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THE EFFECT OF 4-WEEK TWO DIFFERENT STRENGTH TRAINING PROGRAMS ON BODY COMPOSITION

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Abstract:

The purpose of the study was to investigate the effect of the four-week two strength training program on the skin fold thickness and body fat percentage (BFP) characteristics according to the maximal strength and strength endurance principles. Sixteen male volunteers participated in the study. The subjects were divided into two groups as the maximal strength group (MSG, n=8, Age=24.00±3.78 year, Height=172.25±2.19 cm, Weight=75.13±6.60 kg) and the strength endurance group (SEG, n=8, Age=25.13±3.09 year, Height=173.38±2.62 cm, Weight=77.00±7.54 kg). 4 weeks training program was applied to maximal strength group according to maximal strength training principles and applied to strength endurance group according to strength endurance training principles. In both groups, body weight, body mass index (BMI), skin fold thickness (triceps, biceps, pectoral, subscapula, abdominal, suprailiac, femur anterior and posterior, calf) and body fat percentage measurements were taken one day before and after the 4 week period. Between pre-test and post-test of SEG group, significant change was showed in triceps, biceps, pectoral, subscapula, abdominal, suprailiac, femur anterior and posterior skin fold thickness measurements and VFM parameters ($p < 0.05$). Significant change was determined in pre-test and post-test of MSG group in triceps, pectoral, subscapula, abdominal, suprailiac, femur anterior skin fold thickness measurements and VFM parameters ($p < 0.05$). When the pre-post test differences of the groups were compared, no difference was found between MSG and SEG groups ($p > 0.05$). As a result, it can be said that 4-week maximal

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strength training and strength endurance training have positive effects on the skin fold thickness and body fat percentage parameters.

Keywords: maximal strength, strength endurance, training, body composition

1. Introduction

Strength, speed and durability are the basis of motoric features. According to Hollman and Hettinger (1980), the strength is the ability of the muscles faced with resistance to withstand a certain degree of resistance to this contraction within these properties; the strength has its own unique place. The maximal force involved in classifying the force in terms of training science is that the muscular nervous system contracts at a great rate against a resistance and lifts the highest weight (Acıkada et al., 1990). According to Sevim, the maximal force is the highest value an athlete has during the slow motion practice or isometric contraction conditions. The movements are a result of the neuro-muscular system working together to bring it to a conclusion. Accordingly, the maximal force is the greatest force that a nerve muscle system contracts against a resistance (Gül, 1991). Strength training is necessary to improve muscle strength (Biçer et al., 2015; Özdal, 2016; Yılmaz et al., 2016) and a requirement for fatigue delaying (Özdal, 2015; Lomax et al., 2014) or exhaustion (Çinar, 2007).

Strength endurance is the ability of the nervous-muscle system in which the skeletal muscle performs the strength against the resistance for a long period with the voluntary contraction of the nervous-muscle system (Grosser et al., 1989). Strength endurance determines the level of production resulting from the composition of strength and durability in the workout (Bompa, 1998). Endurance; the ability of the organism to resist fatigue in long-term force loading (Günay et al., 1996). In addition to the ability to apply strength at a fairly high level, it is also a capability that allows the force to be applied despite all kinds of obstacles and difficulties (Acıkada et al., 1990).

Body composition is related to maximal performance, physiological parameters and training-based adaptations (Özdal et al., 2016). For example, with two individuals having the same fat-free mass, a higher body fat percentage or fat mass suggests a decreased performance in higher intensity physical activities such as jumping and running (Kraemer et al., 2012), and in lower intensity activities such as simple reaction (Pancar et al., 2016), or in shorter time activities such as vertical jump or step up (Bilgiç et al., 2016; Savucu et al., 2009). Monitoring the body composition of athletes on a regular basis provides useful information for training adjustments, where optimal body weight and composition are required for optimal performance (Venkata et al., 2004; Özdal and Bostanci, 2016). Studies suggest that regular exercise has a positive effect on body weight, body composition, and aging (Andersen and Jakicic, 2009; Falls, 1968; Heyward, 1991).

A variety of exercise modes benefits body composition, improves health, and enhances exercise performance. Moderate-intensity cardiorespiratory exercise and weight training, regardless of gender, are effective for decreasing body fat percentage, fat weight, and body weight (Heyward, 1991). Improvements in fitness components, muscular strength and size, fat-free mass, and decreased body fat have a positive effect on athletic performance (Hoffman, 2002).

It was aimed to investigate the effect of 4-week two different strength training programs on body composition in men who voluntarily participated in the training program three days per week regularly.

2. Method

This research was carried out on the training group including 16 male recreationally active persons to investigate the effect of 4-week two different strength training programs on body composition in the Gaziantep. The group was divided into two sub-groups. Each group consists of 8 recreationally active persons. First group was named Maximal Strength Group (MSG, n=8, Age=24.00±3.78 year, Height=172.25±2.19 cm, Weight=75.13±6.60 kg) and the other Strength Endurance Group (SEG, n=8, Age=25.13±3.09 year, Height=173.38±2.62 cm, Weight=77.00±7.54 kg).

The training program consisted of 9 stations (squat, butterflying, biceps dumbbell curl, bench press, incline bench press, leg extension, triceps press down, shoulder press, back lat pull down) and it was planned in circular training. The duration of the training was 4 weeks. In this sense during this process, maximal strength group was prepared a training program according to the maximal strength principles. Strength endurance group was prepared a training program according to the strength endurance principles.

The 4-week training period is planned to be 3 days per week. The training program was carried out on Monday, Wednesday and Friday at the same time. The groups were taken in the training sessions separately.

All the subjects' maximal strength measurements were made according to the single repeat method (1RM) in the movements to be worked before training program. Body mass index (BMI) was calculated by measuring body weight and height, skin fold thickness measurements from 9 different regions (triceps, biceps, pectoral, subscapula, abdominal, suprailiac, femur ön ve arka, calf) were taken from the subjects one day before and after the 4 weeks training program. Body fat percentage was determined according to the Yuhasz formula.

3. Results

Table 1 shows that the outcome of the pre-test and post-test of the strength endurance group. After four weeks strength endurance training program, significant differences have been shown in skinfold thickens including triceps, biceps, pectoral, subscapula, abdominal, suprailliac, femur front, femur behind and body fat percentage ($p < 0.05$). There was no significant differences on calf region ($p > 0.05$).

Table 1: Pre-test and post-test of the strength endurance group (SEG, n = 8)

		Mean	**Std. Deviation**	**t**	**p**
Weight (kg)	Pre-test	77.00	7.54	1.655	.142
	Post-test	76.25	6.76		
BMI (kg/m^2)	Pre-test	25.54	2.20	1.189	.273
	Post-test	25.36	2.02		
Triceps (cm)	Pre-test	10.69	4.11	**4.204**	**.004**
	Post-test	9.50	3.64		
Biceps (cm)	Pre-test	5.94	1.15	**3.813**	**.007**
	Post-test	5.38	0.92		
Pectoral (cm)	Pre-test	9.13	2.64	**3.969**	**.005**
	Post-test	8.38	2.40		
Subscapula (cm)	Pre-test	16.94	5.36	**3.529**	**.010**
	Post-test	16.13	4.82		
Abdominal (cm)	Pre-test	21.56	6.61	**5.557**	**.001**
	Post-test	19.68	5.85		
Suprailiac (cm)	Pre-test	19.25	6.69	**4.478**	**.003**
	Post-test	17.63	6.11		
Femur front (cm)	Pre-test	13.94	5.10	**3.987**	**.005**
	Post-test	12.75	4.43		
Femur behind (cm)	Pre-test	9.44	3.11	**7.514**	**.000**
	Post-test	8.75	2.99		
Calf (cm)	Pre-test	5.56	1.24	1.000	.351
	Post-test	5.44	1.08		
BFP (%)	Pre-test	15.53	2.79	**6.953**	**.000**
	Post-test	14.79	2.53		

Table 2 shows that the outcome of the pre-test and post-test of the maximal strength group. After four weeks maximal strength training program, significant differences have been shown in skinfold thickens including triceps, pectoral, subscapula, abdominal, suprailliac, femur front, and body fat percentage ($p < 0.05$). There were no significant differences on calf region ($p > 0.05$).

Table 2: Analysis of pre-test and post-test values of maximal strength group (MSG, n = 8)

		Mean	Std. Deviation	t	p
Weight (kg)	Pre-test	75.13	6.60	.683	.516
	Post-test	74.88	6.24		
BMI (kg/m²)	Pre-test	25.26	2.18	.249	.810
	Post-test	25.23	1.98		
Triceps (cm)	Pre-test	8.63	3.25	**7.514**	**.000**
	Post-test	7.25	2.96		
Biceps (cm)	Pre-test	5.63	1.77	1.871	.104
	Post-test	5.13	1.51		
Pectoral (cm)	Pre-test	10.69	3.71	**4.000**	**.005**
	Post-test	9.69	3.33		
Subscapula (cm)	Pre-test	15.25	3.11	**5.338**	**.001**
	Post-test	14.19	3.09		
Abdominal (cm)	Pre-test	18.56	7.54	**4.848**	**.002**
	Post-test	16.69	6.79		
Suprailiac (cm)	Pre-test	12.25	6.07	**2.959**	**.021**
	Post-test	11.19	5.46		
Femur front (cm)	Pre-test	10.25	2.75	**2.876**	**.024**
	Post-test	9.44	2.29		
Femur behind (cm)	Pre-test	7.19	2.14	1.080	.316
	Post-test	6.94	1.82		
Calf (cm)	Pre-test	5.75	1.65	1.930	.095
	Post-test	5.44	1.29		
BFP (%)	Pre-test	13.70	2.44	**4.402**	**.003**
	Post-test	13.01	2.21		

Table 3 shows that the comparison of MSG and SEG measurements. When the differences pre- and post-test of the groups were compared between groups, no differences were found between MSG and SEG groups ($p > 0.05$).

Table 3: Comparison of pre-post-test differences of the groups

		Mean	Std. Deviation	t	p
Weight (kg)	MSG	-.25	1.04	.858	.405
	SED	-.75	1.28		
BMI (kg/m²)	MSG	-.03	.34	.778	.449
	SED	-.18	.43		
Triceps (cm)	MSG	-1.38	.52	-.557	.586
	SED	-1.19	.80		
Biceps (cm)	MSG	-.50	.76	.205	.841
	SED	-.56	.42		

Pectoral (cm)	MSG	-1.00	.71	-.798	.438
	SED	-.75	.53		
Subscapula (cm)	MSG	-1.06	.56	-.821	.425
	SED	-.81	.65		
Abdominal (cm)	MSG	-1.88	1.09	.000	1.000
	SED	-1.88	.95		
Suprailiac (cm)	MSG	-.31	.46	-.917	.375
	SED	-.13	.35		
Femur front (cm)	MSG	-.81	.80	.913	.376
	SED	-1.19	.84		
Femur behind (cm)	MSG	-.69	.44	1.758	.101
	SED	-.75	.30		
Calf (cm)	MSG	-.25	.65	-.917	.375
	SED	-.69	.26		
BFP (%)	MSG	-.31	.46	.297	.771
	SED	-.13	.35		

(MSG: Maximal Strength Group, SED: Strength Endurance Group)

4. Discussion and Conclusion

In the present study, the effect of 4 weeks strength training program on the skin fold thickness and body fat percentage of our study was examined.

Resistance training is a common mode to decrease BF percentage (Heyward, 1991). One of the aims of the present study was to examine the effect of strength endurance training on skinfold thickness and body fat percentage. In this way, it has been found that positive effects of strength endurance training on skin fold thickness and body fat percentage.

The present study shows that after four weeks maximal strength training program, significant differences have been shown in skinfold thickens including triceps, pectoral, subscapula, abdominal, suprailliac, femur front, and body fat percentage. There were no significant differences on calf region. In the strength endurance training program, significant differences have been shown in skinfold thickens including triceps, biceps, pectoral, subscapula, abdominal, suprailliac, femur front, femur behind and body fat percentage.

The literature supports the findings of the present study. Shaw et al. (2009) studied the effects of resistance exercise training on abdominal fat, with no restriction on energy intake. Twenty-five healthy male subjects (25±1 3/6 years) participated in a resistance exercise program for 16 weeks, 3 times per week. At the end of the 16-week period, significant decreases were observed for BF, total skinfold, and body mass index (BMI).

Results from other studies vary with respect to resistance exercise and body composition. Brown and Wilmore (1974) conducted research in which 7 female national throwers (aged 16–23) engaged in resistance exercises for six months, three days per week. At the end of the six-month period, all showed a considerable gain in strength, with no change in body weight or BF percentage.

The other aim of the present study was to examine the effect of maximal strength training on skinfold thickness and body fat percentage. In this context, it has been found that positive effects of maximal strength training on skin fold thickness and body fat percentage. But when comparing two strength training, the positive effects of the strength endurance training were observed in more area on the skin fold thickness.

The reason why no significant differences was seen on calf region is due to the fact that no specific movement to that region in the present training program. And the other issue we believe that the reason for the lack of difference in body weight and body mass index is that the training program is as short as 4 weeks.

In other studies in the literature, Erol (1992) found that the athlete's strength training in the experimental group was statistically significant ($p < 0.01$). When he was working on 28 young basketball players, age group 16-18, changes between maximal bench press, maximal half squat, vertical jump and body fat percentage values were found statistically significant.

As a result, it can be said that 4 weeks maximal strength training and strength endurance programs have positive effects on the skin fold thickness and body fat percentage parameters.

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