FACTA UNIVERSITATIS
Series: **Physical Education and Sport**, Vol. 18, No 2, 2020, pp. 345 - 354
https://doi.org/10.22190/FUPES190402032B

Research article

EFFECTS OF GROUP FITNESS PROGRAMS ON THE BODY COMPOSITION OF WOMEN

UDC 796.012.1.32:615

Bojan Bjelica

Faculty of Physical Education and Sports, University of East Sarajevo, Lukavica, Republic of Srpska, Bosnia and Herzegovina

Abstract. *The aim of the research was to determine effects of group fitness programs of different intensity on changes in body composition. The sample comprised 90 women, aged 25 to 35. The sample consisted of two experimental groups, Zumba (n=30), Fitness (n=30), and one control group (n=30). The applied variables for assessment and changes in body composition were: total body fat (%), total muscle mass (kg), right arm fat (%), left arm fat (%), right leg fat (%), left leg fat (%), torso fat (%). Differences between the groups for each variable were determined through a univariate analysis of variance (ANOVA) and with the LSD Post Hoc test. Based on the results of the study, statistically significant differences were determined in all tests except in left and right arm fat (%). Muscle mass increase was most prominent in the experimental Fitness group (.000), whereas reduction in body fat was most prominent in the Zumba group (.035). It can be concluded that implemented experimental exercise programs, as well as the applied intensity of maximum heart frequency in the experimental groups (Zumba 65-85%; Fitness 55-75%) significantly impacted the changes in body composition at the final measuring, in comparison to the initial one.*

Key words: *Body Fat, Muscle, Zumba, Physical Activity*

INTRODUCTION

Physical activity significantly impacts the consumption of energy, leads to energy deficit which contributes to reduction in body weight (Van Baak, 1999; Hill, & Davies, 2001; DeLany, Kelley, Hames, Jakičić, & Goodpaster, 2014). A significant segment is dosing the load, for it is in close correlation with the exercise outcome, i.e., lost weight and changes in body composition (Jakičić, Marcus, & Gallegher, 2003; Slentz et al., 2004).

Received April 04, 2019 / Accepted September 10, 2020
Corresponding author: Bojan Bjelica
Faculty of Physical Education and Sports, University of East Sarajevo, Vuka Karadžića 30, 71126 Lukavica, Istočno Sarajevo, Republika Srpska, Bosnia and Herzegovina
Phone: + 387 57 320 330 • E-mail: vipbjelica@gmail.com

Body composition represents relative values of muscles, fat, bones and other anatomic components that contribute to the total body weight of a man (Solway, 2013). In practice, the most used are traditional methods of determining body composition based on a two-component model, according to which total body mass is comprised of two parts: fat and non-fat mass (Ellis, 2001). For example, percentage of body fat increases with age (Deurenberg, van der Kooy, Leenen, Weststrate, & Seidell, 1991) and it is more pronounced among the female than male population (Gallagher et al., 1996). Application of certain group fitness programs brings significant changes in body composition, because the application of certain movement structures is a significant anabolic stimulant for the body (Eliakim & Beyth, 2003). Due to the extent, intensity and character of the applied group fitness programs and constant muscle contractions, the biggest changes are reflected in the change of muscle mass and body fat percentage (Frost, 2000). Group fitness programs are a form of programmed physical exercise for women with the goal of improving health and esthetic appearance. Group fitness programs are an efficient tool for the control and reduction of body weight and positive changes in body composition (Donges, Duffield, & Drinkwater, 2010; Stasiulis, Mockiene, Vizbaraite, & Mockus, 2010; Elmahgoub et al. 2009). Zumba as a reflection of the fitness industry is a program with dance structures that, aside to physical, include social and emotional elements (Murciaa, Kreutzb, Cliftc, & Bongarda, 2010). Zumba fitness is a compound of aerobic exercise and Latin dance, performed along with entertaining Latino music (Ljubojević, Jakovljević, & Popržen, 2014). As a combination of aerobic training and strength exercise, Zumba is a good way to increase caloric consumption, improve the function of the cardio-vascular system and strengthen the entire body (Perez & Greenwood-Robinson, 2009). Research shows that Zumba dance encourages calorie consumption in the range between 378 and 817 kcal/h (Otto et al., 2011; Luettgen, Foster, Doberstein, Mikat, & Porcari, 2012; Sternlicht, Frisch, & Sumida, 2013) which is more than the recommended 300 kcal/h (ACSM, 2009). If we consider fitness programs that use additional load like weights along with certain movements, the effects on energy consumption and load intensity shall be completely different. After all, from these programs we can expect a certain level of muscular fiber hypertrophy, which is not the case with Zumba dance. Exercising with weights contributes to the preservation of muscle mass and strength thus improving the physical and functional abilities of female gymnasts (Kryger & Andersen, 2007).

The aim of the research was to determine the effects of group fitness programs of different intensity on changes in body composition.

METHOD

The research and measuring procedures were implemented on a sample of (N=90) females. The sample was divided into 3 sub-samples, two experimental groups: E1 – Zumba program (N=30); E2 – second Fitness program (N=30) and a control group K (N=30).

The sampled population is defined as the population of women aged between 25 and 35.

The following variables were extracted for body composition assessment: body weight (kg), total body fat (%), total muscle weight (kg), right arm fat (%), left arm fat (%), right leg fat (%), left leg fat (%), torso fat (%). All body composition parameters were measured with the segmental analyzer TANITA type BC-545n. The body weight variable (kg) was not subject to statistical data processing.

Before the commencement of the experimental program (first week), initial measuring of the experimental and control groups was carried out. After establishment of the initial state, the experimental group of participants took part in fitness programs. The control group participants were not involved in any type of systematic exercise (inactive women). Trainings were two times a week, one hour long.

The Zumba classes were led by a licensed fitness instructor. Exercise intensity was set by the music tempo, which changed during the training (65-85%) of maximum heart frequency. The warm-up lasted for 7 to 10 minutes (2-3 songs, tempo 120-135 u/m), and in the second part of the warm-up, the participants did strength exercises with moderate intensity through dance variations with lunges in semi-crouches (music tempo 125-140 u/m). The main part of the training was done with previously prepared Zumba music (6-7 genuine Zumba songs) which regulate the change of 30 tempos and dynamics of performing dance choreographies (tempo 140-160 u/m). Dances are 3-5 minutes long, and breaks between the dances are 15-30 seconds. All Latin dances differ in movement character and performance dynamics.

Fitness programs were realized with a slightly different load intensity (55-75%) of maximum heart frequency. In comparison to Zumba, the program structure is differently based. In the introductory part, lasting 8-10 minutes, the participants move in place and space and do complex shaping exercises (8-10 exercises, 10-12 repetitions). The main part of the training is done in line with previously prepared exercises which are divided per muscle partitions and each training puts emphasis on one big and one small muscle group. Exercise emphasis was distributed along the leg muscles, back muscles, arm muscles, abdominal muscles, shoulder muscles and chest muscles. Exercises are done either with own weight or with additional load by using existing props with the possibility of applying previously determined musical choreographies. The final part of the training, lasting 5-8 minutes, has the purpose of stretching and loosening all muscle regions, with emphasis on proper breathing and controlled muscle stretching.

The obtained results were processed in statistical software SPSS 20 for the purpose of this research. Basic statistical indicators were calculated with basic descriptive statistics. The following parameters were calculated: Mean; standard deviation (SD); minimum value (Min); maximum value (Max). Determining differences between groups for each variable was performed with a univariate analysis of variance (ANOVA) and by using the LSD Post Hoc test.

RESULTS

The values of result distribution symmetry indicators or skewness (Skew.) of body composition of the experimental Zumba group presented in Table 1 are in the allowed range of normal result distribution at initial measuring. Mild positive asymmetry towards lower values was recorded in all variables except for the variable - right leg fat (%) (-.02).

The values of elongation of result distribution or Kurtosis (Kurt.) of body composition of the participants, show mild platykurtic distribution in nine variables, while a slight variation in the leptokurtic distribution is indicated in the remaining variables except the variable - torso fat (%), where the distribution of the results is close to the arithmetic mean and the leptokurtic distribution is more pronounced, but still within the limits of normal distribution (Kurt.=2.15).

Table 1 Descriptive parameters of body composition of the experimental Zumba group at the initial and final measuring (n=30)

Initial measuring						
Variable	Mean	Min.	Max.	SD	Skew	Kurt.
Total body fat (%)	23.46	14.20	36.70	5.13	.35	-.03
Total muscle mass (kg)	48.33	40.40	59.80	4.93	.28	-.29
Right arm fat (%)	18.44	11.30	29.30	4.20	.77	.86
Left arm fat (%)	18.78	11.70	28.40	4.30	.44	-.02
Right leg fat (%)	26.36	17.90	35.20	4.18	-.02	-.13
Left leg fat (%)	25.62	18.00	35.20	4.29	.05	-.17
Torso fat (%)	20.21	10.90	35.10	4.84	.69	2.15
Final measuring						
Total body fat (%)	19.89	12.20	28.10	3.91	-.00	-.62
Total muscle mass (kg)	49.59	40.00	62.80	5.34	.29	-.04
Right arm fat (%)	18.11	11.10	27.20	3.92	.45	.20
Left arm fat (%)	18.19	11.40	27.90	4.10	.37	.06
Right leg fat (%)	23.73	15.00	30.60	3.60	-.57	.19
Left leg fat (%)	23.59	15.20	29.30	3.48	-.68	.09
Torso fat (%)	17.83	10.20	27.80	3.68	.36	1.13

The values of result distribution symmetry indicators (Skew.) of body composition of the experimental Zumba group at the final measuring are in the allowed range of normal result distribution. A mild positive asymmetry towards lower values was recorded in eight variables except for the variables - right leg fat (%) (-.57), left leg fat (%) (-.68).

Table 2 displays a mild positive asymmetry towards lower values for two variables, whereas for the remaining four it shows a mild negative asymmetry towards higher result values. The values of elongation of the result distribution (Kurt.) of body composition of the participants show mild leptokurtic distribution in some variables, right leg fat (%) (.05) and left leg fat (%) (.57).

Table 2 Descriptive parameters of body composition of the experimental Fitness group at the initial and final measuring (n=30)

Initial measuring						
Variable	Mean	Min.	Max.	SD	Skew	Kurt.
Total body fat (%)	25.31	18.50	33.20	3.90	.31	-.29
Total muscle mass (kg)	48.96	38.10	59.40	5.50	.16	-.83
Right arm fat (%)	18.43	13.60	22.50	2.40	-.06	-.88
Left arm fat (%)	18.62	13.80	22.70	2.32	-.22	-.58
Right leg fat (%)	28.14	19.90	34.60	3.89	-.62	.05
Left leg fat (%)	28.24	19.70	34.70	3.72	-.75	.57
Torso fat (%)	22.58	16.40	33.70	4.41	.87	-.00
Final measuring						
Total body fat (%)	22.21	16.00	27.50	3.10	-.08	-.87
Total muscle mass (kg)	51.91	40.30	64.10	6.19	.28	-.79
Right arm fat (%)	17.66	13.10	21.50	2.23	.01	-.64
Left arm fat (%)	17.78	13.20	21.60	2.19	-.13	-.60
Right leg fat (%)	25.40	18.00	30.20	3.07	-1.03	.61
Left leg fat (%)	25.44	18.70	30.10	2.98	-.93	.34
Torso fat (%)	21.02	16.20	30.10	3.35	.99	.40

At the final measuring, the variables – right leg fat (%) (.61), left leg fat (%) (.34) and torso fat (%) (.40), show a mild leptokurtic distribution.

Table 3 Descriptive parameters of body composition of the Control group at the initial and final measuring (n=30)

Initial measuring						
Variable	Mean	Min.	Max.	SD	Skew	Kurt.
Total body fat (%)	25.60	18.40	33.90	3.87	.17	-.18
Total muscle mass (kg)	47.86	39.50	59.40	5.22	.36	-.54
Right arm fat (%)	18.41	13.50	26.40	3.05	.43	.57
Left arm fat (%)	18.57	13.50	26.60	3.08	.39	.48
Right leg fat (%)	28.26	20.40	35.80	3.97	-.12	-.23
Left leg fat (%)	28.23	21.20	35.80	3.94	.06	-.57
Torso fat (%)	24.00	16.90	32.60	4.42	.31	-.95
Final measuring						
Total body fat (%)	26.41	18.70	33.40	3.36	-.34	.51
Total muscle mass (kg)	48.16	39.70	60.20	5.09	.38	-.21
Right arm fat (%)	18.58	13.40	25.20	2.97	.25	-.22
Left arm fat (%)	18.56	13.70	25.60	2.92	.39	-.03
Right leg fat (%)	28.66	20.90	35.70	3.66	-.40	.19
Left leg fat (%)	28.70	21.00	35.80	3.65	-.34	-.01
Torso fat (%)	24.36	17.50	32.90	4.07	.18	-.94

Table 3 shows a mild positive asymmetry towards lower result values for most of the variables, whereas for the variable - right leg fat (%) we recorded a mild negative asymmetry towards higher result values. At the final measuring, mild positive asymmetry towards lower result values was recorded for most of variables, whereas for the variables - total body fat (%) (-.34), right leg fat (%) (-.40) and left leg fat (%) (-.34), we recorded a mild negative asymmetry towards higher result values.

The values of elongation of result distribution (Kurt.) of the body composition of the participants show mild platykurtic distribution in all variables, except for the variables - total body fat (%) (.51) and right leg fat (%) (.19), whose values show mild leptokurtic distribution.

In Table 4, at the initial measuring, one can notice that differences were caused by the variables - torso fat (%) (f=5.301; sig.=.007) and left leg fat (%) (f=2.487; sig.=.017), where participants from the experimental Zumba group (E1) achieved significantly better results than the experimental Fitness group (E2) and Control group (K).

The significance of these differences can be seen in Table 5, which displays the results of Fisher's LSD test for the variables - left leg fat [%] (E1>E2, Sig.=.013; E1>K, Sig.=.013) and torso fat [%] (E1>E2, Sig.=.047; E1>K, Sig.=.007).

Table 4 Univariate differences in body composition between groups at the initial and final measuring

Initial measuring						
Variable	Mean E1	Mean E2	Mean K	F	Sig.	Fisher's LSD
Total body fat (%)	23.46	25.31	25.60	2.152	.122	
Total muscle mass (kg)	48.33	48.96	47.86	.333	.718	
Right arm fat (%)	18.44	18.43	18.41	.001	.999	
Left arm fat (%)	18.78	18.62	18.57	.034	.967	
Right leg fat (%)	26.36	28.14	28.26	2.104	.128	
Left leg fat (%)	25.62	28.24	28.23	4.287	**.017**	E1>E2; E1>K
Torso fat (%)	20.21	22.58	24.00	5.301	**.007**	E1>E2; E1>K
Final measuring						
	Mean E1	Mean E2	Mean K	F	Sig.	Fisher's LSD
Total body fat (%)	19.89	22.21	26.41	27.121	**.000**	E1>E2; E1>K; E2>K
Total muscle mass (kg)	49.59	51.91	48.16	3.471	**.035**	E2>K
Right arm fat (%)	18.11	17.66	18.58	.646	.527	
Left arm fat (%)	18.19	17.78	18.56	.455	.636	
Right leg fat (%)	23.73	25.40	28.66	15.838	**.000**	E1>K; E2>K
Left leg fat (%)	23.59	25.44	28.70	17.581	**.000**	E1>E2; E1>K; E2>K
Torso fat (%)	17.83	21.02	24.36	23.267	**.000**	E1>K; E2>K

Table 5 Fisher's LSD test results

Variable	I	J	Mean Diff. (I-J)	Sig.
Left leg fat (%)	E1	E2	-2.62	**.013**
		K	-2.61	**.013**
	E2	K	.01	.995
Torso fat (%)	E1	E2	-2.37	**.047**
		K	-3.79	**.002**
	E2	K	-1.42	.230

At the final measuring, one can notice that differences were caused by the variables-total body fat (%) (F=27.121; Sig.=.000), total muscle mass (kg) (F=3.471; Sig.=.035), right leg fat (%) (F=15.838; Sig.=0.000), left leg fat (%) (F=17.581; Sig.=.000), where the participants from the experimental Zumba group (E1) and experimental Fitness group (E2) achieved significantly better results than the Control group (K) in all the given variables except for the variable - total muscle mass (kg), where only the E2 group achieved better results than the C group. For the variables - total body fat (%) and Left leg fat (%), the participants of the E1 group achieved more superior results than the E2 group. The significance of the given differences can be seen in Table 6, which displays Fisher´s LSD test for the variable - total body fat (%) (E1>E2, Sig.=.011; E1>K, Sig.=.000; E2>K, Sig.=.000), total muscle mass (kg) (E2>K, Sig.=.011), right leg fat (%) (E1>K, Sig.=.000; E2>K, Sig.=.000), left leg fat (%) (E1>E2, Sig.=.037; E1>K, Sig.=.000; E2>K, Sig.=.000) and torso fat (%) (E1>E2, Sig.=.001; E1>K, Sig.=.000; E2>K, Sig.=.001).

Table 6 Fisher's LSD test results

Variable	I	J	Mean Diff. (I-J)	Sig.
Total body fat (%)	E1	E2	-2.32	**.011**
		K	-6.51	**.000**
	E2	K	-4.20	**.000**
Total body muscle mass (kg)	E1	E2	-2.32	.110
		K	1.43	.323
	E2	K	3.75	**.011**
Right leg fat (%)	E1	E2	-1.67	.065
		K	-4.93	**.000**
	E2	K	-3.27	**.000**
Left leg fat (%)	E1	E2	-1.85	**.037**
		K	-5.11	**.000**
	E2	K	-3.26	**.000**
Torso fat (%)	E1	E2	-3.20	**.001**
		K	-6.54	**.000**
	E2	K	-3.34	**.001**

DISCUSSION

On the basis of the descriptive parameters for body composition assessment, as one of the fitness components, it can be concluded that the participants of both the experimental and control groups have similar values of given parameters at the initial measuring and they are in the allowed range of normal values anticipated for the given age (Ugarković, 1986; Mišigoj-Duraković, Hajmer, & Matković, 1998; Mladenović, Joksimović, & Krstić, 2001). At the initial measuring, total body fat (%) is slightly lower for the experimental Zumba group (23.46%) than for the experimental Fitness group (25.31%) and control group (25.60%). The percentage value is in normal distribution for the given population (Wilmore, Buskirk, DiGirolamo, & Lohman, 1994; Deurenberg et al., 1998; Tharp & Woodman, 2002; Heyward, 2006; Egger, Champion, Egger, Champion, & Bolton, 1999). The obtained descriptive parameters at the final measuring show that the participants from the experimental groups had numerical reduction in measures for body composition assessment. High intensity load programs lead to a faster reduction of body fat (Bryner, Toffle, Ullrich, & Yeater, 1997). The application of group fitness programs may initiate the function of energy consumption, which results in the reduction of fat and body weight. Load intensity during the program has a great significance (Grediagin, Cody, Rupp, Benardot, & Shern, 1995). A group of authors highlighted that exercising at full intensity has a more favorable effect on fat loss in all body regions (Lee, Park, Kim, Choi, & Kim, 2012; Amiri, Mirzaie, & Elmieh, 2013). The highest determined values are for the reduction of total body fat (%) (Zumba, initial 23.46, final 19.89; Fitness, initial 25.31, final 22.21). The achieved results were most prominent for the experimental Zumba group for all variables, except for total muscle mass (kg) (initial 48.33, final 49.59) which was better for the second experimental Fitness group (initial 48.96, final 51.91) in comparison to the experimental Zumba group and control group (initial 47.86, final 48.16). The noted changes in body composition might be attributed to the implementation of the experimental program, which was proved in other studies as well (Mitić, 1995; Ross et al., 2000;

Ljubojević et al., 2002; Pantelić & Mladenović, 2004; Bjelica et al., 2016). In both the final and initial measuring, there were numerical differences between the experimental and control groups in body composition, which is in line with other studies (Milburn & Butts, 1983; Wilmore & Costill, 1999). Significant changes were also reflected in the reduction of total body mass (Zumba, initial 65.33-final 60.77; Fitness, initial 66.93-final 63.20) displayed in (kg). Similar results are in line with other studies (Kostić, Đurašković, Miletić, & Mikalački, 2006; Petrofsky, Batt, & Morris, 2006).

Taking all of the above into consideration, it can be concluded that the implemented experimental exercise programs significantly influenced changes in body composition as one of the fitness components for the participants of both experimental groups in the final measuring in comparison to the initial one, which is reinforced by the results of other studies (Preeti, & Nigudkar, 2016; Šebić, Ljubojević, Nožinović, Omerhodžić, & Kajević, 2016; Maisarah et al., 2018).

CONCLUSION

It can be concluded that the implemented experimental exercise programs, as well as the applied intensity of maximum heart frequency for experimental groups (Zumba 65-85% and Fitness 55-75%) significantly influenced the changes in body composition of the participants. Changes are evident in the reduction of fat and increase of muscle mass among the participants. There were no statistically significant changes in the Control group. Reduction of body fat is one of the important factors for health and risk reduction for many diseases, so a group program approach is recommended as an efficient tool.

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EFEKTI GRUPNIH FITNES PROGRAMA NA SASTAV TELA ŽENA

Cilj istraživanja bio je da se utvrde efekti grupnih fitnes programa različitog intenziteta na promene u telesnom sastavu. Uzorak je sačinjavalo 90 žena, starosti od 25 do 35 godina. Uzorak su sačinjavale dve eksperimentalne grupe, Zumba (n=30), Fitness (n=30), i jedna kontrolna grupa (n=30). Primenjene promenljive za procenu i promene u telesnom sastavu bile su: ukupna masnoća u telu (%), ukupna težina mišića u telu (kg), masti desne ruke (%), masti leve ruke (%), masti desne noge (%), masti leve noge (%), masti trupa (%). Razlike između grupa za svaku promenljivu utvrđene su univarijantnom analizom varijanse (ANOVA metodom) i LSD Post Hoc testom. Na osnovu rezultata istraživanja, statistički značajne razlike su utvrđene u svim testovima, osim u masti leve i desne ruke (%). Povećanje mišićne mase bilo je najizraženije u eksperimentalnoj fitnes grupi (.000), dok je smanjenje telesne masti bilo najizraženije u grupi Zumba (.035). Može se zaključiti da su primenjeni eksperimentalni programi vežbanja, kao i primenjeni intenzitet maksimalne frekvencije srca u eksperimentalnim grupama (Zumba 65-85%; fitnes 55-75%), značajno uticale na promene u telesnom sastavu na završnom merenju, u poređenju sa početnim.

Ključne reči*: telesna masnoća, mišići, zumba, fizička aktivnost*