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Effects of electromyostimulation training on body composition

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Abstract

The purpose of this study is to examine the variables such as weight, body fat percentage and amount, lean body mass (FFM) and body mass index (BMI) occurred on body as a result of realization of voluntary contraction and involuntary contraction together with training by electromyostimulation (EMS) system. 41 voluntary women joined the study as treatment (n=20) and control group (n=21). a 25-minute training program was arranged for treatment group with Bodytec EMS device twice a week for 8 weeks. Training was done as strength and durability exercises for 12 minutes, cardio exercises for 8 minutes and active rest for 5 minutes. Ages, genders, lengths, weights, fat percentages, lean body masses and body mass indexes of groups were measured both whole and regional, and then these parameters were compared before and after treatment. Measurements were donetwice as pre-test and post-test. Tanita bc 418 body analyzer belongs to Bio Electricity Impedans method was used for all measurements. In data analysis, 2*2 Repeated Measures Varians Analysis (Repeated Measures ANOVA) was used to compare pre-test and post-test measures. Statistical results were evaluated at $p<.05$ significance level. Consequently, $p<.05$ significance level was identified in favor of the post-tests analyzes of pre-tests and last tests of experimental group in body weight , BMI , fat % (body fat ratio) ,values of fat mass (amount of fat), value of right foot fat percent , value of right foot fat mass , value of left foot fat percent , value of left foot fat mass ,body fat mass in value of right-left arms fat percent. Statistically, $p<.05$ significance level was determined between pre-tests and post-tests of control group's measurements. It was seem to occur significant changes on body compositation values of experimental group as a result of EMS training.

Key words: Electromyostimulation (EMS), Training, Body Composition, Body Mass Index, Body Fat Percentage.

INTRODUCTION

Training with electromyostimulation (EMS) training system is a new and different technology (6). Electromyostimulation (EMS), which was initially applied for rehabilitation and treatment purposes, attracted the attention of coaches, athletes and sports scientists as a popular training method. EMS can be defined as electrical currents applied to muscle tissue or motor spots (5). Modern EMS devices stimulate all the main muscle groups simultaneously at the determined intensity during slow movements (2). Therefore, its applications in the health, fitness and beauty sectors are increasing. Besides its having wide range of applications, it is frequently mentioned that because of its practicality and easy application due to its orthopedic nature, EMS saves time and affects body composition positively (9.6.2). In recent years, instead of local EMS, TB-EMS devices have been widely used in training (3). Time-consuming low intensity exercises, exercise programs that have an impact on fitness and body composition are increasingly encouraged by the fitness industry (11). The positive effects of EMS are indicated in body composition and fitness parameters in recent years.

The aim of this study was to investigate the effect of EMS on body composition and to examine the changes in the body parameters.

MATERİAL AND METHOD

The present study was including 8-week training program, at Fit In Time Gaziantep fitness center (n: 20 training groups and n: 21 control groups). The mean age and height of the participants (n: 41) were 34.05 ± 8.94 years and 1.63 ± 0.06 cm, respectively. The mean age and height of the experimental group (n: 20) and the control group (n: 21) were 33,40 ± 10,29 years and 1,66 ± 0,04 m, respectively; 34.67 ± 7.65 years and 1.60 ± 0.05 m. Power analysis was performed to determine the number of subjects (GPower 3.1). Measurements were performed in the sportive performance

laboratory of Gaziantep University School of Physical Education and Sports.

Each training lasted 25 minutes, 2 days a week for 8 weeks. For each workout, classic physical movement applications (squat, lunge, jumping, burpees, jump squat, scissor kick, bench press, dumbbell curl, and crunches) were done by using the EMS computer application. The measurements were recorded at the beginning and at the end of the 8-week training with Tanita's Bc 418 model using the Bioelectric Impedance Method. Five different parts of the body were analyzed. The measurements of the participants' body compositions were recorded a day before and a day after the 8-week training program. In our 8-week study, a total of 25-minute training programs were organized with the miha bodytec EMS. The workout program was planned as 12 minutes of strength and endurance training, 8 minutes of cardio and 5 minutes of active rest. The participants' height, weight, fat ratios, body fat mass and body mass indexes were measured before and after the study, and at the end of eight-week training these measurements were compared.

INTERPRETATION OF ANALYSIS AND FINDINGS

The Statistical analysis was done by using SPSS software program. 2*2 Repeated Measurements Variance Analysis was used to compare the pre-test and post-test scores of the variables. Statistical results were evaluated at p<.05 significance level.

Table . Body Composition Values of Experimental and Control Groups.

Variables	Groups	N	Pre-test $\overline{X} \pm SS$	Post-test $\overline{X} \pm SS$	
Body weight (kg)	**Experimental**	20	69,54±12,39	67,39±12,04	F_g=1,912; p=0,175
	Control	21	73,94±15,46	75,08±15,59	
	Total	41	71,79±14,05	71,32±14,33	**F_{int}=56,399;p=0,001***
			F_t=5,378; p=0,026		
Body-Mass Index	**Experimental**	20	25,29±3,90	24,48±3,81	**F_g=7,390; p=0,010**
	Control	21	29,09±6,21	29,52±6,24	
	Total	41	27,24±5,49	27,06±5,74	**F_{int}=58,438;p=0,001***
			F_t=5,287; p=0,027		
Body fat Rate (%)	**Experimental**	20	33,36±6,14	31,72±6,53	**F_g=4,780; p=0,035**
	Control	21	37,65±8,29	37,54±8,45	
	Total	41	35,55±7,55	34,70±8,04	**F_{int}=7,608;p=0,009***
			F_t=9,958; p=0,003		
Body fat mass (kg)	**Experimental**	20	23,88±8,40	22,06±8,26	F_g=3,596; p=0,065
	Control	21	28,87±11,72	29,20±11,93	
	Total	41	26,43±10,42	25,72±10,80	**F_{int}=19,193;p=0,001***
			F_t=9,110; p=0,004		
Fat-Free Mass (kg)	**Experimental**	20	45,68±4,36	45,33±4,11	F_g=0,001; p=0,982
	Control	21	45,07±4,93	45,87±5,20	
	Total	41	45,36±4,62	45,61±4,65	**F_{int}=10,580;p=0,001***
			F_t=1,692; p=0,201		

F_g: F value for group comparison; F_t: F values for time comparison; F_{int}= F value for group*time interaction; *p<0,05

Group-time interaction for body weight, body mass index, body fat ratio, body fat mass and body fat-free mass variables were statistically significant (p<.05). According to this, body weight, body mass index, body fat ratio, body fat mass and body fat mass were decreased while the mean of the control group increased.

CONCLUSION AND EVALUATION

The present study was carried out to determine the effect of electromyostimulation (EMS) training system on body composition. In our study, the parameters of body weight, body fat percentage and amount, body fat-free mass (FFM) and body mass index (BMI) were investigated.

In this research, it was confirmed that the mean body weight of the experimental group decreased

while the mean weight of the control group increased as a result of 8-week EMS training.

Scientific studies have concluded that regular exercise programs affect body weight and physical performance (4.2). In many studies, the positive effects of EMS training on body weight, which is one of the determinants of physical fitness, is frequently emphasized(9.2.6). EMS training is a training method applied by sending electrical warnings on muscles. The effectiveness of EMS training is related to the intensity of electrical currents during training. Within the scope of this information, there are few studies on the tolerance of muscles and nerves to electrical currents. Today, Electromyostimulation (EMS) system is preferred as an alternative training method because it is both portable and economical. The EMS system is also used for rehabilitation purposes after injuries. Sedans, elderly and overweight women and men who do not spend much time in sports in daily life often prefer EMS applications (5). In 2016, Özdal and Bostancı reported a significant difference in body weight values in their study on women for 8 weeks with EMS.In 2017, Çetin et al. found significant differences in body weight values as a result of their training in 24 volunteer women, 8 weeks with EMS (9.2). The duration, method and results of the two studies above are in parallel with our study. When we compare the results obtained in our study with the results of the studies in literature, it can be said that the exercises performed with EMS significantly affect the body weight value.

In our study, it was determined that the mean BMI of the experimental group decreased while the mean BMI of the experimental group was slightly increased (10). World Health Organization women's BMI classification is as follows. The BMI is 1st degree obese between 18.5 kg / m2 weak, 18.5 and 24.9 kg / m2 normal, between 25.0 to 29.9 kg / m2 excessively heavy, between 30.0 to 34.9 kg / m2 and if the value is above 35.0, it is II. or III. Degrees obese (1). Ound a significant difference in their BMI values at p <.05 level in a study conducted on women in 8 weeks with TB-EMS study in 2016 (9). In 2017, Çetin et al. found significant differences in BMI values at p <.05 as a result of their 8-week EMS training with 24 volunteer women (2). In 2005, Porcari et al. applied electrical muscle stimulation training for 8 weeks and 5 times a week on healthy adults and found no significant difference in body mass index value with some similar values (12). The results of the other studies and the BMI values of our study are in parallel. In addition that the reason of the difference of the results having been studied by Porcari et al. 2005, might be the frequency and duration of training.

In our study, it is confirmed that the mean body fat ratio of the control group didn't change while the body fat ratio average of the experimental group decreased. In many studies, it has been reported that the muscle workout performed with EMS application is effective on body fat content (7.8). The results of the present studyin terms of body composition are in parallel with other studies such as (6.2.9). In 2005, Porcari et al. applied electrical muscle stimulation training for 8 weeks and 3 times a week on healthy university students and although they found decrease in body composition values in pretest and posttest mean, unlike this study and above mentioned studies they didn't find statistically significant differences (12). It is observed that subject group of Porcari et al. 2005, consists of male and female athletes. Some sources stated that there are important morphological differences between men and women and one of the most important of these is the amount and distribution of fat tissue. The average body fat is 27% for women and 15%for men. Adipose fat ratio is 15% for females and 12% for males. Total body fat contains different essential fat ratio between the genders which is 12% for women and 3% for men (14). Therefore, we can say that the reason why the results of Porcari et al.' s study and the present study and the studies mentioned abovewere differentis due to the fact that men and women are in the same experimental group (9). found a significant difference in body fat mass values at p <0.05 level in a study conducted on women in 8 weeks with TB-EMS study in 2016. In 2017, Çetin et al. found significant differences in body fat mass values at p <0.05 as a result of their training, which was carried out on 24 volunteer women by EMS for 8 weeks and 2 days a week (2).

In our study, body fat-free mass averages of both groups did not show any statistical difference after 8-week EMS training. Counter-resistance trainings can cause changes in body composition; thus, it can be said that body fat ratios may be reduced by this kind of training. Trainings focusing on short-term muscle contraction can also lead to slight increases in lean mass (13). In 2016, in a study conducted by Özdal et al. the pre-test for lean body mass index was found as 45.56 ± 8.60 and the post-test score was found as 45.33 ± 8.20. There was no

significant change in body fat-free mass after EMS training and the results obtained from this study are in accord with the results of our study. When we look at the studies in the literature above, it is reported that EMS training applications generally have positive effects on sport performance and body composition parameters.

As a conclusion, it was observed that the exercises performed with EMS system applied to sedentary women twice a week for 8 weeks have positive effects on body composition parameters such as body weight, body fat percentage and amount, and body mass index (BMI). It is determined that the training with EMS system is beneficial on sedentary women and even active sportsmen taking part in training protocols. It can also be recommended that both sports scientists and coachesuse EMS applications.

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