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СПОРТНА ПЕДАГОГИКА

SPORTS EDUCATION

FITNESS INFLUENCE ON THE TRANSFORMATION OF BODY COMPOSITION AND ON THE IMPROVEMENT OF AEROBIC SUSTAINABILITY IN WOMEN

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Abstract: *The purpose of this research is to determine the effects of a specialised two-month fitness programme with strength exercises on the body composition and aerobic endurance in recreational women. The research included a group of women aged 18–35 who had not previously been engaged in recreational exercises in fitness centres. The sample included 50 women who exercised at the Fivestar fitness centre in Gjilan, and who underwent the abovementioned programme. The composition of the body was evaluated using a Tanita BC-601 device and the bioelectrical impedance analysis (BIA), which was conducted as a reference method in the research related to the analysis of body composition. For this research, the following variables of body composition and aerobic endurance were applied: body height (BH), body weight (BW), body mass index (BMI), body fat percentage (BFP), muscle mass (TBM), bone mass or density (BMD), calorie expenditure (DCI), body vitality (BMR), body water intake (TBW), visceral fat intake (AVF), and the Rockport fitness test for aerobic endurance (ROFT). For the dependent group, the T-test analysis was applied through statistical methods. The results obtained after statistical processing showed that, in relation to the two-month programme three times a week (24 trainings), physical exercises in the fitness can affect the reduction of subcutaneous adipose tissue, and thus reduce the risk of various cardiovascular diseases. In addition to reducing fat mass with strength exercises in the fitness, there was also an improvement in aerobic endurance. This shows that, besides aerobic exercise, weight training should be applied to increase aerobic capacity.*

Keywords: *women; fitness; T-test; body composition; aerobic endurance.*

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INTRODUCTION

According to the report of the World Health Organization (WHO 2002), insufficient physical activity has been declared an independent risk factor and represents the biggest health problem of a nation. Hypokinesia (decreased mobility, decreased physical activity) is a factor that contributes to the development of many diseases and chronic disorders. It also leads to an increased risk of cardiovascular and other chronic diseases, such as diabetes, overweight, hypertension, bone and joint diseases, etc. (Warburton et al. 2001). Diseases that occur due to this lifestyle and negative environmental factors are predominant in the health statistics of the modern era. The active participation of individuals is essential to reduce and prevent this condition, so it is especially important that the "ordinary" person is provided with information on how and in what way he/she should live and maintain health through physical exercise. Body composition can be improved by providing good nutrition and regular physical activity as part of your normal routine. It is important to be realistic and to understand what can and cannot be changed in your body. Also, keep in mind that, despite the social pressure, the variety of body shapes and sizes is very normal. The composition of the body differs from other components of fitness due to the fact that certain specific parts of the body cannot be changed through diet or exercise. It is worth mentioning that the physical appearance of the body itself reflects and reveals the way of life itself to a large extent, especially the behaviour and the relation to the body.

Insufficient physical activity is a nation's biggest health problem. It has been proven to be a contributing factor to the development of chronic diseases and disorders (Blair et al. 2004). If we look at the genesis of cardiovascular disease, reduced physical activity or insufficient movement is one of the main risk factors. There is much evidence to suggest that recreational physical activity affects lipoprotein metabolism, slows the rate of arteriosclerosis and other arterial diseases, and individuals who engage in physical activity have better health (Thompson et al. 2003). There are many different mechanisms by which fitness and aerobic exercise reduce the risk of cardiovascular disease, including effects on lipid metabolism, blood pressure, endothelial function, vasodilation, blood clotting, insulin sensitivity, and body composition (Lee et al. 2003). Studies show that fitness reduces the risk of cardiovascular disease by 20%, and in people who are much more physically active by up to 27%.

One of the most modern methods of measuring body composition is the method of resistance or bioelectrical impedance, which is based on the fact that electricity passes more easily through an organism that has more water in its composition. Since fats have less water in their composition, the body's resistance to conducting electricity is due to fats in the body. So, electrical resistance is an index of total body fat and is based on various formulas measuring the percentage of body fat and its composition. The purpose of this research is to determine the effects of the specialised two-month fitness programme with strength exercises on body composition and aerobic endurance in recreational women.

MATERIAL AND METHODS

Subjects

The research included a group of women aged 18–35 who had not previously been engaged in recreational exercises in fitness centres. The sample included 50 women who exercised at the Fivestar fitness centre in Gjilan, and who underwent a programme specialised for two months in fitness with strength training.

Instrument for Assessment

The composition of the body was evaluated with a Tanita BC-601 device and the bioelectrical impedance analysis (BIA), which was conducted as a reference method in research related to the analysis of body composition. For this research, the following anthropometric, body composition and aerobic endurance variables were applied: body height (BH), body weight (BW), body mass index (BMI), body fat percentage (BFP), muscle mass (TBM), bone mass or density (BMD), calorie expenditure (DCI), body vitality (BMR), body water intake (TBW), visceral fat (AVF), and the Rockport fitness test for aerobic endurance (ROFT).

Experimental Model of Fitness Exercises

The group of women performed 12 strength exercises consisting of arm and shoulder exercises, back exercises, abdominal muscle and leg exercises. Their programme was set up to 3 sets with 10 reps for the upper body and 14 reps for the lower body. Weight adjustment was assessed on the basis of age, height, weight and gender for each car by means of the Techno Gym Wellness System. The time for a training session lasted 60 minutes.

Table 1. A Summary of the 12 Exercises that Respondents Performed over Eight Weeks (Schroeder, 2015)

1.	(chest press)
2.	(shoulder press)
3.	(pull-down)
4.	(lower back)
5.	(abdominal crunch)
6.	(torso rotation)
7.	(Scott biceps curl)
8.	(triceps extension)
9.	(leg press)
10.	(quadriceps extension)
11.	(leg curl)
12.	(abduction)

Table 2. Modified Standard Exercise Programme (Schroeder, 2015)

Strength Training									
	First day			**Second day**			**Third day**		
		Repetition			Repetition			Repetition	
Week	Series	Hands Spine Tummy	Legs	Series	Hands Spine Tummy	Legs	Series	Hands Spine Tummy	Legs
1	1	18	20	1	18	20	2	18	20
2	2	18	20	2	18	20	2	18	20
3	2	15	18	2	15	18	2	15	18
4	2	15	18	2	15	18	2	15	18
5	2	12	16	2	12	16	2	12	16
6	2	12	16	2	12	16	2	12	16
7	3	10	14	3	10	14	3	10	14
8	3	10	14	3	10	14	3	10	14

Statistical Analysis

Descriptive statistical parameters were calculated: arithmetic mean and standard deviation. To determine the statistically significant differences between the initial and the final measurement regarding the effects of the two-month experimental fitness programme on the indicators of body composition and aerobic endurance, the T-test analysis was applied for the dependent group. All statistical analyses of the data were processed with the statistical package SPSS, version 23.0 for Windows (SPSS Inc, Chicago, IL, USA).

RESULTS AND DISCUSSION

The results of this research are presented in three tables. The ones in Table 3 show the basic descriptive parameters of the female participants in the initial and final measurement. Numerical differences have been noticed between these measurements.

Table 3. Basic Descriptive Parameters of Women (N = 50) in the Initial and Final Measurement

	N	*Mean*	*Std. Dev.*	*Mean*	*Std. Dev.*
BH (cm)	50	165.7	4.9	165.7	4.9
BW (kg)	50	69.8	9.0	66.0	8.6
BMI (kg/m^2)	50	25.4	3.1	24.1	2.9
BFP (%)	50	37.9	3.1	33.4	3.9
TBM (kg)	50	45.1	3.3	45.4	3.7
BMD (kg)	50	2.5	0.2	2.5	0.2
DCI (kcal)	50	2224.1	159.7	2272.0	126.9
BMR (metabolic age)	50	36.8	4.3	30.7	4.2
TBW (%)	50	50.6	3.7	50.8	4.8
AVF (%)	50	4.9	1.5	3.9	1.3
ROFT (index)	50	29.8	2.6	34.2	3.2

Table 3 shows the basic statistical parameters of arithmetic mean (Mean), and standard deviation (Std. Dev.). The body height is the same in the two time periods (BH = 165.7) with a standard deviation of 4.9. Therefore, the comparison between the results in the two time periods has not been calculated. In terms of body weight in the initial state (BWI = 69.8) and in the final state after the realisation of the fitness programme (BWF = 66.0), the difference is lower: 3.8 kg. With body mass index (BMI) in the initial state (BMII = 25.4) and in the final state after the realisation of the fitness programme (BMIF = 24.1), the difference is 1.3%. As for the percentage of fat (BFP) in the initial state (BFPI = 37.9) and in the final state after the implementation of the fitness programme (BFIF = 33.4), the difference is 4.5%. With muscle mass (TBM) in the initial state (TBMI = 45.1) and in the final state after the implementation of the fitness programme (TBMF = 45.4), the difference is -0.4 kg. With regard to the amount of minerals in the bones (BMD) in the initial state (BMDI = 2.5) and in the final state after the realization of the fitness programme (BMDF = 2.5), the difference is 0.0%. As for the daily calorie intake (DCI) in the initial state (DCII = 2224.1) and in the final state after the realisation of the fitness programme (DCIF = 2272.0), the difference is -47.9 kcal. With body vitality (BMR) in the initial state (BMRI = 36.8) and in the final state after the implementation of the fitness programme (BMRF = 30.7), the difference is 6.1 years. In terms of the amount of water in the body expressed in percentage (TBW) in the initial state (TBWI = is 0.2%) and in the final state after the implementation of the fitness programme (TBWF = 50.8), the difference is -0.2%. With visceral body fat (AVF) in the initial state (AVFI = 4.9) and in the final state after the realisation of the fitness programme (AVFF = 3.9), the difference is 1%. As for the aerobic endurance test (ROFT) in the initial state (ROFTI = 29.8) and in the final state after the realisation of the fitness programme (ROFTF = 34.2), the difference is -4.4%.

One of the main objectives of this paper was to establish the difference between the initial and final condition of women (after kinesiological treatment) in terms of body composition. Table 4 shows the differences in the values of the arithmetic mean of body components in the females included in the experiment.

Table 4. Differences Between the Initial and Final State of Women (N = 50) in the Variables of Body Components

	Paired Differences	*Mean*	*Std.*	*Std. Error*	*Lower*	*Upper*	*t*	*Df.*	*Sig.*
			Dev.	Mean					
Pair 2	BWI-BWF	3.78	1.34	0.19	3.39	4.16	19.9	49	.000
Pair 3	BMII-BMIF	1.38	0.48	0.07	1.25	1.52	20.47	49	.000
Pair 4	BFPI-BFPF	4.55	2.35	0.33	3.88	5.22	13.71	49	.000

Pair 5	TBMI-TBMF	-0.39	3.34	0.47	-1.34	0.56	-0.82	49	.416
Pair 6	BMDI-BMDF	0.01	0.06	0.01	-0.01	0.02	0.5	49	.622
Pair 7	DCII-DCIF	-47.96	86.9	12.29	-72.66	-23.26	-3.9	49	.000
Pair 8	BMRI-BMRF	6.1	2.59	0.37	5.36	6.84	16.66	49	.000
Pair 9	TBWI-TBWF	-0.24	3.29	0.46	-1.18	0.69	-0.52	49	.605
Pair 10	AVFI-AVFF	0.94	0.65	0.09	0.75	1.13	10.2	49	.000
Pair 11	ROFTI- ROFTF	-4.36	2.23	0.45	-5.28	-3.44	-9.8	49	.000

Table 4 also shows the results of the T-test for the dependent samples, which determined the changes from the initial to the final measurement for the group that implemented the fitness programme. The same table gives the parameters of the arithmetic mean and the standard deviation in the initial and final measurement in order to make it clear what changes actually occurred after the application of the kinesiology programme. There are significant positive changes in most variables of body composition (except in Muscle Mass /TBM/, Bone Mineral Amount /BMD/ and Expressed Percentage of Body Water /TBW/) and in the aerobic endurance variable (ROFT). In particular, the reduction in body weight affected all variables where it had the greatest impact, especially on the adipose tissue of the body. Statistically significant differences were obtained in the variables. The difference in body weight (BW) is Mean dif. = 3.78, t = 19.9, and $p < .000$. The body mass index (BMI) is Mean dif. = 1.38, t = 20.47, and $p < .000$. The fat percentage (BFP) is Mean dif. = 4.55, t = 13.71, and $p < .000$. The muscle mass (TBM) is Mean dif. = -0.39, t = -0.82, and $p > .000$. The amount of minerals in the bones (BMD) is Mean dif. = 0.01, t = 0.50, and $p > .000$. The daily calorie intake (DCI) is Mean dif. = -47.96, t = -3.90, and $p < .000$. The body vitality (BMR) is Mean dif. = 6.1, t = 16.66, and $p < .000$. The amount of water in the body expressed as a percentage (TBW) is Mean dif. = -0.24, t = -0.52, and $p > .000$. The visceral body fat (AVF) is Mean dif. = 0.94, t = 10.20, and $p < .000$. The aerobic endurance test (ROFT) is Mean dif. = -4.36, t = - 9.80, and $p < .000$.

Recently, researchers have often analysed the effects of different forms of fitness training on changes in body composition variables. In this regard, research on women is frequent, taking into consideration the many problems recorded in this population. The first and basic reason is that modern life generates employment among adult women who are also busy doing daily chores at home (Daly 2002). This clearly refers mainly to housework, childcare, and other similar issues. The fact that women today are often employed professionally, without having enough time to devote to themselves, certainly contributes to this (Festini 2009). To this must be added the fact that active movement and transport (walking, cycling) is very limited in general because of daily obligations. It becomes clear that women's physical activity is significantly reduced as compared to some previous periods. This lack of physical activity generates low calorie intake, which, along with high calorie intake through high calorie foods, leads to an increase in adipose tissue, overweight, and obesity (Rosenheck 2008). Therefore, it should come as no surprise that a large number of studies have investigated the issue of fat reduction, i.e. changes in body composition, precisely in the adult population of women (Chyu et al. 2013; Myrtaj et al. 2018; Stojmanovska & Gontarev 2018; Myrtaj & Shkodra 2019; Elezi et al. 2020; Shkodra et al. 2020).

Perhaps the most important effect of weight training, which contributes to fat loss and modification of body composition, is the increase in basal metabolism. Studies conducted so far on the topic of fitness exercises with external load have shown that this form of exercise has an extremely good effect in terms of reducing body fat in women. This is evidenced by studies that have been carried out among women (Fritz et al. 2018). The reason for this phenomenon should be sought in the fact that fitness exercises with an external load produce relatively high energy consumption, although the programme itself was performed using exercises that were mainly anaerobic (phosphagen or glycogen). This consumption generates the metabolism of fatty acids in the energy processes in the breaks between sets during training, and certainly contributes to the need for resynthesis of energy sources after training (Wilmore et al. 2008). Perhaps the most important effect of weight training, which contributes to fat loss and modification of body composition, is the increase in basal metabolism. Research shows that basal metabolism is increased more after exercises with an external load than after aerobic exercises (endurance training)

(Ahtiainen et al. 2015). This leads to an increased need for energy in the post-work periods, which in longer periods also contributes to the reduction of fat cells due to the use of fat as an energy source.

CONCLUSION

We can emphasise that the participation of women in various physical recreational activities, including fitness in Kosovo, is still not satisfactory, although there is a growing trend in this regard. This low participation occurs due to the role that women play in society in cultural, economic, traditional, customary, political, and ideological terms. The increasing awareness of the role and impact of exercise on a woman's health and appearance has recently led to an increase in the number of women going to the gym. Nowadays, the fitness trend has attracted an increasing number of women who want to improve their health and appearance, which is a preventive measure for many cardiovascular and other diseases. There is a lot of physical exercise in the fitness that can affect the reduction of subcutaneous adipose tissue, and thus reduce the risk of various cardiovascular diseases. In addition to reducing fat mass, strength exercises in the fitness significantly lead to improved aerobic endurance. This shows that, along with aerobic exercise, weight fitness exercises should be applied to increase aerobic capacity. The programmes presented in this paper, as well as the methods applied in exercise, have a positive effect on body composition, mainly contributing to the successful reduction of subcutaneous adipose tissue in women after adolescence. The paper shows which fitness exercise programmes are optimal for women of this age and have the impact of reducing subcutaneous adipose tissue in order to prevent various diseases, promote health, and enhance and maintain the quality of life.

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