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The effects of concurrent training with and without branch chain amino acids on lipid profiles and testosterone level of male body-builders

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Abstract

Introduction: This study compared the effects of 8–week of concurrent exercises (aerobic and resistance training) with and without Branch Chain Amino Acids (BCAA) supplement on testosterone level and lipid profiles of male body builders.

Material & Methods: Forty male body builders that had 3-4 years training background were randomly selected and divided into two equal groups as control group who only did concurrent exercises (aerobic–resistance) and experimental group who perform concurrent exercise and taking BCAA supplement after training and before going to bed. The average age and body mass index of control group and experimental group were 24.8±5.1and 27.3±2.15, 25±2.1 and 27.4±2.13 respectively. To show the central tendency and variability, descriptive statistics was applied. Independent t-test analyses were carried out to discover the difference of the two groups. Statistical significance was set at ($P<0.05$). All data were analyzed by SPSS software, version 18.

Results: The results show significant decrease of Triglyceride (TG) (P=0.001), low density lipoprotein (LDL-c) (P=0.034), total cholesterol (TC) (P=0.003) and increase high density lipoprotein (HDL-c) (P=0.001) in control group and decrease of TG (P=0.001) LDL (P=0.037), TC (P=0.025) and increases of HDL-c (P=0.002) in experimental group. Furthermore, the testosterone level of subjects didn't change significantly in control and experimental groups.

Conclusions: In conclusion, concurrent training may be more effective than endurance and strength training alone for simultaneously improving the serum lipid profile.

Key words: Branched Chain amino acids, Concurrent exercises, Lipid profiles, Testosterone, Male Body-builders

1. Introduction

The consumption of nutritional supplements is so common among athletes especially among body builders to improve performance (1,2). Some studies has been shown that nutritional supplements with weight training can increase muscle fiber size and strength In both men and women, so it is not surprising that nutritional supplements are consumed in conjunction with resistance training (RT) to improve body composition and performance (3,4). However, the health and safety outcomes of these supplements are not well known when consumed in combination with RT. One of these supplements is Branched Chain Amino Acids (BCAAs). BCAAs refer to three amino acids: Leucine, Isoleucine and Valine. BCAAs supplementation, for people with low dietary protein intake, can promote muscle protein synthesis and increase muscle growth over time. It can also be used to prevent fatigue in novice athletes (5,6). BCAAs comprise one-third of muscle protein which its supplementation can decrease muscle protein degradation that, in turn, improves recovery from exercise (7). Also it seems there is correlation between BCAAs and increases in muscle protein synthesis (8)

Low density lipoprotein cholesterol (LDL-c) is considered the "bad" cholesterol because it contributes to plaque, a thick, hard deposit that can clog arteries and make them less flexible. This condition is known as atherosclerosis. It was reported that LDL-c levels decreases after aerobic exercise especially after high intensity activity, also HDL/ LDL ratio improve and total cholesterol (TC) remains unchanged (9).

High density lipoprotein cholesterol (HDL-c) is considered "good" cholesterol because it helps remove LDL-c from the arteries. HDL-c is most likely to improve as the result of physical activity (PA). Banz et al reported increase in HDL-c following 10-week aerobic training at 85% of the maximal heart rate (10). Regular aerobic exercise modestly increases HDL-c level. There appears to exist a minimum exercise volume for a significant increase in HDL-c level (11). Jafari and Ramezani (2012) studied the effects of 8-week concurrent training included (Interval endurance training and resistance training) and concurrent training (continuous endurance and strength training) on lipid profiles of obese non-active males. They found a significant increase of HDL-c level and strength in upper and lower extremities and significant decrease in their body fat percent, TG, LDL-c and TC levels in both groups (12).

Yektayar et al. (2012) compared the effects of resistance, endurance and combined exercises on lipid profile of non-athlete healthy middle aged men. The levels of HDL-c, LDL-c, TG and TC were measured before and after exercise. According to their finding the levels of TG and LDL-c levels decreased significantly in Endurance training and combined endurance and resistance training group ($P<0.05$). TC/HDL-c Ratio reduced significantly in resistance training group ($P<0.05$). TC levels did not show any significant change in the groups (13).

Testosterone is main anabolic hormone which it stimulates protein synthesis mainly in muscle. The testicles primarily make testosterone in men. Women's ovaries also make testosterone, though in much smaller amounts. Testosterone production starts to increase significantly during puberty, and begins to dip after age 30 or so (14). Testosterone will be elevation even in low intensity exercise but if prolonged enough in duration (15).

Limitation of study about the influence of concurrent training and branched-chain amino acid supplementation on Lipid Profiles and Testosterone level and controversial in previous studies findings this study seems necessary.

2. Material & Methods

Subjects and experimental design

In this semi-experimental study forty male bodybuilder attending sport clubs from Shiraz city of Iran randomly were chosen. The mean of their age, weight, height and BMI were 25±4.5, 82±4.25, 172±4.3 and 27.3±2.1 respectively. Our inclusion criteria were being male, having at least 3 years background of physical fitness training, and taking no supplement in the 3 months. Informed consent was obtained from every person participating in the study.

Subjects were divided in two equal groups as control and experimental groups according their BMI. The control group only did concurrent (aerobic –resistance) exercises however the experimental group did concurrent exercises along with using branched amino acids supplements. They took three 2.5-milligram BCAA tablets after training and three before going to bed. The two groups performed same exercises for about90 min, 3 days per week for a period of 8 weeks under the supervision of a skillful trainer. Every session started with stretching exercise and jogging for 5-10 min and for a period of 5-10 min of cooling down at the end of the period. Exercises were done on even days at 6:00 pm. The exercise protocols of the 2 groups were even and are summarized below:

Barbell Bench press, Barbell Push Press, Flat bench press with dumbbell, Dumbbell lateral raise, Barbell incline, Dumbbell Pull over, Barbell upright rows, Dumbbell decline, barbell upright rows, push up curl, Close grip bench press, half squat, Barbell triceps, Hug squat, sit up, treadmill, Cycling, Stomach Crunch, leg press, Leg extension. The aerobic training was done on treadmill equipped with heart beat pacer and with a maximum of 70%-75% of their maximal heart rate using targets heart rate method. The aerobic training lasted 40 min per session.

Anthropometric measurements

All anthropometrical measurements were done with the subjects wearing light underwear and without shoes. Body weight was measured to the nearest 0.5 kg; using digital scale (made in Germany) that was calibrated with a 50 Kg weight in the days that test was done. Height was measured to the nearest 0.5 cm against a wall mounted tape. Body mass index was calculated by dividing the weight in Kilograms by height in meters squared.

Blood samples

Blood samples were obtained in the morning after an 8-12 hr fast prior to the start of the study and again 8 weeks after at the end of the study under the same conditions. Serum total Cholesterol and triglyceride levels were measured by enzymatic kits (Mann Chemical Company) using an auto analyzer. LDL-c and HDL-c were measured by an Auto analyzer using commercial kits (Pars Azema Company, Teheran, Iran). Hormonal analysis was conducted by using single-antibody solid phase radioimmunoassay procedures using commercially available kit (Spectria, Finland) for the determination of total testosterone.

Statistical analyses

To show the central tendency and variability, descriptive statistics was applied. Independent t-test analyses were carried out to discover the difference of the two groups. Statistical significance was set at ($p<0.05$). All data were analyzed by SPSS software, version 18.

3. Results

Participant Characteristics of experimental and control group were shown in the Table 1.

Table 1. Participant characteristics of the experimental and control groups

Variables	Control group	Experimental group
Age (year)	24.8 ± 5.1	25 ± 2.1
Body weight (kg)	82.1 ± 5.7	82.50 ± 4.25
BMI (kg/m^2)	27.3 ± 2.15	27.4 ± 2.13

A significant decrease in the TG (P=0.001, P=0.001), TC (P=0.003, p=0.025), LDL-c (P= 0.034, P= 0.037) and an increase in HDL-c (P=0.001, P=0.002) and also a significant ratio between TC/ HDL-c in both groups were seen (Table 2 and Table 3).

Table 2. Lipid profiles and testosterone levels of control group at Pretest and Posttest

Variables	Pretest	Posttest	Inter-group Changes	
			t	P
TG (mg/dl)	165.2 ±49.3	143.2±43.5	3.92	0.001*
TC (mg/dl)	175.2±1.1	167.3±22.5	3.59	0.003*
LDL-c (mg/dl)	105.5±18.2	96.8±11.6	2.21	0.034*
HDL-c (mg/dl)	45.6±3.2	47.2±2	-4	0.001*
TC/HDL-c	4.1±0.32	3.6±0.91	4.72	0.000*
Testosterone (n mol/ml)	14.65±4.21	14.91±3.81	-9.30	0.07

* Significant differences (P<0.05)

Table 3. Lipid profiles and testosterone levels of experimental group at Pretest and Posttest

Variables	Pretest	Posttest	Inter-group Changes	
			t	P
TG (mg/dl)	168.2 ±51.3	144.2±43.5	3.91	0.001*
TC (mg/dl)	174±19.1	166.3±21.5	3.55	0.025*
LDL-c (mg/dl)	106.5±18.2	95.8±15.6	2.23	0.037*
HDL-c (mg/dl)	46.5±3.2	47.9±2	-4	0.002*
TC/HDL-c	4.1±0.36	3.7±0.50	4.67	0.000*
Testosterone (n mol/ml)	14.82±3.83	15.11±3.1	-5.44	0.45

* Significant differences (P<0.05)

4. Discussion

This study was designed to investigate the effects of 8-week of concurrent training with and without BCAAs supplementation on lipid profiles and testosterone level in body builder male. The finding revealed that there were significant decrease in serum levels of TG, TC, LDL-c and TC/HDL-c ratio and significant increase in serum level of HDL-c following 8-week in both groups. Furthermore, the testosterone of subjects didn't change significantly in control and experimental group.

Beneficial effect of physical activity to decrease the LDL-c, TC, TG levels, TC/HDL-c ratio and increased the HDL-c level were shown by many studies. Study based on middle aged individuals confirmed the beneficial effect of physical activity on LDL-c, TG and HDL-c, (16). Findings of this study indicated that TC levels decreased significantly in experimental and control groups. These results are consistent with Dange (1987) during yoga over a period of 4-5 months (17) and Khare et al. (1988) who determines that running have definite value in lowering total cholesterol (18). Physical activity improve lipid metabolism and increases the conversion of VLDL-c to HDL-c that result activation of lipolysis of fat tissue and decreases insulin and increases glucagon which lead concentration of free fatty acids in plasma. This process effects cholesterol buildup and reduce it (19).

We found that after 8- week of concurrent training HDL-c level increases. The factors influencing HDL-c levels are: Increase utilizing lipids by skeletal muscle as fuel and decrease consumption glycogen (20). Also it is possible physical activity decreases homocysteine which increasing HDL-c. Some study show resistance training improves lipid metabolism by lowering the synthesis of free fatty acids and stimulating lipid oxidation (21). The final factors may be depending upon energy expenditure. Ferguson et al. (1998) reported that 1100 Kcal of expenditure is needed to increases lipoprotein lipase activity which has been showed increases in HDL-c (22).

The results revealed that there is significant decrease in TG level in experimental and control groups. PA may increase the activity of lipoprotein lipase which using TG as fuel. It is possible that PA increases oxidation of lipids and lead to decreased TG level (23)

Present study findings show that there is statistically significant decrease in LDL-C levels after 8-week concurrent training in both groups. The result is consistent with Mohammadi et al. (2014) (24) but is not in the same direction with Banitalebi et al. (2010) (25). It is possible Physical activity leads to increased Lipoprotein activity which effects catabolism of cholesterol and reduces the amount of LDL-c.

In this study BCAA does not appear to have any significant effects on lipid profiles and seems all changes are due to PA especially aerobic exercise. Athletes use BCAAs to improve exercise performance and reduce muscle protein breakdown and help the body absorb protein during intense exercise. However many studies show association between increased circulating levels of BCAAs and insulin-resistant obesity and type 2 diabetes mellitus, as well as the observations that these increases might predict future insulin resistance or type 2 diabetes mellitus (26). Results of studies about the effect of resistance exercise on lipid profiles are controversial. Kokkinos et al. (1991) reported that strength training did not improve Lipid profiles in middle aged men (27).

A meta-analysis has reported a decrease in TG with resistance training, but also noted a decrease in body fat (28). Swapnil et al studied the effects of 8 week resistance training on lipid profile and insulin levels in overweight/obese pre-pubertal boys and reported no significant changes in concentrations of TG, TC, HDL-c, and LDL-c (29). The results are consistent with Gorzi et al. (2012) (30) but did not match with Spillane et al. (2012) (31). The data concerning the effects of resistance training on serum lipid concentration indicates that this form of training may not result in the same positive adaptations as aerobic training (32)

Vivan et al. (2008) did not observe statistically significant differences for testosterone after 12 month moderate-intensity aerobic exercise program which is consistent with our study (33). However In some studies, elevations in testosterone, has also been observed, but the hormone changes are variable and may depend on many factors such as resistance vs aerobic, the exercise intensity, the study population (young vs older men), active or non-active people and dietary habits (34,35). In the study we did not control dietary intake or measure the energy expenditure of the subjects during the study, however we asked participants do not change dietary habits.

5. Conclusion

In conclusion, the results of the current study show that a concurrent training results in a number of favorable blood lipid characteristics. Consequently concurrent training may be more effective than endurance and strength training alone for simultaneously improving the serum lipid profile. BCAA didn't have any effect on lipid profile and, also no effect was found on testosterone level by concurrent training or concurrent training with BCAA supplementation.

Conflict of interests: No conflict of interests amongst authors.

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