with revolution of 3500 (RPM) and in duration of 10 min. The whole blood samples were preserved in frozen form and at temperature of -20℃, and thereafter were used at laboratory examination time. It should be noticed, the participants were demanded to avoid using cigarette, alcohol and caffeine, at the nights before samples collecting and generally in entire stages of the research. The whole steps of samples collecting were carried out in the same conditions, for each of the participants. Also, each

participant started and finished his entire activity sessions at their particular times, which were same for his entire training sessions. The growth hormone (GH) serum was measured by ELISA method using LDN (Labor Diagnostica Nord GMBH2Co) kit, with sensitivity level of 0.2 (ng/ml), for each sample. Pseudo-insulin growth factor (IGF-1) serum was gauged by ELISA method utilizing ids (Immunodiagnostiv System) kit, with sensitivity level of 3.1 (mg/l).

Statistical methods

At first, value of each under study variable was described by utilizing mean (average) and standard deviation. Initially, Smirnov-Kolmogorov test was applied, to investigate natural distribution and usage of parametric or non-parametric tests, in this research. Since, the data had natural distribution; analysis of variance test with repeated measurements was used, to investigate variations of under study variables in both continuous and intermittent groups. Also, data sphericity was investigated, simultaneously with execution of variance analysis test, to implement Greenhouse-Giggs modification on relative degree of freedom, in necessary cases. And, in order to compare values of any sample collecting time concerned to each under study variable, between the two continuous and intermittent groups, independent one-way analysis of variance test was applied, at the step of before activity, considering the presence of the control group, and independent T test was utilized at the steps of immediately then and 2 hrs after activity. Also, T paired test was implemented, to confide nonbeing change of under study variables in the control group. The level of significance considered as 0.05, for the whole statistical tests. SPSS v.16 statistical software was used for accomplishing statistical calculations.

Results

Statistical descriptions of GH and IGF-1 values have been presented in table 2. The values have been reported as mean and standard deviation. Table 3 shows statistical results of independent one-way variance analysis test, which have compared relaxation levels of under study variables, between the three groups of continuous training, intermittent training and control, before and after the trainings period. Table 4 indicates results of Toki post-hoc test, concern to observed significant difference of post exercise relaxation levels from independent one-way analysis of variance (table 3). Table 5 represents results of independent T test that have compared post exercise values of under study variables, between the two continuous and intermittent groups, before and after the trainings period. Table 6 shows results of variance analysis test with repeated measurements, which have investigated variations of under study variants, in the two training groups. Table 7 presents results of LSD post-hoc test, related to observed significant differences of both training groups from variance analysis test with repeated measurements (table 5). Table 8 indicates results of dependent T test, which have investigated changes of the control group, during the 8 weeks.

Table 1. The subjects' properties.

Variable	Continuous group	Intermittent group	Control group
Number	7	7	7
Age (years old)	27.33±3.11	26.78±2.9	28.21±2.69
Height (cm)	178.31±4.55	178.63±5.21	179.34±6.83
Weight (Kg)	76.46±5.76	75.86±5.94	77.25±6.53

There wasn't observed any significant difference in GH serum, between the three groups, before the trainings period (P=0.93). A difference between the 3 groups was significant, after ending of the trainings period (P=0.018). However, the difference between the continuous and intermittent groups wasn't significant (P=0.99). Also, there wasn't observed any significant difference among in response to sport

values of GH, between the two experimental groups, immediately then and 2 hrs after exercise, before and after the trainings period (P>0.05). Levels of GH serum increased significantly, in both training groups, during the research period (P=0.000).

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

Variables	Sampling Times	Continuous Groups	Intermittent Groups	Control Groups
GH (ng/ml)	Pre	3±0.60	3.09±0.58	2.99±0.591
	Post 1	3.37±0.68	3.43±0.59	
	Post 2	3.91±0.78	3.92±0.74	
	Post 3	4.34±0.97	4.36±0.92	3.10±0.593
	Post 4	4.52±0.93	4.55±0.95	
	Post 5	4.69±0.95	4.71±1.001	
IGF-1 (mg/l)	Pre	118±24.27	140±28.64	128.29±30.75
	Post 1	138.71±29.69	157.29±19.88	
	Post 2	146.71±30.08	167.14±20.82	
	Post 3	155.43±27.14	174.29±23.77	141.43±36.45
	Post 4	167.57±24.60	182±26.38	
	Post 5	180.14±21.24	199.29±24.44	

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

Variables	Time of Sampling		Sum of Squares	df	Mean Square	F	P-value
GH	Before Training	Between Groups	0.5	2	0.025	0.071	0.93
		Within Groups	6.32	18	0.35		
		Total	6.37	20			
	After Training	Between Groups	7.28	2	3.64	5.02	0.018 *
		Within Groups	13.04	18	0.72		
		Total	20.331	20			
IGF-1	Before Training	Between Groups	1696.381	2	848.190	1.080	0.36
		Within Groups	14133.429	18	785.190		
		Total	15829.810	20			
	After Training	Between Groups	3806.095	2	1903.048	2.170	0.14
		Within Groups	15788.857	18	877.159		
		Total	19594.952	20			

* The mean difference is significant at the 0.05 level.

There wasn't observed any significant difference in IGF-1 serum, between the three groups, before the trainings period (P=0.36). The differences between the three groups, weren't significant, after ending of the trainings period, too (P=0.14). Also, there wasn't observed any significant difference among in response to sport values of IGF-1, between the two experimental groups, immediately then and 2 hrs after exercise, before and after the trainings period (P>0.05). Levels of IGF-1 serum increased significantly, in both training groups, during the research period (P=0.000).

Table 4. Results of Toki post-hoc test, concern to observed significant difference of post exercise relaxation levels of GH.

Comparison of Between Groups	Mean Difference	Std. Error	P-value
Continuous Groups - Intermittent Groups	0.024	0.45	0.99
Continuous Groups - Control Groups	1.23	0.45	0.036 *
Intermittent Groups - Control Groups	1.26	0.45	0.032 *

* The mean difference is significant at the 0.05 level.

Discussion

According to founds of the present study, the differences in relaxation levels of GH serum, between the continuous and intermittent groups, weren't significant, before and after the trainings period. Also, there wasn't observed any significant difference among in response to sport values of GH, between the two continuous and intermittent training groups. Exercise intensity is one of the most important training variables, in hormonal responses, and maybe span of exercise is another prominent and effective variant, after the intensity of exercise (Kraemer, 1988). Indeed, intensities and spans of both continuous and intermittent trainings were same in the present research, and the differences were in continuous and intermittent executions of similar trainings, for both experimental groups.

Table 5. Statistical results of independent T test to compare post exercise values of variables, between the two groups.

Variables	Time Training	ofTime of Exercise	T	df	P-value
GH	Before Training	Immediately After Exercise	0.17	12	0.86
		2 Hours After Exercise	0.024	12	0.98
	After Training	Immediately After Exercise	0.05	12	0.95
		2 Hours After Exercise	0.03	12	0.97
IGF-1	Before Training	Immediately After Exercise	1.375	12	0.19
		2 Hours After Exercise	1.477	12	0.16
	After Training	Immediately After Exercise	1.085	12	0.31
		2 Hours After Exercise	1.564	12	0.14

* The mean difference is significant at the 0.05 level.

Table 6. Statistical results of variance analysis test with repeated measurements to investigate variations of variables, in the two training groups.

Group	Variables	Sum of Squares	df	Mean Squares	F	P-value
Continuous Groups	GH	15.851	2.14	7.53	47.36	0.000 *
	IGF-1	14.52	1.44	10.04	10.04	0.000 *
Intermittent Groups	GH	16812.476	5	3362.495	37.405	0.000 *
	IGF-1	14628.857	1.835	7971.590	23.355	0.000 *

* The mean difference is significant at the 0.05 level.

The recent issue denotes similar growth responses of the bodies to these two types of trainings, in active young males. The continuous trainings use lipid acids for energy production more than the intermittent ones, and it has been determined that GH associates in calling of lipid acids (Wilmore, 2012). Though, because the activity execution of the intermittent training wasn't being cut during its 3 min, this training (the intermittent training) has properties of the continuous training, too. Actually, only exercise intensity of the intermittent training was being become heavier and lighter, and the exercise execution wasn't being cut, in duration of each movement. Also, Weltman *et al.*, (2008) indicated that both continuous and intermittent aerobic resistance trainings have same influence on increment of the growth hormone secretion, in mature young people. Murphy and Hardman (1998), Jakicic and Winters (1999) and Donnelly and Jacobsen (2000) observed increase in the growth hormone, in both aerobic continuous and intermittent trainings. However, previous founds are few about this field, and further researches should be done, yet. Based on understandings of the present study, levels of GH serum significantly increased in both continuous and intermittent resistance training group, during the research period. Daniel *et al.*, (2010) investigated two types of resistance trainings, which one of them involved for-arm movement and the other consisted of fore-open and fore-arm

movements, on twelve men with ages of 21 years old, and in duration of 15 weeks. It wasn't occurred any increase in GH, in their first exercise. But, a significant increment was observed in the second one, immediately after 15 to 30 min training. Cross section area of muscle increased 12% and 10% by the first and second trainings, respectively. Marx *et al.*, (2000) investigated the consistencies to resistance trainings with light masses versus those of with heavy ones, in duration of 4 weeks, in women.

Table 7. Statistical results of LSD post-hoc related to observed significant differences in both training groups from variance analysis test with repeated measurements.

	GH		IGF-1	
	Continuous Groups	Intermittent Groups	Continuous Groups	Intermittent Groups
Pre-Post 1	0.02*	0.001*	0.001*	0.039*
Pre-Post 2	0.001*	0.001*	0.001*	0.045*
Pre-Post 3	0.000*	0.000*	0.000*	0.009*
Pre-Post 4	0.000*	0.000*	0.000*	0.001*
Pre-Post 5	0.000*	0.000*	0.000*	0.000*
Post 1-Post 2	0.002*	0.005*	0.113	0.111
Post 1-Post 3	0.001*	0.001*	0.011*	0.001*
Post 1-Post 4	0.000*	0.001*	0.003*	0.001*
Post 1-Post 5	0.000*	0.001*	0.001*	0.000*
Post 2-Post 3	0.014*	0.006*	0.150	0.23
Post 2-Post 4	0.004*	0.002*	0.001*	0.045*
Post 2-Post 5	0.001*	0.001*	0.001*	0.001*
Post 3-Post 4	0.009*	0.011*	0.034*	0.24
Post 3-Post 5	0.002*	0.001*	0.007*	0.002*
Post 4-Post 5	0.025*	0.005*	0.009*	0.000*

* The mean difference is significant at the 0.05 level.

Results of hormonal changes were in a manner that GH remained invariant. Nicklas *et al.*, (1995) examined GH responses to 16 weeks resistance trainings, in thirteen men with ages of 60 years old, and showed GH didn't change after trainings execution. Their founds indicated that an acute resistance training would cause GH responses in the elderly, but 16 weeks resistance trainings didn't have 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 practiced, for 12 weeks. GH didn't change in their results.

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

Variables	T	df	P-value
GH	1.58	6	0.16
IGF-1	0.66	6	0.52

Their results showed the resistance trainings don't have any effect on relaxation and serum concentrations of this hormone (McCall *et al.*, 1999). The incongruous founds maybe understand, because of various training protocols or different durations of trainings periods. Also, the differences in under study society shouldn't be neglected. The growth hormone, except its common effects on growth generation, has many particular metabolic influences, too. Especially, some of these particular influences are; increase in protein centesis amount in entire cells of the body by intensification of amine acid transportation through cells' membranes, intensification of RNA translation for protein centesis by rybosoms and increment of RNA formation by increase in DNA copying and decrease in protein catabolism, increase in calling of lipid acids for energy production, and decrease in glucose level throughout the body. Therefore, the growth hormone actually increases protein of the body, consumes lipid storages and preserves carbohydrates (Guyton and Hall, 2006).

So, it seems both continuous and intermittent

resistance trainings would cause favorable metabolic and growth influences in active young men, who could use these trainings. However, further researches should be carried out to present a secure conclusion for various research conditions. There're still many unclear details about GH responses to various resistance trainings.

According to understandings of the present study, there wasn't observed any significant difference in IGF-1 relaxation levels, between the continuous and intermittent groups, before and after the trainings period. Also, there wasn't seen any significant difference among in response to sport values of IGF-1, between the two types of continuous and intermittent resistance activities, before and after continuous and intermittent resistance trainings periods. Although, it's needed to perform more researches, to clarify the results, well. In the present study, whenever intensities and spans of activities and trainings have been kept the same and the resistance activities and trainings were performed in continuous and intermittent schemes, there wouldn't be generated any different variation in concentrations of IGF-1 serums, between the two schemes.

Also, based on founds of the present research, levels of IGF-1 serums increased significantly, in both continuous and intermittent resistance training groups, during the research period. Daniel *et al.*, (2010) examined two types of resistance trainings, which one of them (1st type) involved fore-arm movement and the other (2nd type) consisted of fore-open and fore-feet movements, on twelve young men with ages of 21 years old and in duration of 15 weeks. It wasn't occurred any increase in IGF-1 by the first type of training, though a significant increment in IGF-1 was observed by the second type of training, immediately after 15 to 30 min exercise. In research of Orsatii *et al.*, (2008) their training group showed greater IGF-1 than their control one. Walker *et al.*, (2004) investigated effects of 10 weeks strength trainings on IGF-1. Their volunteers carried out intense strength training sessions, in two groups of large muscles of the body and elbow bender muscles, during 10 weeks (2 weekly sessions). Their outcome results showed that there wasn't observed any significant difference in IGF-1. Urso *et al.*, (2005) examined effects of 10 weeks resistance trainings on density of IGF-1 receptors. Muscular biopsies of 5 males and females indicated that IGF-1 receptors density of muscles increased in training group, after training period. Parkhouse *et al.*, (2000) investigated the possibility that long-term resistance trainings might increase rest status IGF-1 accessibility, in the elderly women with low bone mineral densities. Levels of IGF-1 increased significantly, by resistance trainings.

These researches concluded that IGF-1 might have roles about significant achievement of the observed strength by the resistance trainings. Borst *et al.*, (2001) surveyed effects of resistance trainings on IGF-1. Their training schedule consisted of 25 weeks trainings (3 weekly sessions). Results indicated that circulating IGF-1 increased almost twenty percent, during 13 weeks. There wasn't shown any further increment after 13th to 15th week, and these researchers concluded the increment of circulating IGF-1 might mediate at least a part of the strength enhancement of under influences of the resistance trainings, and had being been effective on it, indirectly. Marx *et al.*, (2001) investigated consistencies to light mass resistance trainings versus heavy ones, in females, in duration of 4 weeks. Hormonal results were in a manner that IGF-1 increased. Nicklas *et al.*, (1995) examined IGF-1 responses to 16 weeks resistance trainings, in thirteen males with ages of 60 years old, and showed IGF-1 didn't change, after trainings execution. Kraemer *et al.*, (1999) compared consistency of endocrine system to resistance trainings, between young and elderly men, and concluded IGF-1 didn't have any variation, after 10 weeks. McCall *et al.*, (1999) investigated acute and chronic effects of resistance trainings on hormones. Eleven male students practiced for 12 weeks. Results were in a manner that IGF-1 didn't have any change. Their understandings denoted the resistance trainings don't have any influence on relaxation and serum concentrations of IGF-1.

Further investigations are necessary, to determine reasons of incongruous founds. However, expectation of anabolic responses observation, following the resistance trainings, couldn't be simplistic. Results might not be same, in various research conditions. Training protocol might play a substantial role, in observation of various founds. Kraemer (1988) stated that a collection of several variables, effect on acute and chronic hormonal responses. He counted the intensity, mass, duration and rest period of training, and also engaged muscular mass of training, in company with subjects' properties like; age, healthiness level and training situation, substantial. The growth hormone has a weak link to proteins of blood plasma. Hence, this hormone would rapidly release from interior of the blood into the issues, and its half-life is less than 20 min, inside the blood. In contrast, IGF-1 establishes a strong link to carrier protein of the blood. This carrier protein is also created in response to GH, like somatomedin C. Therefore, somatomedin C would slowly release from the blood into the tissues, and some resources has mentioned a half-life about 20 hrs, for it. This matter elongates progressive effects of interrupted accretion of GH, largely (Guyton and Hall, 2006).

Pseudo-insulin growth factors, link to the carrier proteins and circulate inside the blood current, and this issue creates some changes in their half-life and would elongate them. These factors have anabolic influences. Some of these effects are; amine acid transportation, RNA and DNA centesis, proteins centesis, chondroitin sulfate production and collagen centesis to stimulates cartilages, and in muscular tissues are; amine acid transportation, proteins centesis, glucoses transportation, glycogen production (pseudo-insulin activity), and also in lipid tissues are; glucoses transportation, lipolysis process restraint and stimulation of cells copying (Guyton and Hall, 2006). So, it seems both continuous and intermittent trainings would cause appearance of such consistencies. However, further researches with consideration of other effective variables are still required.

Conclusion

According to understandings of the present study, it appears GH and IGF-1 increased in young men's bodies, after resistance activities. And, it seems these increments don't relate to type of resistance activity (whether continuous or intermittent). Considering the shortage of researches about this field, it's a little simplistic to present an emphatic conclusion and insist on it, without more investigations. It appears that further studies are required, about comparing effects of continuous and intermittent resistance trainings. Though, the increments of those anabolic hormones in both training groups, during the research period, and the lack of significant difference between the continuous and intermittent resistance trainings, are obvious in the present study. It seems that the two types of resistance trainings (considering to the utilized training protocol of the present research) would cause creation of anabolic physiologic consistencies in active young men. Of course, further researches with more subjects and measurement of other effective variables are required.

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