EXAMINING THE EFFECTS OF 8-WEEK ZUMBA AND STEP-AEROBIC EXERCISES ON HEALTH-RELATED PHYSICAL FITNESS FACTORS IN WOMEN¹

KADINLARA UYGULANAN 8 HAFTALIK ZUMBA VE STEP-AEROBİK EGZERSİZLERİNİN SAĞLIK İLİŞKİLİ FİZİKSEL UYGUNLUK UNSURLARINA ETKİSİNİN ARAŞTIRILMASI

Özcan SAYGIN¹, Gökçe OKTAY², Halil İbrahim CEYLAN³

¹⁻²⁻³⁻Muğla Sıtkı Kocman University, Faculty of Sport Sciences, Muğla / Turkey

Öz: Bu çalışma bayanlara uygulanan 8 haftalık zumba ve step aerobik egzersizlerinin sağlık ilişkili fiziksel uygunluk unsurları, kan basıncı ve dinlenik kalp atım sayısına olan etkisini incelemek amacıyla yapılmıştır. Çalışmaya, 60 kadın gönüllü olarak katılmıştır. Araştırmaya katılan kadınlar, zumba grubu, step-aerobik ve kontrol grubu olmak üzere, rastgele 3 farklı gruba ayrılmıştır. Zumba ve step aerobik gruplarına egzersiz, 8 hafta boyunca haftada 3 gün, 60 dakika süreli olmak üzere uygulanmıştır. Grupların ön ve son test değerlerinin karşılaştırılmasında Paired t testi kullanılmıştır. Verilerin çözülmesi sonucunda; zumba ve step-aerobik gruplarının ön ve son testleri arasında vücut ağırlığı, esneklik, MakVO₂, bacak kuvveti, sırt kuvveti ve vücut yağ oranı değerlerinde anlamlı fark bulunmuştur ($p<0.05$). Ayrıca step-aerobik grubunun sağ ve sol el kavrama kuvvetlerinin ön ve son testlerinde de anlamlı farka rastlanmıştır ($p<0.05$). Her iki egzersiz grubunun kan basıncı ve dinlenik kalp atımı sayısı değişkenlerinde anlamlı farka rastlanmamıştır ($p>0.05$). Sonuç olarak; 8 haftalık zumba ve step aerobik egzersizlerinin sağlık ilişkili fiziksel uygunluk unsurlarına olumlu yönde etkilediği ancak kan basıncı ve dinlenik kalp atım sayısını anlamlı olarak etkilemediği ortaya çıkmıştır.

Anahtar Kelimeler: Egzersiz, Fiziksel Uygunluk, Kadın, Step-Aerobik, Zumba

Abstract: This study has been carried out to examine the effects of 8-week Zumba and Step-Aerobics exercises on the health-related physical fitness components, blood pressure and resting heart rate. 60 woman volunteers participated in this study. The women participating in the study were randomized into 3 different groups as the Zumba Group, the Step-Aerobics Group, and the Control Group. The exercises were applied to the Zumba Group and to the Step-Aerobics Group for 8 weeks, 3 days a week for 60 minutes. Paired t Test was used for the comparisons of the pre and post-test values of groups. Upon the analysis of the data, it was observed that there was a difference between the pre and post-tests of the Zumba and the Step-Aerobics Groups in terms of body weight, flexibility, MaxVO₂, leg strength, back strength, and body fat percentage ($p<0.05$). Moreover, there was a significant difference in the pre and post-tests of the Step-Aerobics Group in terms of the right and left hand grip strengths ($p<0.05$). There was not a significant difference between the two groups in terms of the blood pressure and the resting heart rate variables ($p>0.05$). As a consequence, it was concluded that 8-week Zumba and Step-Aerobics exercises affected the physical fitness factors positively; however, it was also concluded that these exercises did not affect the blood pressure and the heart rate at a significant rate.

Key Words: Exercise, Physical Fitness, Women, Step-Aerobic, Zumba

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- (1) *Corresponding Author: Özcan SAYGIN, Muğla Sıtkı Koçman University, Faculty of Sport Sciences, Muğla / Turkey ozsaygin@hotmail.com Received: 14.02.2016 Accepted: 26.05.2016 Type of article (Research and Practice) Conflict of Interest: None Ethics Committee: None*

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INTRODUCTION

Sedentary lifestyle leads to hypertension, obesity, muscle weakness, postural deficiency, diabetes, coronary heart disease, and threatens the health of the individuals (Adnan et al., 2012: 428), and also affects the life quality of people for the forthcoming years (Raju, 2014: 51). It is a widely-known fact that physical activity performed in proper intensity and with proper frequency constitute an important part of the healthy lifestyle (Sedenkova et al., 2012: 55), improve physical fitness (Drobnik-Kozakiewicz et al., 2013:3), and prevent the development and progression of the diseases that stem from inactivity. Based on this fact, a number of physical fitness programs have been developed in order to attract the attention of the individuals, and make them adopt the habit of exercising (Kin et al., 1996: 23-24). These exercise programs include the dance activities that are preferred by women for functional abilities (like increasing the aerobic endurance), morphological properties (weight and body fat loss), for health (Nikic and Milenkovic, 2013: 26), and for the purpose of staying fit and healthy and having a quality life. Dancing is a type of specific exercise at the aerobic level and is physical activity that involves the functional, motor and musical skills in which the major muscle groups are involved. It is also recommended to protect the muscular tonus, the coordination and the relevant skills (Kostic et al., 1999: 15; Sofianidis et al., 2009: 168). Zumba and Step Aero-

bics are the most popular collective activities among the aerobic exercises (Drobnik-Kozakiewicz et al., 2013: 4; Luetngen et al., 2012: 357).

Fitness group exercises represent the programmed activities that are intended to regulate the body shape and live in a healthier life (Ljubojevic et al., 2014: 29). The most popular of these activities is Zumba, which appeared as a fitness concept in mid-1990s in Colombia (Luetngen et al., 2012: 357). Zumba includes the basic steps of the merengue, salsa, samba, rumba, cha-cha, and other Latin dances, and consists of the combination of the exercises that constitute the basis of basic aerobics, resistance, interval training that play a great role in developing the components of fitness, balance, agility, flexibility, and correcting the body posture. It also increases the burning of the calorie in the body, strengthens the heart muscle, lowers the resting heart rate, regulates blood pressure, elevates the metabolism (Perez and Greenwood-Robinson, 2009: 3-15), and improves and maintains cardiorespiratory fitness (Dalleck et al., 2015: 690)

Step-Aerobics, which is another popular exercise type, is an activity that plays an important role in improving the cardiovascular fitness, physical health, and body composition by adapting the movements to the music played by using a step platform, and consists of opening-stretching activities in a tempo. It promotes exercising in an enjoyable manner accompanied by music by making the movements to the front, next to,

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behind and across the platform (Kurt et al., 2010: 668; Ossanloo et al., 2012: 3668).

When the literature is examined, it is observed that although there are a number of studies that deal with the effect of regular exercises (Colakoglu and Karacan, 2006: 35; Sedenkova et al., 2012: 55; Hosiso et al., 2013:1), and step-aerobics exercises (Altunoz, 2010: 50) on health-related physical fitness parameters of women, However there are very few studies conducted on the potential fitness benefits of Zumba despite its spreading popularity (Luetngen et al., 2012: 357). These studies are mostly conducted on the decrease in the body fat percentages of women with Zumba fitness exercises (Barene et al., 2014: 990; Ljubojevic et al., 2014: 29). In this study, the effects of 8-week Zumba and Step-Aerobics exercises on health-related physical fitness factors (flexibility, aerobic fitness, muscle strength and endurance, body composition), blood pressure (systolic, diastolic), and resting heart rate were examined, and the issue of which of these dancing exercises (Step-Aerobic and Zumba) are more influential on these health-related parameters.

METHOD

The Participants: This is an empirical study of 60 woman volunteers, who did not do regular exercises and did not have any illnesses or sports injuries, participated in this study. All participants signed an informed consent form. The women

who participated in the study were randomized into 3 groups as The Zumba Group (n=20, average age: 21.30 ± 2.29 years); the Step-Aerobic Group (n=20, age: 20.60 ± 1.42 years); and the Control Group (n=20, age: 21.55 ± 1.90 years). The Zumba and the Step Aerobics Groups received the exercises for 8 weeks, 3 days a week, and for 60 minutes on non-consecutive days and were led by a certified instructor. The women in the Control Group were not subjected to any exercise programs. All the measurements and tests that were applied to the Study Group were made twice; the first one, two days before the exercise program started; and the second one, two days after the program ended

The Zumba Exercises: A choreography consisting of complicated movements accompanied by various dance music were applied to the Study Group 3 days a week, at a grade of 50-60% of the targeted heart rate (calculated to Karvonen formula) for 60 minutes (including the warm-up and cooling) as the Zumba Exercise (Kurt et al., 2010: 668; Ljubojevic et al., 2014: 30 Narrt. from Lukic, 2006 by Ljubojevic et al., 2014: 30). This application consists of 8-10 Zumba Music, each music lasting 3-5 minutes. The exercises were applied with 15-30 seconds of interval for relaxation (Ljubojevic et al., 2014: 30).

The Step-Aerobic Exercises: The Step-Aerobic Exercises: A Step-Aerobic dance exercise program was applied to the Study Group at a grade

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of 50-60% of the targeted heart rate (Kurt et al., 2010: 668) for 60 minutes (including the warm-up and cooling). The program was modified by the Author of the Study (Table 1)

*The music for the sessions was selected by the Author so as to make the women use their 50-60% of their heart rate reserves with the rhythm in the music (Kin et al., 1996: 26).

The Intensity of the Exercise: To determine the intensity of the exercise, the Karvonen formula was used (Zorba and Saygin, 2013: 102).

Table 1. Sample Zumba and Step-Aerobic Exercise Programs

	Zumba	Step-Aerobic
Warm-up (10-15 minutes)	Flexibility movements (simple dance steps with the increasing music, marching, steps, walking side-by-side)	Flexibility movements
Main Part (40-45 minutes)	The choreography consisting of complicated movements accompanied by the music used for Salsa, Merengue,	4x8 Simple steps marching 4x8 Single step front/back 8 repetition-pull the knee 8 repetition-pull the ankle 8 repetition-open the legs side/back 8 repetition-three repetitive knee pull/pull the ankle 8 repetition walk to the corner from the corner 4x8 single step front/back 4x8 marching
Cooling (10-15 minutes)	Dance accompanied by light music, stretching movements. No jumping or squats were allowed. The movements were made in sitting, lying, and standing position.	Flexibility movements

Data Collection Tools

Body Weight and Height: The weights were measured with a scale of 0.01 kg sensitivity, the heights were measured with a digital stadiometer with 0.01 cm sensitivity. The data were written

on the information form as centimeter and kilogram (Gunay et al., 2013: 580).

Sit and Reach Test: The flexibility measurements of the participants were made with the Sit-Reach Test. The tests were carried out with tripod located 0-50 cm above the upper surface of mea-

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surement table. (length of 35 cm, a width of 45 cm, a height of 32 cm, the surface length of 55 cm). In addition, 3 to 5 minute warm-up exercises were performed by subjects before starting the test. The test was repeated twice, and the best result was accepted as the flexibility value (Gunay et al., 2013: 464).

20-Meter Shuttle Run Test: The Shuttle Run Test for 20 meters was used in order to estimate the aerobic fitness of the participants (MaxVO_2). The 20-meter shuttle run test followed previously explained protocols where participants ran back and forth between two lines set 20 m. apart. According to the results obtained, the max.VO_2 value was estimated as ml/kg/min. (Gunay et al., 2013; 537-538; Leger et al., 1982: 2).

Measuring the Leg and Back Strenght: The test was performed by using the 23527-3 Brand Backlift dynamometer produced by Lafayette Instrument Company. During the measurements, the participants were asked to apply maximum strenght to their legs and backs and pull the chain of the dynamometer upwards. After a warming-up for 3-5 minutes, the test was repeated for 3 times. The best results were recorded (Gonulates et al., 2010: 963).

Measuring the Hand Grip Strenght: The measurement was performed by using a Takkei brand hand dynamometer. After a 5-minute warm-up, the measurement was made while the subject was standing without bending the arm

on which the measurement was made, and without contacting it with the body. This situation was repeated twice for the dominant hand. The best value was recorded (Gunay et al., 2013; 454; Vancampfort et al., 2012: 417).

Body Composition: In order to determine the body composition, the Skinfold Method was used.

The Skinfold Method: In the Skinfold Method, the Holtain Skinfold Kaliper, which applied 10 g/sq mm pressure in every angle was used. Durning and Womersley (1974) formula was used in order to measure the body fat percentage of the subjects with the triceps, biceps, abdominal and suprailiac skinfold values that were previously obtained (Adnan et al., 2012: 429; Durning and Womersley, 1974: 79-87; Gonulates et al., 2010: 964)

Body Fat Percentage (BFP): The body fat percentage measurements were made by using the Durning-Womersley formula (Adnan et al., 2012: 429; Durning and Womersley, 1974: 79-87 Gunay et al., 2013; 562).

Women = $\text{BD} = 1.1599 - 0.0717 \times X$

$\text{Log } x = (\text{Biceps} + \text{Triceps} + \text{Subscapular} + \text{Suprailiac})$

$\text{Fat \%} = (4.95 / \text{BD} - 4.5) \times 100$

Blood Pressure: In blood pressure measurement, the Riester brand blood pressure monitor was

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used. Sphygmomanometer wounded to subject's arm. A stethoscope diaphragm placed on the brachial arteries and just below the antecubital fold in the elbow of the arm. After sphygmomanometer inflated to the pressure of 160-180 mm Hg, the pressure was slowly reduced until first pulse shot clearly clicks. This was "Korotkoff sounds". This was the first "Korotkoff sounds" during the reading of the manometer was considered a systolic blood pressure index. When stroke sounds thoroughly reduced or completely cut off, manometer was re-read. This was considered the diastolic blood pressure. (Gunay et al., 2013:444). The measurements were made three times after 5 minutes relaxation period by experts in the field.

Resting Heart Rate: The resting heart rates of the participants were measured by listening with a stethoscope in sitting position for 15 seconds and were multiplied by four, and the values were recorded (Gonulates et al., 2010: 963).

The Analysis of the Data: The statistical analyses were made with the SPSS (version 18.0) program. After the analyses of the data, it was observed that all the parameters showed normal distribution. The Paired t Test was used in comparing the pre and post-test values of the Groups. The percentage (%) values were examined for the average difference. The significance value was taken as $p < 0.05$.

RESULTS

Table 2. The Mean and Standard Deviations of the Age and Height Values of the Zumba, Step-Aerobics and Control Groups

Variables	Zumba Group	Step-Aerobic Group	Control Group
	Mean±S.D.	Mean±S.D.	Mean±S.D.
Age (years)	21.30±2.29	20.60±1.42	161.30±5.77
Height (cm)	166.45±6.57	161.30±5.77	21.55 ±1.90

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Table 3. The Comparison of the Pre and Post-Test Values of the Body Weight, Body Fat Percentage, MaxVO₂ Flexibility of the Control Group

Variables		N	Mean±S.D.	Mean Difference (%)	t	p
Body Weight (kg)	Pre test	20	59.70±5.23	0.80	-4.120	.001*
	Post test	20	60.18±5.32			
Body Fat Percentage (%)	Pre test	20	25.10±2.88	7.25	-2.716	.014*
	Post test	20	26.92±3.10			
MaxVO ₂ (ml/kg/min-1)	Pre test	20	20.36±1.34	-2.75	2.104	.049*
	Post test	20	19.80±.86			
Flexibility (cm)	Pre test	20	29.50±10.67	-4.91	4.041	.001*
	Post test	20	28.05±9.73			

* p<0.05

Significant difference was determined in the body weight, body fat percentage, MaxVO₂ and flexibility values of the women in the control group

(p<0.05). It was observed increase in the body weight, body fat percentage while decrease was seen in MaxVO₂ and flexibility performance after 8 weeks.

Table 4. Comparison of the Pre and Post-Test Values of the Strenght Variables of the Control Group

Variables		N	Mean±S.D.	Mean Difference (%)	t	p
Leg Strenght (kg)	Pre test	20	36.17±11.72	-2.21	1.180	.253
	Post test	20	35.37±9.81			
Back Strenght (kg)	Pre test	20	45.00±13.3	-3.66	2.617	.017*
	Post test	20	43.35±11.50			
Dominant Hand Grip Strenght (kg)	Pre test	20	24.62±3.93	-1.94	1.892	.074
	Post test	20	24.14±3.94			

* p<0.05

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Significant difference was determined in the back strenght values of the women in the control group ($p<0.05$). However, there was no significant dif-

ference in the leg strenght and dominant hand grip strenght values of the control group ($p>0.05$).

Table 5. Comparison of the Pre and Post-Test Values of the Blood Pressure and Resting Heart Rates of the Control Group

Variables		N	Mean±S.D.	Mean Difference (%)	t	p
Systolic Blood Pressure (mmHg)	Pre test	20	120.00±3.24	1.66	-1.710	.104
	Post test	20	122.00±5.23			
Diastolic Blood Pressure (mmHg)	Pre test	20	81.00±5.52	0.63	-1.000	.577
	Post test	20	81.50±5.87			
Resting Heart Rate (beat/min)	Pre test	20	67.55±4.26	1.18	-1.775	.092
	Post test	20	68.35±3.81			

No significant differences were determined in the systolic blood pressure, diastolic blood pres-

sure and resting heart rate (RHR) values of the women in the control group ($p>0.05$).

Table 6. Comparison of the Pre and Post-Test Values of the Body Weight, Body Fat Percentage, MaxVO₂ Flexibility Variables of the Zumba Group.

Variables		N	Mean±S.D.	Mean Difference (%)	t	p
Body weight (kg)	Pre test	20	63.22±8.11	-4.08	10.715	.000*
	Post test	20	60.64±7.39			
Body Fat Percentage (%)	Pre test	20	25.37±2.84	-8.86	5.560	.000*
	Post test	20	23.12±2.68			
MaxVO ₂ (ml/kg/min-1)	Pre test	20	22.28±3.64	15.70	-6.621	.000*
	Post test	20	25.78±3.43			
Flexibility (cm)	Pre test	20	28.20±8.53	15.24	-13.932	.000*
	Post test	20	32.50±8.00			

* $p<0.05$

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Significant difference was determined in the body weight, body fat percentage, MaxVO₂ and flexibility values of the women in the zumba group (p<0.05).

Table 7. Comparison of the Pre and Post-Test Values of the Strenght Variables of the Zumba Group

Variables		N	Mean±S.D.	Mean Difference (%)	t	p
Leg Strenght (kg)	Pre test	20	48.99±12.99	11.85	-9.182	.000*
	Post test	20	54.80±11.66			
Back Strenght (kg)	Pre test	20	54.75±16.36	11.21	-10.107	.000*
	Post test	20	60.89±14.67			
Dominant Hand Grip Strenght (kg)	Pre test	20	27.35±4.18	0.73	-.015	.988
	Post test	20	27.55±4.22			

* p<0.05

Significant difference was determined in the leg strenght and back strenght values of the women

in the zumba group (p<0.05). However, there was no significant difference in the dominant hand grip strenght values (p>0.05).

Table 8. Comparison of the Pre and Post-Test Values of the Blood Pressure and Resting Heart Rate of the Zumba Group

Variables		N	Mean±S.D.	Mean Difference (%)	t	p
Systolic Blood Pressure (mmHg)	Pre test	20	119.50±3.94	-0.41	1.000	.330
	Post test	20	119.00±3.07			
Diastolic Blood Pressure (mmHg)	Pre test	20	79.50±3.94	0.62	-1.000	.330
	Post test	20	80.00±3.24			
Resting Heart Rate (beat/min)	Pre test	20	67.35±4.23	0.44	-.623	.541
	Post test	20	67.65±3.70

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Significant difference was not determined in the systolic blood pressure, diastolic blood pressure and resting heart rate (RHR) values of the women in the zumba group ($p>0.05$).

Table 9. Comparison of the Pre and Post-Test Values of the Body Weight, Body Fat Percentage, MaxVO₂, Flexibility Variables of the Step-Aerobic Group

Variables		N	Mean±S.D.	Mean Difference (%)	t	p
Body Weight (kg)	Pre test	20	58.22±9.93	3.81	8.342	.000*
	Post test	20	56.00±9.29			
Body Fat Percentage (%)	Pre test	20	23.83±4.09	-5.79	4.776	.000*
	Post test	20	22.45±3.86			
MaxVO ₂ (ml/kg/min-1)	Pre test	20	21.48±2,38	-25.27	-9.668	.000*
	Post test	20	26.91±2.77			
Flexibility (cm)	Pre test	20	32.15±9.17	-11.50	-14.091	.000*
	Post test	20	35.85±9.20			

* $p<0.05$

Significant difference was determined in the body weight, body fat percentage, MaxVO₂ and flexibility values of the women in the step-aerobic group ($p<0.05$).

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Table 10. Comparison of the Pre and Post-Test Values of the Strenght Variables of the Step-Aerobic Group

Variables		N	Mean±S.D.	Mean Difference (%)	t	p
Leg Strenght (kg)	Pre test	20	48.62±17.05	-15.75	-7.560	.000*
	Post test	20	56.28±15.40			
Back Strenght (kg)	Pre test	20	55.55±18.96	-14.92	-4.993	.000*
	Post test	20	63.84±16.70			
Dominant Hand Grip Strenght (kg)	Pre test	20	24.24±4.35	-6.43	-2.685	.015*
	Post test	20	25.80±4.95			

* p<0.05

values of the women in the step-aerobic group (p<0.05).

Significant difference was determined in the leg strenght, back strenght and dominant hand strenght

Table 11. Comparison of the Pre and Post-Test Values of the Blood Pressure and Resting Heart Rates of the Step-Aerobic Group

Variables		N	Mean±S.D.	Mean Difference (%)	t	p
Systolic Blood Pressure (mmHg)	Pre test	20	120.50±3.94	-0.41	1.000	.330
	Post test	20	120.00±3.24			
Diastolic Blood Pressure (mmHg)	Pre test	20	80.00±5.61	-0.62	1.000	.330
	Post test	20	79.50±6.48			
Resting Heart Rate (beat/min)	Pre test	20	67.35±4.23	-0.07	-.075	.941
	Post test	20	67.30±3.14

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Significant difference was not determined in the systolic blood pressure, diastolic blood pressure and resting heart rate (RHR) values of the women in the step-aerobic group ($p>0.05$).

DISCUSSION and CONCLUSION

Sixty woman volunteers, who did not do regular exercises and did not have any illnesses and sports injuries, participated in this study. The women participating in the study were divided into 3 different groups as follows; and the Control Group ($n=20$, age: 21.55 ± 1.90), the Zumba Group ($n=20$, age: 21.30 ± 2.29) and the Step-Aerobic ($n=20$, age: 20.60 ± 1.42). The exercises were applied to the Zumba and Step-Aerobics Groups for 8 weeks, 3 days a week, for 60 minutes.

In the present study, there was significant difference was determined in the body weight value in the Zumba and the Step-Aerobics Groups at $p<0.001$ level, and in the Control Group at $p<0.01$ level. An increase was observed in the Control Group with 0.80%. A decrease of 4.08% was observed in the Zumba Group, and 3.81% in the Step-Aerobic Group. It is possible to claim that the Zumba Exercise is more effective in the decreasing the body weight (Table 3, Table 6, Table 9). It was reported in previous studies that the Aerobic dance exercises, Step-aerobics and Zumba exercises caused significant decreases in the body weight (Altinoz, 2010: 38; Arslan, 2011: 160; Bicer et al., 2009: 1; Krishnan et al., 2015:

109; Ljubojevic et al., 2014: 29; Tortop et al., 2010: 91) there are also some study indicating that they did not have significantly effects on weight (Rossmeissl et al., 2016: 7).

In the present study, significant difference was determined in the body fat percentage values in the Control Group at $p<0.05$, Zumba and Step-Aerobic Groups at $p<0.001$ level. There was an increase in the Control Group in 2.75% while there was 8.86% decrease in the Zumba Group, 5.79% in the Step-Aerobic Group. It is possible to claim that the Zumba Exercise is more effective in decreasing the body fat percentage (Table 3, Table 6, and Table 9). Although there are studies reporting that the Aerobic dance, Step-Aerobics and Zumba Exercise programs improved the fat percentage and the body composition (Adnan et al., 2012: 428; Barene et al., 2013: 990; Micallef, 2014: 211; Tortop et al., 2010: 91), there are also some studies reporting that they did not have significantly effects (Delextrat et al., 2015; Dowdy et al., 1985: 227; Rossmeissl et al., 2016: 7).

In the present study, significant difference was observed in MaxVO_2 values in the Control Group at $p<0.05$ level, Zumba and the Step-Aerobic Groups at $p<0.001$ level. It was observed that there was 15.70% decrease in the Zumba Group, 25.27% increase in the Step-Aerobic Group; and a 2.75% decrease in the Control Group. It is possible to claim that the Step-Aerobic Exercise is more effective in the increase of the MaxVO_2

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(Table 3, Table 6, Table 9). Adnan et al., (2012) conducted a study and reported that an Aerobic Dance applied for 6 weeks as 2 days a week for about 40 minutes at the high-influence segment improved the aerobic capacity (MaxVO_2). In previous studies, it was reported that the Step-Aerobic, Aerobic dance and Zumba Exercise programs improved the MaxVO_2 performance (Altinoz, 2010: 40; Delextrat et al., 2015; Dowdy et al., 1985: 227; Drobnik-Kozakiewicz et al., 2013: 3; Hallage et al., 2010: 2261; Jaywant, 2013: 6; Kosar et al., 1998: 3; Luetngen et al., 2012: 357; Najafnia et al., 2013: 1335; Okonkwo, 2012: 31). These studies are consistent with our study.

In the present study, significant difference was determined in the flexibility values in the Control Group at $p < 0.01$, the Zumba and the Step-Aerobic Groups at $p < 0.001$ level. It was observed that there was 15.24% increase in the Zumba Group, 11.50% increase in the Step-Aerobic Group; and a decrease in the Control Group in 4.91%. It is possible to claim that the Zumba Exercise is more effective in increasing the flexibility (Table 3, Table 6, Table 9). Najafnia et al., (2013) conducted a study and reported that 8-week Step-Aerobic Exercise increased the flexibility performance; and Donath et al., (2014) reported in their studies that 8-week Zumba Exercise improved the flexibility performance. Wu et al., (2012) reported that an Aerobic dance exercise which was applied for nearly 3 years, 5 times a

week for 30 minutes at low intensity improved the flexibility performance in the lower extremity. Kin et al., (1996) conducted a study and compared the effects of 8-week Step and Aerobic dance applications on physical fitness. The Step and Aerobic dance Groups participated in 8-week program for 3 days a week, 45 minutes a day at a level of 60-70% of their maximum heart beat reserves. It was reported that the Step and Aerobic Group flexibility values were increased.

In the present study, a significant difference was determined in the back and leg strenght values in the Zumba and Step-Aerobics Groups at $p < 0.001$ level, and in the Control Group in the back strenght value at $p < 0.05$ level. In addition, in the dominant hand grip strenght, there was a significant difference in the Step-Aerobic Group at $p < 0.05$ level. No significant difference was determined in other parameters. An increase was determined in the leg strenght in the Zumba Group in 11.85%; and in 15.75% in the Step-Aerobics Group; while there was a decrease in the Control Group in 2.21%. An increase in the back strenght was determined in the Zumba Group in 11.21%; and in the Step-Aerobic Group in 14.92%; while a decrease was determined in the Control Group in 3.66%. An increase was determined in the dominant hand grip strenght in the Zumba Group in 0.73%; in the Step-Aerobic Group in 6.43%; and a decrease in the Control Group in 1.94%. It is possible to claim

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that the Step-Aerobic exercise is more effective in the increase in the strenght performance (Table 4, Table 7, and Table 10). Tortop et al., (2010) conducted a study and reported that the Step-Aerobic exercise improved the back strenght and right hand grip strenght. In a study conducted by Irez et al., (2014), 20 volunteering university students participated in the Aerobic dance group, 20 students in the Step dance group, and 15 students in the Control Group. The exercises were applied to the students for 3 months, 2 times a week and for 1 hour. At the end of the study, significant improvements were observed in the Step dance group leg strenght values. Kurt et al., (2010) conducted a study with middle-aged sedentary women and applied 8-week Step-Aerobic exercises to evaluate the effects of these exercises on some physical fitness parameters, and observed that there was 24,74% improvement in the leg strenght values, and 14,5% improvement in the back strenght values. Delextrat et al., (2015) conducted a study and reported that 8-week Zumba exercises influenced the muscle strenght values in healthy women in a positive way.

In the present study, no significant differences were found in the systolic blood pressure and diastolic blood pressure values of the Control, Zumba, Step-Aerobics Groups. It was also observed that there was an increase in the systolic blood pressure in the Zumba Group in 0.48%; in the Step-Aerobic Group in 0.42%; while there

was an increase in the Control Group in 1.66%. There was a decrease in the diastolic blood pressure in the Zumba Group in 0.62%; in the Step-Aerobic Group in 0.62%; and an increase in the Control Group in 0.63%. It was observed that the Zumba and Step Aerobic exercises did not cause any significant differences in the systolic blood pressure and diastolic blood pressure values (Table 5, Table 8, and Table 11). Dody et al., (1985), Bahia et al., (1988), Kostic et al., (2005) conducted a study and reported that after the Step-Aerobics and Aerobic dance exercises, the systolic and diastolic blood pressure decreased; however, this decrease was not significant. Rossmeissl et al., (2016) indicated that zumba dance exercises didn't have any effects on systolic and diastolic blood pressure. These studies show parallelism with the results of the present study. Bicer et al., (2009), Raju (2014) and Cugusi et al., (2015) conducted a study and observed that the Zumba, Step-Aerobics and Aerobic dance exercise programs caused decreases in the systolic and diastolic blood pressure values. The results of these studies do not overlap with the results of our study.

In the present study, no significant differences were determined in the resting heart rate values in the Control, Zumba, Step-Aerobics Groups. There was a decrease in the Zumba Group in 0.44%; in the Step-Aerobic Group in 0.07%; while in the Control Group an increase was determined in 1.18%. No influences of the ex-

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ercises were observed in the resting heart rate (Table 5, Table 8, and Table 11). The results of the study was conducted by, Rossmeissl et al., (2016) reported that 12-week Zumba dance programme didn't have an effect on resting heart rate values significantly, support our results. Doddy et al., (1985), Bahia et al., (1988), Kostic et al., (2005) and Kurt et al., (2010) reported in their studies that the Step-Aerobics and Aerobic dance exercises influenced the resting heart rate in a positive way, and caused significant decreases. The results of these studies do not overlap with the results of our study.

As a conclusion, it was observed in this study that the 8-week zumba and step-aerobic exercises influenced the Aerobic fitness, body composition, flexibility, leg and back strenght, only in step-aerobic exercises in dominant hand grip strenght, which are among the health-related physical fitness factors, in a positive way; while both exercise programs did not influence the blood pressure, resting heart rate in a significant way. The difference in the improvement in the dominant hand grip strenght may be associated with the density of the hand and arm movements in the step-aerobic exercises, and with the characteristics of the group. It is considered that the duration, frequency and density of the exercises are sufficient to influence the health-related physical fitness factors in a significant way; however, it is also considered that more time is

needed to increase the resting heart rate and blood pressure values in a positive way.

APPLICATIONS in SPORT

Zumba and step aerobics, which are one of the most popular dance activities among young women, are effective tools to improve aerobic fitness, body composition, flexibility, leg and back strenght performance. Most of women can be canalized to dance activities like zumba, step aerobic except other activities (walking, running, biking, etc.) for losing weight, improve the daily living conditions, being healthy, increasing quality of life and increasing aerobic fitness. The frequency and the duration of exercises should be increased to improve blood pressure and resting heart rate. In further studies, comprehensive studies which examine the effect of step aerobics, zumba or other dances (latin dances) on different parameters related to health or performance on different populations, should be performed.

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