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DIFFERENCES IN THE BODY COMPOSITION OF WOMEN WHO ENGAGE AND THOSE WHO DO NOT ENGAGE IN PROGRAMMED PHYSICAL ACTIVITY

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Abstract: *The aim of the scientific study is to determine the differences in the body composition of women who exercise and those who do not engage in programmed physical activity. The research and measurement procedure were conducted on a sample of forty-three (N=43, 25-35 years old) female persons. The sample was divided into two subsamples, an experimental group (n=20) that practiced programmed physical activity and a control group (n=23). The following variables were used to assess body composition: Total Fat Mass (%), Total Muscle Mass (kg), Total Trunk Mass (kg), Trunk Fat (%), Body Water (%) and Visceral Fat Mass. The highest level of differences was observed in Total Fat Mass and Total Muscle Mass (F=100.36, Sig.=.000 and F=84.93, Sig.=.000, respectively), followed by Total Trunk Mass (F=79.11, Sig.= .000), Body Water (F=77.23, Sig.=.000) and Trunk Fat (F=48.58, Sig.=.000). Based on the obtained results, after the implemented experimental program, it can be concluded that the twelve-week program has an impact on the body composition of the female population.*

Key words: body composition, physical activity, experimental program, female population

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Introduction

Physical activity plays a very important role in health status, whether it is a physical or a mental component, and life without movement is not possible for a long time and without it it can disappear.[1] Diet and the amount of physical activity directly affect the health status of adults and children.[2,3] Due to the fact that the largest part of the world's population is physically inactive, physical inactivity is considered to be a public health problem, not only for individuals, and cause serious consequences for health and quality of life in general.[4,5] Modern living conditions limit man's space and time for exercising various forms of recreational activities, and the average level of physical activity among the population is becoming lower and lower.[6] There is irrefutable evidence that regular physical activity is effective in the primary and secondary prevention of several chronic diseases and preventable death.[7] Physical activity, exercise and recreational sports promote and improve the fitness components and health of the individual and have effects on multiple organ systems.[8]

The generally accepted scientific definition of physical activity defines physical activity as any bodily movement produced by skeletal muscles that results in caloric expenditure.[9] It usually represents a certain form of sports-recreational or organized physical activity that is mainly performed within a fitness or other program under the supervision of an expert, a licensed trainer and aims to improve health, physical abilities and generally for the well-being of each person or participant.[10] By body composition we mean the composition of the human organism represented by the size and grouping of the existing measurable segments from which it is composed.[11]

Current research shows that moderate physical activity reduces the risk of cardiovascular disease by 20%, and by 27% in people who are significantly more physically active.[8] The most commonly practiced physical exercise programs for women are various group fitness programs. The goal of these programs is to satisfy the motivation to preserve health, improve physical appearance and reduce body mass.[12] Also, recreational aerobic exercise can largely serve to preserve and improve fitness components. Different models of recreational aerobic exercise can have a large impact on cardiorespiratory fitness, as well as on the body composition segment.[13,14] When talking about the female population, more and more of them exercise because they feel better, the tension is less, they are functionally and emotionally more capable, more durable in numerous jobs, family activities and many other obligations.[15] Application of different group fitness programs showed significant effects in improving motor and functional abilities,[16] as well as changes in body composition of women.[17,18]

Many people do not have time for recreational pursuits and practicing physical activity, especially organized form. As inactivity affects the onset of various types of diseases, so the need for exercise is increasing. Therefore, the study was justified, which aimed to determine the differences in the body composition of women who exercise and those who do not engage in programmed physical activity.

Methods

A sample of participants

The research and measurement procedure were conducted on a sample of forty-three (N=43) female persons. The sample was divided into two subsamples, namely the experimental group (n=20) who practiced programmed physical activity and the control group (n=23), which had no organized form of physical activity. The population from which the research sample was taken is defined as the population of women chronologically aged from 25 to 35 years. All subjects were informed about the objectives and protocols of the testing and gave written consent to participate in the research. To avoid potential bias, participants were not informed about the theoretical background and received no feedback from the testers. The study was approved by the institutional human research ethics committee and was conducted in accordance with the Declaration of Helsinki.[19]

Procedure

Body composition was measured using InBody270. The basic characteristics of the sample of participants are shown as body height (BH - body height in cm), body mass (BM - body mass in kg) and BMI (body mass index in kg/m^2). The following variables were used to assess body composition: Total Fat Mass (%) - TFM%; Total Muscle Mass (kg) – TMM; Total Trunk Mass (kg) – TTM; Trunk Fat (%) – TF%; Body Water (%) – BW% and Visceral Fat Mass – WFM. All tests were performed in similar conditions (20-25°), in the same closed space - fitness center. The participants were orally introduced to the testing procedure, to which they voluntarily agreed, through explanations and demonstrations.

Experimental procedure

Before the beginning of the experimental program (the first week), an initial measurement of the test subjects of the experimental (E) and control (K) groups was performed. After the established initial state, the test subjects of the experimental group were included in the programmed physical activity - fitness program. The subjects of the control group were not involved in any content of systematic exercise (inactive women).

The aim of the experimental program was to determine the differences in the body composition of women who engage in and those who do not engage in programmed physical activity, whether and to what extent the experimental program influenced changes in body composition. Experimental programs differed in exercise intensity, the intensity was controlled using a POLAR Ft1 Heart Rate Monitor pulse meter. The fitness program was implemented over the course of three months, twice a week (24 training sessions) for sixty minutes, and the intensity of the load was from 55 to 75%.

In the introductory part, lasting 10 to 12 minutes, exercises in place and movement and a complex of shaping exercises are performed, which consists of 8 to 10 different exercises and 12-15 repetitions. The main part (40-45 minutes) is performed according to a pre-programmed training with exercises that are divided by muscle groups, and each training has an emphasis on one large and one smaller muscle group. Exercises are performed with your own body or with additional load in the form of weights and props with the use of musical choreography. At the beginning, a complex of basic exercises was performed for all muscle groups, as well as isolation of certain muscle groups with an emphasis on proper and independent performance, and short breaks were used. Performing sets of exercises, with an emphasis on the leg muscle region, consisted of squats, lunges, lunges obliquely backwards, one-legged squats, lifting on the toes while standing/squatting, lunges to the side, leg extensions from the bench, etc. Performing sets of exercises with an emphasis on the back muscle region consisted of Y, T, I lifts lying on the stomach, extensions on the floor/Pilates ball, exercises in a seated position with an elastic band, flying with a bend - weights 0.2 - 0.4 kg, shrugging shoulders, assembling shoulder blades, etc. Performing sets of exercises with an emphasis on the arm muscle region consisted of resting the hands on the wall, squatting on the bench, bending the arms with weights 0.2 - 0.4 kg, exercises for triceps/biceps with tires, push-ups from the knees, engagement with weights, rotation forearm with weights, exercises with a partner, etc. Performance of sets of exercises with an emphasis on the region of the abdominal muscles and shoulder girdle consisted of exercises: flying/handstand/handstand with a load of 0.2 - 0.4kg, raising arms above the head with a load, push-ups, circling arms in a handstand, sit-ups on a flat/inclined surface, rotational steps, rotations in a forward bend, wood chop, plank, etc. The circular form of work is composed of previously worked muscle sets (Full body program). The stations are placed in the following order: leg muscles, back, arms and shoulder girdle, abdominal muscles. The emphasis was on correct execution of exercises, own/additional load. The circles are performed 3-5 times with breaks of 3-5 minutes depending on the needs of the participants. The final part of the programmed training, lasting 5-8 minutes, aims to stretch and loosen all regions of the body, focusing on proper breathing and controlled muscle stretching due to the possibility of injury. The circular form of work is composed of previously worked muscle sets (Full body program). The stations are placed in the following order: leg muscles, back, arms and shoulder girdle, abdominal muscles. The emphasis was on correct execution of exercises, own/additional load. The circles are performed 3-5 times with breaks of 3-5 minutes depending on the needs of the participants. The final part of the programmed training, lasting 5-8 minutes, aims to stretch and loosen all regions of the body, focusing on proper breathing and controlled muscle stretching due to the possibility of injury.

Statistical analysis

All statistical analyzes were performed using SPSS Statistics 20 software (SPSS Inc., Chicago, IL). Descriptive statistics were used to calculate: minimum values (Min), maximum values (Max), mean values (Mean) and standard deviation (Standard

Deviation). Univariate analysis of variance (ANOVA) was used in order to determine the level of statistical significance of possible differences in the body composition of women who engage in and those who do not engage in programmed physical activity. The alpha level was set at $p < 0.05$ to indicate statistical significance. Univariate analysis of covariance (ANCOVA) was used to determine the real effects of the applied experimental program.

Results

Table 1 shows the general descriptive parameters of the sample of respondents at the initial and final measurements, for both groups, namely body height, body mass and body mass index.

Table 1. *General descriptive parameters*

	IE	FE	IK	FK
BH (cm)	169.1	169.1	166.6	166.6
BM (kg)	66.93	63.1	65.84	65.14
BMI	23.4	22.1	23.7	23.5

Legend: IE – Initially experimental group; FE – Final experimental group; IC – initially control group; FK – final control group; BH – body height; BM – body mass; BMI – body mass index.

Table 2 shows the descriptive parameters of the body composition of the experimental (fitness) group at the initial and final measurements on a sample of twenty female subjects.

Table 2. *Descriptive body composition parameters of the experimental group FITNESS at the initial and final measurement (N=20)*

	Initial				Final			
	Mean	**Min**	**Max**	**Std.Dev.**	**Mean**	**Min**	**Max**	**Std.Dev.**
TMF%	25.31	18.50	33.2	3.90	22.21	16.00	27.50	3.10
TMM (kg)	48.96	38.10	59.40	5.50	51.91	40.30	64.10	6.19
TTM (kg)	27.66	19.70	33.40	3.31	25.91	19.10	31.20	2.78
TF%	22.58	16.40	33.70	4.41	21.02	16.20	30.10	3.35
BW%	56.50	52.00	61.00	2.28	59.50	55.00	64.00	2.54
WFM	2.50	1.00	4.00	3.32	2.25	1.00	3.50	2.31

Legend: Mean - arithmetic mean; Min - minimum result values; Max – maximum values of results; Std.Dev. - standard deviation; TFM% - Total Fat Mass; TMM - Total Muscle Mass; TTM - Total Trunk Mass; TF% - Trunk Fat; BW% - Body Water; WFM - Viscelar Fat Mass.

As for the mean value Total body fat (25.31%), it is within limits, as most women who exercise regularly are within 18-24%, and most average women are over 24%, i.e. a healthy proportion of body fat for women , from 20 to 39 years old, is from 22 to 33%. Also, this can be stated for the other monitored parameters, because they are within the normal limits for the observed population.

Table 3 shows the descriptive parameters of the body composition of the control group at the initial and final measurements on a sample of twenty-three female subjects.

Table 3. *Descriptive body composition parameters of the control group at the initial and final measurement (N=23)*

	Initial				Final			
	Mean	**Min**	**Max**	**Std.Dev.**	**Mean**	**Min**	**Max**	**Std.Dev.**
TMF%	25.60	18.40	33.90	3.87	26.41	18.70	33.40	3.36
TMM (kg)	47.86	39.50	59.40	5.22	48.16	39.70	60.20	5.09
TTM (kg)	27.17	20.40	33.70	3.13	27.58	21.10	34.00	3.12
TF%	24.00	16.90	32.60	4.42	24.36	17.50	32.90	4.07
BW%	58.50	55.00	62.00	3.21	59.00	56.00	62.00	2.21
WFM	2.75	1.00	4.50	3.45	3.00	1.00	5.00	3.10

Legend: Mean - arithmetic mean; Min - minimum result values; Max – maximum values of results; Std.Dev. - standard deviation; TFM% - Total Fat Mass; TMM - Total Muscle Mass; TTM - Total Trunk Mass; TF% - Trunk Fat; BW% - Body Water; WFM - Viscelar Fat Mass.

Table 4 shows the differences in body composition between the initial and final measurements. It can be seen that a statistically significant difference between the E and K groups was obtained for all body composition variables at the p = .000 significance level, except for the visceral fat variable, where there were no differences (p = .146). The highest level of differences was observed in the percentages of Total Body Fat and Total Body Muscle Weight (F=100.36, Sig.=.000 and F=84.93, Sig.=.000, respectively), followed by Total Carcass Weight (F= 79.11, Sig.=.000), Water (F=77.23, Sig.=.000) and Trunk Fat (F=48.58, Sig.=.000).

Table 4. *Differences in body composition between initial and final measurements*

	Adj. Mean E	**Adj. Mean K**	**F (2; 74)**	**Sig.**
TFM%	21.82	25.69	100.36	**.000***
TMM (kg)	51.29	48.57	84.93	**.000***
TTM (kg)	25.63	27.79	79.11	**.000***
TF%	20.85	22.97	48.58	**.000***
BW%	63.11	58.42	77.23	**.000***
WFM	2.12	3.34	2.43	.146

Legend: Adj. mean E – set values of the arithmetic means of the experimental group; Adj. mean K – set values of arithmetic means of the control group; F – value of the F-test coefficient; * - statistically significant differences; TFM% - Total Fat Mass; TMM - Total Muscle Mass; TTM - Total Trunk Mass; TF% - Trunk Fat; BW% - Body Water; WFM - Viscelar Fat Mass.

Discussion

The purpose and goal of this research was to determine the differences in the body composition of women who exercise and those who do not engage in programmed physical activity. The analysis of the obtained results shows that the programmed physical activity had an impact on changes in body composition, that is, that the women who practiced the programmed fitness program, within 24 training sessions, had a positive impact on the monitored variables.

Based on the descriptive parameters, both groups, at the initial measurement, had similar values that are within the limits of normality.[20] The E group had slightly higher values for the BH variable (Ini E = 66.93; Ini K = 65.84) and BMI (Ini E = 23.4; Ini K = 23.7), and after the implemented fitness program, the results achieved were better in the E group for the mentioned variables (Fin E = 63.1, Fin K = 65.14; Fin E = 22.1 , Fin K = 23.5, respectively). The normal distribution of BMI for women ranges between 18.5 - 24.9,[21] which was also obtained in this scientific research. Furthermore, it can be concluded that the application of programmed physical activity, with its content, has statistically significant changes in the body composition of women, compared to those who did not practice any recreational activity.physical activity has a great impact on changes in health components and the feeling of better appearance in women.

Differences in body composition between initial and final measurements (Table 4), applying univariate analysis of covariance (ANCOVA), were obtained at the level of statistical significance Sig. < .001 in all monitored variables, namely TFM%, TMM, TTM, TF% and BW%. The variable in which there were no changes at the level of statistical significance is WFM (Sig. = .146).

Some of the research shows that more intense forms of physical activity provide greater benefits, when taking into account the reduction of body mass and the health status of the individual, than activities of moderate intensity, which primarily means reducing the risk of cardiovascular diseases and increasing the functions of the locomotor apparatus.[22] Also, the positive effects of high-intensity activity on the reduction and maintenance of optimal body mass are known, both in the female population and in men.[23] Therefore, in the last few years, research has focused on determining the extent and intensity of exercise and daily activities, as well as their impact on fitness components.[24]

The obtained results for body composition parameters are in accordance with the studies published so far.[17,18] Conducted research indicates that physical fitness programs accompanied by music and dance as a basis, using different choreographies and moving structures, have positive effects on the reduction of body fat, increase in muscle mass and changes in other parameters of body composition.[25,26] The experimental fitness program had a significant effect on the reduction of total body fat as well as an increase in relative muscle mass compared to the control group where no changes were recorded.

The value of organizing physical activity in free time is reflected in improving the quality of life and realizing the right to a quality life, which refers to the reduction of hypokinesia, a healthier way of eating, as well as the possibility of preventing various diseases and socially deviant behaviors.[27] Education, motivation and organization of activities can influence the correction of body mass, i.e. body composition, as well as the improvement of physical abilities.[28] A programmed reduced diet in combination with physical activity represents an ideal formula for correction, i.e. reduction of body mass and subcutaneous fat tissue.[29] Based on the results of the research, it can be concluded that the realized experimental programs had a significant impact on the changes in body composition

in the E group at the final compared to the initial measurement, which is confirmed by the results of other realized studies.[30]

Conclusion

Based on the obtained results, after the implemented experimental program, it can be concluded that the twelve-week program has an impact on the body composition of the female population. Also, there was a change in the parameters that were assumed to increase or decrease, namely that there was a decrease in total body fat, total body weight and body fat, and an increase in muscle weight in the body.

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