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BODY SHAPING THROUGH AEROBIC TRAINING IN THE GYM IN ADULT WOMEN

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ABSTRACT. Introduction. Regular physical activity has positive effects on human body composition, even if not combined with a diet. For many people this activity aims to reduce the amount of fat in some areas of the body and targets body shaping. **Objectives.** The main objective of this study was to learn about the effects of a 12-months regular participation in aerobic training exercises. **Methods.** This study was voluntarily attended by 89 women with an average age of 31.62, practicing aerobic exercises in gyms, three times a week for a period of 12 months. We carried out anthropometric measurements of subjects at the beginning and at end of the study, respectively, and data was statistically analysed using the SPSS 23.0 software. **Results.** Data collected was statistically processed, showing that participation in physical training led to reducing body weight by 4.81 kg, decrease of adipose tissue - between the two moments there was a difference of 5 % - fat mass decreased by 4.26 kg, and lean body mass by 0.55 kg. Significant decrease in chest, waist and hip circumference was also noticed. **Conclusions.** Regular participation in physical training programs involving aerobic exercise for 12 months has had the effect of reducing body weight and the amount of fat in some areas of the body, materialized by decreasing the value of the circumference of the chest, waist and hips, with the intention of reaching the ideal body weight and aiming for body shaping.

Keywords*: body shaping, physical activity, adipose tissue/ fat, adult women, ideal body weight.*

REZUMAT. ***Modelare corporală prin activități fizice în sala de fitness la femei adulte. Introducere:*** Practicarea regulată a activităților fizice are efecte pozitive asupra compoziției corporale, chiar dacă nu sunt combinate cu o dietă alimentară. Pentru multe persoane această activitate are în vedere reducerea cantității de țesut adipos din unele zone ale corpului, modelarea corpului. **Obiective:** Obiectivul principal al acestui studiu a fost să aflăm care sunt efectele participării cu regularitate, timp de 12 luni, la programe de antrenament aerobic.

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Metode: La acest studiu au participat voluntar 89 de persoane de gen feminin cu vârsta medie de 31,62, practicante ale activităților aerobice în cadrul unor săli de fitness, de trei ori pe săptămână, timp de 12 luni. Au fost efectuate măsurători antropometrice la începutul și sfârșitul studiului, iar datele au fost analizate statistic cu ajutorul programului SPSS 23.0. **Rezultate:** Datele colectate au fost prelucrate statistic, reieșind că participarea la antrenament a avut ca efect reducerea greutății corporale cu 4.81 kg, țesutul adipos a scăzut – între cele două momente de timp existând o diferență de 5 procente – masa grasă a scăzut cu 4,26 kg, iar masa slabă cu 0,55 kg. De asemenea, s-au constatat reduceri semnificative ale circumferințelor pieptului, taliei și șoldurilor. **Concluzii:** Participarea cu regularitate la programe de antrenament cu exerciții aerobice timp de 12 luni a avut ca efect reducerea greutății corporale și a cantității de țesut adipos din unele zone ale corpului, concretizată prin scăderea valorii circumferințelor pieptului, taliei și șoldurilor, cu intenția de a se apropia de greutatea corporală ideală și de modelare a corpului.

Cuvinte cheie*: modelare corporală, activitate fizică, țesut adipos, femei adulte, greutate corporală ideală.*

Introduction

Body shaping refers to the transformation of one or more areas of the human body through certain procedures, including physical exercise. Specifically, it is about reducing body weight. Body shaping training programs can be followed by people of all ages, both women and men. When we refer to weight loss, we consider both the reduction of fat percentage and the maintenance or development of muscle mass (Mendonca, 2014). According to the American Council of Exercise (2018), a non-athlete woman should have less than 31% body fat and a non-athlete man less than 24%. This difference is due to the fact that in general men have more developed muscles.

The standards of the female body have changed substantially during the development of human society. These changes have been at a much faster pace in the XXth century and the beginning of the XXIst, the influence of the written and audio-visual media being sometimes decisive, intensely publicizing some sizes of the perfect body, such as "90-60-90" (chest circumference - waist circumference - hip circumference in cm).

Body image is directly related to body shaping and can be either positive or negative. The relationship between body image and physical exercise is strong, and issues such as body weight and one's satisfaction with his/her body

influence participation in physical activities. Brudzynsky (2010) argues that the perception of one's own body can be an advantage or a disadvantage in the practice of physical exercises. Overweight and obese people engage more themselves in physical activity in order to lose more weight than people who are not perceived as having an excessive body weight. A barrier in the practice of physical exercises is the negative perception of own body image, more precisely in the case of people who manifest a strong social anxiety.

The sciences that deal with the technique of measuring the human body and establishing the relationships between the parameters obtained through these measurements is the anthropometry or the somatometry. In order for a body to look harmoniously developed, there must be certain relationships, a certain proportionality, between its different parts. When we talk about the ideal female body, we also refer to body proportion, which is related to the general appearance of the human body. The ideal weight can be calculated using several formulas, in all of which the height of the subjects being used. According to the National Heart, Lung, and Blood Institute, "the ideal weight is defined as a body mass index between 18.7 - 24.9 for all adults, regardless of age" (Heiat, 2003).

Physical exercise has gained notoriety as a type of activity that involves minimal investment, having many benefits and which can be practiced by a large part of the population. It is one of the reasons why more and more people are going to gyms. The *American College of Sports Medicine* recommends regular physical activity because they have a positive contribution to health management and well-being (Pate et al., 1995).

Among the physical activities carried out in a gym we often encounter aerobic training, which are recommended for decreasing the percentage of body fat, improving physical fitness, building muscle strength, decreasing the circumference of the waist, hip and thighs. In recent years, *The American College of Sports Medicine (ACSM)* (2013) annually publishes training opportunities for a healthy lifestyle.

Our study aimed to analyse the effects of aerobics training programs conducted in gyms for 12 months on anthropometric parameters in some parts of the adult female body.

Working hypothesis

In this study we started from the working hypothesis that the participation of adult women in aerobic training programs in gyms will have the effect of reducing both body weight, and the chest, waist and hip circumference, as well as changing body composition.

Materials and methods

This study was carried out between January 2016 and January 2017 in two fitness rooms in the city of Oradea, with the voluntary participation of 89 adult women. The study subjects gave their written consent, being ensured of maintaining the confidentiality of their data. Three aerobic exercise workouts (Circuit, Softball, Fit ball, Aerobics and Tae-bo) were planned each week, each session lasting 60 minutes. At the beginning and at the end of the research, participants were subjected to waist, body weight, skinfold, and body circumference (chest, waist and hip) measurements.

The data thus collected were statistically analysed using the SPSS software, ver. 23.0.

The following formulas were used to calculate the ideal body weight:

- Ideal body weight = height (cm) - 105 (in women);
- Hammond's formula: Wt (kg) = 45 + 0.9 x (Ht-150 cm);
- Ideal body weight formula based on gender and age: IBW = (50 + 0.75x (W-150) + (A-20) / 4) x0.90.

To calculate the percentage of adipose tissue, the measurement of five skin folds was used, and the calculation formula used was: Adipose tissue (%) = sum of the five skin folds (mm) x 0.15) +5.8 + SC m^2.

Results

The research female subjects had an average age of 31.62 (6.59) years, with a minimum age of 18 and the maximum age of 52. Of the total 89 subjects, 5 (5.62%) were under 25 years old, 65 (73.03%) were between 25 and 34 years old, 13 (14.61%) were between 35 and 44 years old, and 6 (4.74%) were over 44 years old (see Figure 1 and Table 1 below).

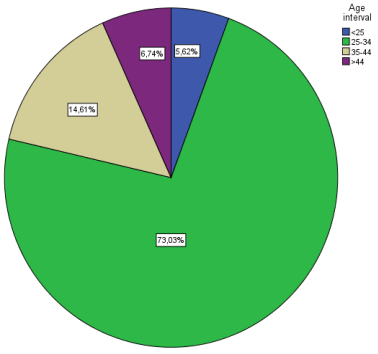

Figure 1. Percentage distribution of subjects by age range (N = 89)

Table 1. Descriptive analysis of the age of subjects included in the study (N = 89)

Descriptive Statistics

Age range	N	Minimum	Maximum	Mean	Std. Deviation
< 25 years	5	18	24	21.38	2.503
25-34 years	65	25	34	29.52	2.776
35-44 years	13	35	44	37.94	2.695
> 44 years	6	47	52	49.30	1.849
Total	**89**	**18**	**52**	**31.62**	**6.597**

The mean body weight of the subjects at the initial testing was 65.62 (13.77) kg, the highest value being 114 kg while the lowest was 48 kg (see Table 2 below), these parameters indicating the lack of homogeneity of the survey sample. In terms of ideal body weight, the table shows us that there are small differences between the different calculation formulas we used. Thus, when calculated according to gender and age this difference was 59.99 (3.53) kg, while according to the Broca index the difference was 63.33 (4.50) kg, and if calculated according to the Hammond formula the difference was 61.49 (4.05) kg.

Table 2. Descriptive analysis of anthropometric data and parameters (N = 89)

Descriptive Statistics

Variable	N	Mean	Std. Deviation	Minimum	Maximum
Body Weight (kg)	89	65.62	13.77	48	114
Height (cm)	89	168.33	4.50	161	180
Ideal Body Weight (kg)	89	59.99	3.53	54.39	68.25
Broca index	89	63.33	4.50	56	75
Ideal Body Weight Hammond	89	61.49	4.05	54.9	72.0
Valid N (list wise)	89				

In order to notice the effect of the physical activity intervention programs on the percentage of adipose tissue, fat mass and lean body mass, we used the method focused on analysing the skin folds' measurement results. The test of the normality of the data distribution was carried out with the help of the Kolmogorov-Smirnov Goodness of Fit Test, resulting that they were normally distributed only in terms of percentage of fat tissue (BF), followed by a paired sample-test, while for the fat mass and lean body mass the Wilcoxon test was used.

From the analysis we notice that between the two evaluation moments (T1 and T2) there are significant differences, the participants' body weight decreased by 4.81 kg, adipose tissue decreased by 5%, fat mass decreased by 4.26 kg, and the difference in terms of lean body mass was 0.55 kg (see Table 3).

Table 3. Descriptive analysis of body mass composition determined by measuring 5 skin folds before and after the physical activity intervention program (N = 89)

Descriptive Statistics									
Variable	N	Mean	Std. Deviation	Min.	Max.	t*/Z	df	Sig. (2-tailed)	r/d**
BW (kg) T1	89	65.621	13.7691	47.6	114.0	7.81	88	.000	0.82
BW (kg) T2	89	60.811	8.6902	50.0	85.3				
BF (%) T1	89	22.8806	2.42151	15.91	27.92	30.96*	88	.000	3.282**
BF (%) T2	89	17.8847	1.88646	13.25	22.67				
BFM (kg) T1	89	15.1398	4.17682	8.12	29.36	-8.19	88	.000	-0.613
BFM (kg) T2	89	10.8770	1.95907	7.15	17.22				
LBM (kg) T1	89	50.4816	9.97462	37.01	84.65	-.824	88	.410	No
LBM (kg) T2	89	49.9342	7.20757	39.96	70.28				
Valid N (list wise)	89								

Note: BF= Body Fat; BFM=Body Fat Mass; LBM=Lean Body Fat; *t-test; ** Cohen'd

Significant decrease was also found in terms of circumferences (see Table 4 below). Thus, the average circumference of the chest decreased from 94.438 cm to 90.079 cm (4.36 cm difference), that of the waist from 73.785 cm to 70.627 cm (3.16 cm difference), and that of the hip from 102.298 cm to 96.528 cm (5.77 cm difference). The differences between the circumference means, calculated in the two moments of the measurements, are significant and the effect is substantial (> 0.80).

Table 4. Descriptive analysis of circumferences by measurement time (N = 89)

Descriptive Statistics									
Variable	N	Mean	Std. Deviation	Min.	Max.	t	df	Sig. (2-tailed)	Size effect (d)
CC (cm) T1	89	94.438	7.0501	80.0	119.0	13.775	88	.000	1.46
CC (cm) T2	89	90.079	5.1417	79.0	109.0				
WC (cm) T1	89	73.785	10.0843	57.0	101.0	12.206	88	.000	1.29
WC (cm) T2	89	70.629	8.6621	57.0	90.0				
HC (cm) T1	89	102.298	7.8192	87.0	135.0	15.080	88	.000	1.60
HC (cm) T2	89	96,528	5,5944	85,0	117,0				
Valid N (list wise)	89								

Note: CC= Chest circumference; WC= Waist circumference; HC= Hip circumference

Table 5. Correlations between body mass, chest, waist and hip circumference after completion of the physical activity intervention program (N-89)

Correlations

		BW (kg) T2	CC (cm) T2	WC (cm) T2f	HC (cm) T2
BW (kg) T2	Pearson Correlation	1	.516**	.436**	.475**
	Sig. (2-tailed)		.000	.000	.000
CC (cm) T2	Pearson Correlation	.516**	1	.308**	.248*
	Sig. (2-tailed)	.000		.003	.019
WC (cm) T2f	Pearson Correlation	.436**	.308**	1	.149
	Sig. (2-tailed)	.000	.003		.164
HC (cm) T2	Pearson Correlation	.475**	.248*	.149	1
	Sig. (2-tailed)	.000	.019	.164	

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

In order to notice if there was a correlation between the subjects' body weight and her chest, waist and hip circumference, the Pearson correlation coefficient (see Table 5 above) was calculated at the final test (T2). The analysis of the measurements performed at the end of the physical activity intervention program reveals that there is an acceptable correlation between body weight and measured circumferences (see Table 5). Moreover, the correlation analysis shows a lack of correlation between the circumference of the chest and that of the hip, while there is an acceptable correlation for other circumferences.

The graphical representation of the correlation between body weight and waist circumference (see Figure 2) indicates a coefficient of determination of R^2 = 0.324, which means that in 32% of subjects the linear relationship between circumference and body mass can be substantiated, and the Pearson correlation coefficient (r = 0.57) shows a moderate to good correlation between waist circumference and body weight. At time T2, the mean body weight of the survey sample was reduced by 4.82 kg, and waist circumference by 3.16 cm., while the coefficient of determination R^2 was reduced to 0.190, so only in 19% of subjects the increased waist circumference can be explained due to their high body weight, Pearson correlation coefficient r = 0.44 indicating an acceptable correlation between the subjects' waist circumference and body weight.

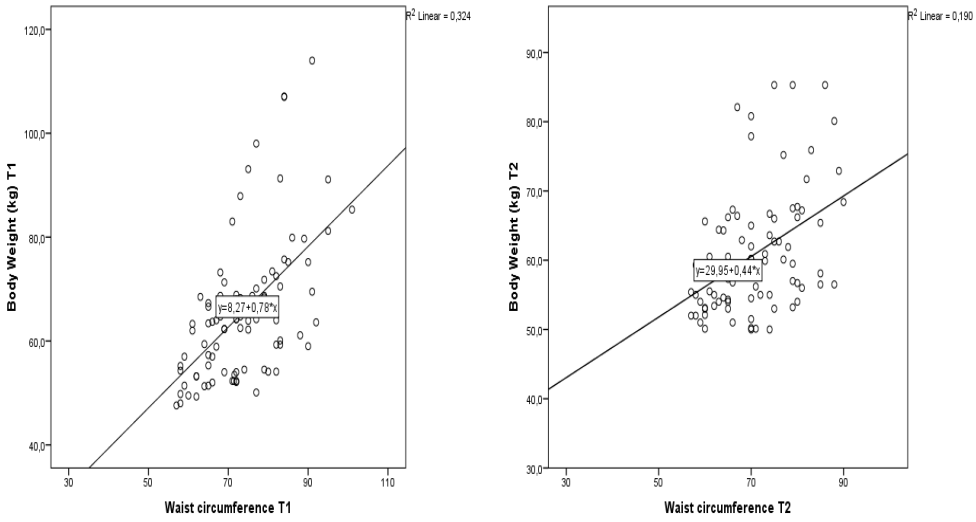

Figure 2. Correlation between body weight and waist circumference before and after the physical activity intervention program (N = 89)

Discussion

It is advisable that body weight analysis be carried out in comparison with the ideal body weight. Weber, Velazquez & Weber (2018) recommend calculating the ideal body weight using the Broca index, other authors suggesting Hammond's formula or the one that uses gender and age in determining the ideal body weight. Following the statistical analysis of the measurements, performed before and after the physical activity intervention program, we notice that the latter had the effect of reducing body weight, percentage of adipose tissue, fat mass and resulted in a slight increase in lean body mass.

The measurements made in the two moments of time showed a weight difference of 4.81 kg and we can state that the physical activity intervention program had a positive effect, triggering a reduction in participant's body weight. The average body weight after the application of the intervention program was 60.81 kg, close to the value of the ideal body weight calculated according to gender and age (59.98 kg, according to Table 2 above). In a study carried out on 232 adult women aged 40 to 50 years Choi, Guiterrez, Gilliss and Lee (2012) found that the subjects who did not engage in physical activity increased weight, those who had a low level of physical activity had only a slight weight gain and a slight decrease in waist circumference. Similar results were obtained by Pelin and Osman (2019) in a study in which the survey sample was made by 45 sedentary women who participated in an aerobic exercise program three times a week, for 12 weeks. They managed to reduce their body weight from 70.83 (1.67) to 64.41 (1.72).

The influences of physical exercise programs were also evident on the circumferences of the chest, waist and hips, and significant reductions were found in these dimensions, the impact being rather strong (> 0.80).

Our results showed that the physical activity intervention program also triggered some effects on body composition of the women participating in the program. The percentage of adipose tissue and the amount of fat mass decreased, causing a slight influence on the amount of lean body mass. In a similar study by de Mendonça, de Araújo Júnior, de Sousa & Fernandes (2014), an exploratory and descriptive survey conducted on 89 women aged between 25 and 55 years (41.42 ± 9.23 years), carried out for 18 weeks, the subjects practiced various physical exercise programs. Regardless of the type of exercise program they practiced, the authors noted healthy effects in the physical activity groups compared to the control group.

Conclusions

Following the implementation of the physical activity intervention program it resulted that in the subjects from the sample included in the research, in terms of body weight and percentage of adipose tissue variables, the differences between the means were significantly smaller at the final measurements than at the initial measurements, this means that the applied programs had achieved the goal.

Our results were similar to those obtained in other studies. Many studies have reported that a large waist circumference and an increased body mass index (> 25) indicate a state of overweight or obesity, being associated with a low level of physical activity or with physical inactivity.

By participating in aerobic exercise training programs, study participants were able to reduce their body weight and decrease the amount of adipose tissue in some areas of the body, with the intention of approaching the ideal body weight and obtain body shaping.

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