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THE EFFECT OF PHYSICAL ACTIVITY PROGRAMS IN FITNESS HALLS ON BODY WEIGHT

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ABSTRACT. ***Introduction.*** Recent epidemiological studies have highlighted increased obesity rates all over the world, of sometimes epidemic proportions. The World Health Organization recommends individuals to constantly practicing physical activities, since many specialists have noted the obvious contribution of physical activity to human health management, well-being and labour productivity. ***Objectives***. The main objective of this study was to analyse the effect of different types of aerobic physical activity practiced in fitness rooms on weight loss. ***Methods***. This research included 88 female practitioners in two fitness halls in the city of Oradea and the length of the study was eight months. Depending on the type of physical activity practiced, five groups were formed. Participation in the study was on a voluntary basis. Somatic measurements were carried out at the beginning and the end of the physical activity intervention program. The data thus collected were statistically analysed with SPSS, version 20.0. ***Results*****.** This study has shown the contribution of physical activities to body weight management, with an average body weight loss of 4.31 kg (ranging from 2.88 kg to 5.62 kg), a body fat decrease by 6.24%, of the body adiposity index by 2.17% and the hip circumference by 4.69 cm. ***Conclusions*****.** Regular participation in physical activity programs can contribute to loss of weight and body fat, while the type of physical activity plays a determining role.

Key words: *recreational physical activity, aerobic, body composition, body adiposity index*, *obesity risk, body mass index.*

REZUMAT. ***Efectul programelor de activitate fizică din săli de fitness asupra greutății corporale. Introducere.*** Studii epidemiologice recente semnalează creşterea prevalenţei obezităţii în lume ajungându-se uneori la proporţii epidemice. Organizația Mondială a Sănătății recomandă practicarea constantă a activităților fizice, mulţi specialişti au remarcat că este evidentă contribuţia acestora în managementul sănătății, asupra stării de bine şi productivităţii muncii. ***Obiective.*** Obiectivul principal al acestui studiu a fost analiza efectului diferitelor tipuri de activitate fizică aerobă practicate în săli fitness asupra scăderii greutății corporale. ***Metode*****.** La acest studiu au participat 88 de persoane de gen feminin, practicante

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de exerciţii fizice în două săli de fitness din oraşul Oradea timp de 8 luni. În funcţie de tipul de activitate fizică practicată au fost formate 5 grupe. Participarea la studiu a fost voluntară. Au fost efectuate măsurători somatice la începutul şi finalul programului de intervenţie. Datele au fost analizate statistic cu programul SPSS, varianta 20.0. ***Rezultate***. Studiul prezent a demonstrat contribuția activităților fizice în managementul greutății, cu efect de reducere a masei corporale în medie cu 4,31 kg (de la 2,88 kg până la 5,62 kg), scăderea procentului de țesut adipos cu 6,24%, a indicelui de adipozitate cu 2,17% și a circumferinței șoldului cu 4,69 cm. ***Concluzii.*** Participarea cu regularitate la programe de activitate fizică poate să contribuie la pierderea de greutate şi de ţesut adipos, tipul de activitate fizică practicată având rol determinant.

Cuvinte cheie: *activităţi fizice recreative, aerobic, compoziţie corporală, indice de adipozitate, risc de obezitate, indice de masă corporală.*

Introduction

Several epidemiological studies indicate an increase in the prevalence of obesity worldwide taking on epidemic proportions (WHO, 2000). It is well-known that excessive adiposity is strongly associated with cardiovascular disease risk factors such as hypertension, diabetes and dyslipidaemia (Cornier, Despres, Davis, Grossniklaus, Klein, Lamarche et al., 2011). Low, Chin, Deurenberg-Yap (2009) claim that "Obesity increases the risk of chronic diseases such as diabetes mellitus, cardiovascular disease, stroke and some forms of cancer. It is a serious public health problem that increases in low-income or middle-income countries."

Aerobic training is of interest to the female population, with more and more people choosing fitness rooms and aerobics as physical activities during their spare time. The *American College of Sports Medicine* recommends constantly practicing physical activities as their contribution to health management, well-being and labour productivity is obvious" (Pate, Pratt, Blair, Haskell, Macera, Bouchard, King, 1995).

According to the scientific research, practicing physical exercise can reduce the risk of diseases such as osteoporosis (Welten, Kemper, & Post, 1994), cardiovascular diseases (Berlin & Colditz, 1990), type II diabetes (Macdonald, Philip, Harrison, And Watt, 2006; Spelsberg, 1994), colon cancer (Slattery, Potter, Caan et al., 1997), and obesity (Cortright, Sandhoff, Basilo et al., 2006). If practiced on a regular basis, physical exercise has been shown to be effective in managing stress and improving the treatment of depression (Simonsick, 1991), as well as improving body image (Suris & Parera, 2005; Williams & Cash, 2001).

This study aimed at studying the effects of physical activity programs performed in fitness rooms on body weight, body fat percentage and body mass

index (BMI) of female subjects. The study also aimed to analyse the effectiveness of the different types of physical activity programs practiced by the subjects included in the study.

The objectives of our study were to find out whether following the participation in various aerobic gymnastics programs for eight months, effects were noticed on:

- body mass;
- body fat percentage;
- body adiposity index;
- body mass index;

In this study, we started from the assumption that regular exercise of physical activity can cause weight loss and such a decrease depends on the type of physical activity performed.

Material and methods

In this study, 88 female subjects were divided into five groups, depending on the type of physical activity they participated in, as follows: Group 1 - circuit (n = 13); Group 2 - softball (n = 17); Group 3 – Fit ball (n = 20); Group 4 - toning body (n = 20); Group 5 - Tae-Bo (n = 18). The breakdown by groups was made according to the subject's choice for a certain type of physical activity. The research has been conducted for eight months, i.e. from 20.01.2015 to 20.09.2015, in two fitness halls in Oradea.

We carried out measurements of body mass (weight), height, hip circumference, and skinfolds (five skinfolds: triceps, subscapular, suprailiac, abdominal, biceps) before and after the physical activity intervention programs. Weight and height of subjects were used for BMI calculation, and hip circumference and height for calculating the body adiposity index.

The body adiposity index (BAI) was calculated by the formula below:

$$\text{Body Adiposity Index} = (\text{Hip Circumference cm} / \text{Height in m}^{1.5}) - 18$$

and the body fat percentage (BFP) by the formula below:

$$\text{BFP (\%)} = \Sigma \text{ 5 skinfolds (in mm)} \times 0.15 + 5.8 + \text{body area in m}^2$$

The data collected were statistically processed using the SPSS software, version 20.0. Central tendency parameters were calculated, and averages recorded in experimental groups were compared using parametric or nonparametric tests, depending on the data distribution. For the comparison of the differences among group means, we used the analysis of variance – ANOVA - for normal distribution data or the Kruskal-Wallis nonparametric test for non-uniform values or ranks. Distribution testing was done using the Shapiro-Wilk test.

The aerobics training took place twice a week, with a total training period of 60 minutes. A registration form was used to collect the data, and in order to have subjects' acceptance to participate in the study, a data processing sheet and a participation agreement were signed by both parties before starting the activity.

Initial testing (T1) took place in January 2015, and final testing (T2) in September 2015.

Results

The subjects included in the study were women with an average age of 33.01 (± 8.45), the youngest subject being of 22 years old, and the oldest subject of 56 years old. Measurements were made at the beginning of the study (T1) for body mass, height, skinfolds, Body Mass Index (BMI), Body Adiposity Index (BAI) and the Body Fat Percentage (BFP) were calculated too (Table no. 1).

Table 1. Descriptive statistics of subjects participating in the study (N = 88)

	N	Minimum	Maximum	Mean	Std. Deviation
Age (years)	88	22	56	33.01	8.45
Body mass (kg)	88	47	89	63.36	9.29
Height (cm)	88	158	176	167.61	4.11
Hip circumference (cm)	88	87.00	120.00	101.56	7.90
BFP (%)	88	15	44	28.32	6.73
BMI (kg/m^2)	88	17.11	29.41	22.56	3.14
BAI (%)	88	21.21	37.71	28.84	4.05
Valid N (list wise)	88				

The means and the standard deviations of the variables, according to the groups in which the subjects were distributed, are presented in Table no. 2.

Table 2. Mean and standard deviation of variables in initial testing by group

Group	Body mass (kg)	Height (m)	Body surface (m^2)	Body Fat (%)	BMI (kg/m^2)	BAI (%)
1 (N=13)	66.77(10.91)	166.85 (4.49)	2.00 (.00)	29.85 (6.31)	23.97 (3.27)	29.95 (3.53)
2 (N=17)	61.4711.25)	168.53 (4.43)	1.94 (.24)	31.18 (6.27)	21.66 (3.72)	27.94 (4.05)
3 (N=20)	64.40 (8.50)	168.00 (4.13)	2.00 (.00)	24.00 (5.09)	22.92 (3.31)	30.18 (4.24)
4 (N=20)	61.05 (6.61)	166.95 (3.47)	2.00 (.00)	33.30 (5.61)	21.79 (2.38)	27.38 (4.26)
5 (N=18)	64.11 (9.37)	167.61 (4.39)	1.97 (.10)	23.78 (4.13)	22.84 (2.81)	29.03 (3.59)

In view of comparing the means of the subjects included in the five groups, the testing the normal distribution was performed using the Shapiro-Wilk test. According to Table no. 3, the data are normally distributed for following variables: body mass, body fat percentage (except for subjects in Group 5), BMI and body adiposity index (BAI), and as far as the age variable is concerned, data are

not normally distributed (except for subjects in Group 1). Consequently, in order to run the test of significance of differences in the case variables non-normally distributed variables, we use nonparametric tests.

The running of Kruskal-Wallis nonparametric test, by which we compared the mean age of the subjects distributed in the five groups, indicates that the means are different from the point of view statistical data (p = 001). In the case of variables body mass, height and BMI, the ANOVA test shows that differences in group means are not significant: body mass (F = 1.045, df = 4, p =.389); height (F = 1.478, df = 4, p = 0.216), BMI (F = 1.478, df = 4, p = .216). In contrast, the difference between group means in terms of body fat variable is significant (F = 4.383, df = 4, p =.003).

Table 3. Testing the normality of the distribution of variables according to the type of physical activity performed

Variable	Subgroup	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistical	df	Sig.	Statistical	df	Sig.
Age (years)	1	0.137	13	0.200*	0.976	13	0.957
	2	0.227	17	0.020	0.847	17	0.010
	3	0.264	20	0.001	0.673	20	0.000
	4	0.208	20	0.024	0.867	20	0.010
	5	0.155	18	0.200*	0.886	18	0.034
Body mass (kg)	1	0.184	13	0.200*	0.933	13	0.369
	2	0.187	17	0.116	0.923	17	0.168
	3	0.139	20	0.200*	0.940	20	0.240
	4	0.136	20	0.200*	0.950	20	0.361
	5	0.129	18	0.200*	0.926	18	0.165
Body Fat (%)	1	0.196	13	0.183	0.878	13	0.068
	2	0.197	17	0.078	0.942	17	0.345
	3	0.122	20	0.200*	0.940	20	0.236
	4	0.122	20	0.200*	0.970	20	0.755
	5	0.219	18	0.022	0.842	18	0.006
BMI (kg/m^2)	1	0.143	13	0.200*	0.937	13	0.415
	2	0.156	17	0.200*	0.922	17	0.157
	3	0.099	20	0.200*	0.951	20	0.375
	4	0.107	20	0.200*	0.963	20	0.610
	5	0.141	18	0.200*	0.967	18	0.732
BAI (%)	1	0.113	12	0.200*	0.970	12	0.911
	2	0.117	17	0.200*	0.936	17	0.273
	3	0.072	20	0.200*	0.977	20	0.885
	4	0.161	20	0.184	0.939	20	0.233
	5	0.096	19	0.200*	0.978	19	0.918

*. This is a lower bound of the true significance. a. Lilliefors Significance Correction

After the physical activity intervention program was performed for eight months, the subjects were tested again (T2), the statistical processing of the data revealing the effects of this intervention program. Body mass and skinfolds were measured, then the percentage of body fat and body mass index were calculated.

Because data was normally distributed, except for the body fat percentage in Group 3, the paired sample t-test, was used to compare the means. Analysing the results of this test in all subjects included in the research we find that the differences are significant for the variables body mass, body fat, BMI, hip circumference and body adiposity index (Table no.4).

Table 4. The paired sample t-test (N = 88)

Pair sample variables	t	df	Sig. (2-tailed)
Body mass (kg) T1 – Body mass (kg) T2	15.408	87	0.000
Body Fat (%) T1 – Body Fat (%) T2	21.759	87	0.000
BMI (kg/m²) T1 – BMI (kg/m²) T2	15.409	87	0.000
Hip circumference (cm) T1 – Hip circumference (cm) T2	13.548	87	0.000
BAI T1 (%) – BAI T2 (%)	13.472	87	0.000

The same can be mentioned if we compare the means of these variables depending on the type of physical activity performed by the subjects (Table no. 5). Consequently, the results show that physical exercise programs in fitness rooms caused significant changes in body mass, body fat, body mass index and body adiposity index.

Table 5. The paired sample t-test by type of physical activity

Group	Paired sample variable	t	df	Sig. (2-tailed)
1 (N=13)	Body mass (kg) 1 – Body mass (kg) 2	5.744	12	0.000
	Body Fat (%) 1 – Body Fat (%) 2	9.679	12	0.000
	BMI 1 – BMI 2	6.453	12	0.000
	Body Adiposity Index 1 – Body Adiposity Index 2	4.727	12	0.001
2 (N=17)	Body mass (kg) 1 – Body mass (kg) 2	4.962	16	0.000
	Body Fat (%) 1 – Body Fat (%) 2	7.778	16	0.000
	BMI 1 – BMI 2	4.961	16	0.000
	Body Adiposity Index 1 – Body Adiposity Index 2	4.116	16	0.001
3 (N=20)	Body mass (kg) 1 – Body mass (kg) 2	9.489	19	0.000
	Body Fat (%) 1 – Body Fat (%) 2	12.943	19	0.000
	BMI 1 – BMI 2	9.372	19	0.000
	Body Adiposity Index 1 – Body Adiposity Index 2	8.576	19	0.000
4 (N=20)	Body mass (kg) 1 – Body mass (kg) 2	8.853	19	0.000
	Body Fat (%) 1 – Body Fat (%) 2	19.222	19	0.000
	BMI 1 – BMI 2	7.393	19	0.000
	Body Adiposity Index 1 – Body Adiposity Index 2	7.688	19	0.000
5 (N=18)	Body mass (kg) 1 – Body mass (kg) 2	8.363	17	0.000
	Body Fat (%) 1 – Body Fat (%) 2	23.805	17	0.000
	BMI 1 – BMI 2	8.907	17	0.000
	Body Adiposity Index 1 – Body Adiposity Index 2	11.142	17	0.000

Observing the data in Table no. 6, we find that there is a positive relation and statistically significant correlation between the variables body mass, BMI and body fat percentage (BFP) in subjects in all groups.

Table 6. Correlations between age, body mass, Body Fatand BMI of subjects (N = 88)

Group	Variable	Body Fat(%)	BMI (kg/m^2)	Body mass (kg)	Age (years)
1 (N=13)	Body Fat (%)	1	0.722**	0.724**	0.410
	BMI (kg/m^2)	0.722**	1	0.936**	0.062
	Body mass (kg)	0.724**	0.936**	1	-0.025
	Age (years)	0.410	0.062	-0.025	1
2 (N=17)	Body Fat (%)	1	0.932**	0.929**	0.428
	BMI (kg/m^2)	0.932**	1	0.949**	0.425
	Body mass (kg)	0.929**	0.949**	1	0.347
	Age (years)	0.428	0.425	0.347	1
3 (N=20)	Body Fat (%)	1	0.715**	0.756**	-0.150
	BMI (kg/m^2)	0.715**	1	0.940**	-0.019
	Body mass (kg)	0.756**	0.940**	1	-0.100
	Age (years)	-0.150	-0.019	-0.100	1
4 (N=20)	Body Fat (%)	1	0.750**	0.889**	0.258
	BMI (kg/m^2)	0.750**	1	0.912**	0.193
	Body mass (kg)	0.889**	0.912**	1	0.133
	Age (years)	0.258	0.193	0.133	1
5 (N=18)	Body Fat (%)	1	0.788**	0.803**	-0.176
	BMI (kg/m^2)	0.788**	1	0.912**	-0.194
	Body mass (kg)	0.803**	0.912**	1	-0.225
	Age (years)	-0.176	-0.194	-0.225	1

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

At the same time, the relationship is poor between the same variables aforementioned and the age variable that is we can not say that subjects of a certain age have lost more weight or have a lower body fat percentage.

Discussions

According to the comparative analysis of the data recorded in the initial and final tests, significant differences were found in all groups, but the influence of the types of physical activity differs from one variable to another (Table no. 7). Thus, the biggest effect on body mass was the circuit program (with a loss of 5.62 kg.), and the toning body program (with a loss of 5.40 kg.), while the lowest average weight loss was recorded in the group practicing the softball program (2.88 kg.). Since the highest weight loss was recorded in the group practicing the circuit program, it is natural that the highest difference in terms of body mass index (2.05 kg/m^2) be also recorded in this group.

Table 7. The effect of type of physical activity on body mass, BFP, BAI, hip circumference and BMI

Variable	Sample	Group				
	N (=88)	1 (N=13)	2 (N=17)	3 (N=20)	4 (N=20)	5 (N=18)
Body mass (kg)	4.31	5.62	2.88	3.85	5.40	4.00
BFP (%)	6.24	2.32	4.40	4.44	13.40	4.86
BAI (%)	2.17	1.82	1.32	1.89	3.52	2.05
Hip circumference (cm)	4.69	3.92	2.88	4.10	7.55	4.44
BMI (kg/m^2)	1.52	2.05	1.06	1.38	1.75	1.45

From the point of view of the effect of the type of physical activity on decreasing the percentage of Body Fat and the hip circumference, the highest scores were recorded in Group 4 (13.40% and 7.55 respectively). The lowest loss of Body Fatwas recorded in Group 1 (2.32%), and in Group 2 the hip circumference was 2.88 cm lower at the end of the physical activity intervention program.

The effect of aerobic exercise on female subjects was also studied by Siqiang Duo (2018). He analysed the influence of aerobic activities on obese female students and concluded that practicing aerobic exercises had a positive effect on the weight loss of students and their physical and mental health. Clark (2015) argues that exercise efficacy is directly proportional to their intensity, regardless of the methodology used in the intervention protocol (whether a food plan is included or not). Moreover, he argues that there is a clear delimitation between the types of exercises used and the efficacy of responses induction.

Other studies demonstrated that physical exercise is effective in loosing body weight. Ward and Bar-Or (1993) reviewed 13 studies based on aerobic exercise for a period of 9 to 18 months. The percentage of body fat has decreased from 10% to 5% in all 13 reviewed studies. According to Grilo (1994), people who exercise constantly achieve better results in decreasing their body weight than those who are exercising less.

Ross, Janssen, Dawson et al. (2004) recorded similar results in a study encompassing a sample of 17 post-menopausal obese women (aged ~ 43) who burned 500 calories a day (a maximum rate of 80%) for 14 weeks in an aerobic exercise program and had a weight loss of 6.8%.

Results similar to those we recorded were reported in a study by King, Hopkins, Caudwell, Stubbs, and Blundell (2008), which showed a weight loss of 4.1% in a sample of overweight and obese women who participated in a 12 weeks training program, five sessions a week, recording a 500 kcal burning each session.

Specific literature has certain limitations when it comes to the link between weight loss and the difficulty of exercises, and the results are mixed. For example, Jakicic, Otto, Lang, et al (2011) demonstrated in a predominantly female random sample (~ 90%) who practiced physical exercise for 18 months,

an insignificant weight loss. Church, Blair, Cocreham, Johannsen, Johnson, Kramer, and Earnest. (2010) showed similar results in their study, which lasted for 6 months with subjects practicing supervised exercises, 3-4 times a week, with a 50% consumption of the maximum oxygen volume, their sample being divided into three groups, and the weight loss recorded was minimal and did not increase significantly with the increased difficulty of exercise.

Conclusions

This study found that practicing of regular physical recreational exercise by adult women for eight months causes loss of body weight and decrease of hip circumference, reduces the body fat percentage, decreases the body adiposity index and body mass index. Significant differences were found between the different types of physical activity practiced by the subjects involved in the study. We also found that between body mass, the body fat percentage and BMI there is a positive relation and statistically significant relationship, but that this relationship is not significant depending on the age of the participants in the study. Thus, the research assumption was verified and confirmed.

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