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An Investigation of the Effects of an 8-Week Zumba Exercise Program on Physical Fitness Components in Sedentary Women

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ABSTRACT

This study aimed to investigate the effects of an 8-week Zumba exercise program on weight, body fat percentage (BFP), body muscle mass (BMM), grip strength, back strength, flexibility, and MaxVo2 parameters in sedentary women. Twenty-four women (age: 21.54±1.84, height: 163.75±4.15) who did not engage in regular physical activity and had no history of illness or sports injuries volunteered to participate in the study. The participants were randomly divided into two groups: an experimental group (12 participants) and a control group (12 participants). The experimental group underwent 60-minute Zumba exercises three days a week. Weight, height, BFP, BMM, grip strength (right and left), flexibility, and MaxVo2 were measured. The data were analyzed using SPSS 25 statistical software package. Wilcoxon Test was used for intra-group pre-test and post-test comparisons, and a significance level of $p<0.05$ was accepted. In the experimental group, significant differences were observed in weight, BFP, BMM, flexibility, back strength, and MaxVo2 values between the pre-test and post-test, while there was no statistically significant difference in grip strength (right and left) with $p<0.05$. In the control group, a significant difference was observed in BFP. However, no statistically significant differences were found in weight, BMM, flexibility, grip strength (right and left), back strength, and MaxVo2 with $p<0.05$. In conclusion, based on the results of this study and considering the literature, it can be stated that Zumba exercises, which are widely practiced today, expose individuals to high-intensity physical activity. Consequently, an 8-week Zumba exercise program may positively affect weight, body fat percentage, body muscle mass, MaxVo2, flexibility, and strength parameters.

Keywords: Exercise, Physical Fitness, Strength, Zumba



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INTRODUCTION

A sedentary lifestyle is characterized by prolonged periods of sitting or inactivity, low energy expenditure, and inadequate exercise capacity (Kilinç & Kartal, 2022; Yılmaz, 2019). A sedentary lifestyle has been associated with a range of negative health conditions, including obesity, deterioration, diabetes, metabolic syndrome, and a decline in overall well-being (Kalkavan et al., 2016, Özbakkaloğlu & Demirci, 2003; Yılmaz, 2019).

It is observed that 60% of the adult population worldwide, and two-thirds of the young population, do not engage in sufficient physical activity, with a higher prevalence of physical inactivity among women (Civan, 2021). Particularly, women may be more exposed to the adverse effects of a sedentary lifestyle. Sedentary women typically have low levels of physical activity, which leads to poor physical fitness (Yüksel & Ersoy, 2022). Among sedentary women, there is a risk of obesity due to their low levels of physical activity (Yüksel & Ersoy, 2022). Moreover, a sedentary lifestyle can contribute to various health issues such as muscle loss, osteoporosis, and reduced endurance (Çiçek et al., 2017; Rezende et al., 2015). However, it has been emphasized that to mitigate these negative effects and lead a healthy life, regular physical activity has been shown to bring about positive changes in body composition and positively impact daily life (Vural et al., 2010). Furthermore, research has demonstrated the positive effects of regular physical activity on mental health, stress reduction, and strengthening the immune system (Öztürk, 2021), as well as its association with increased social and psychological well-being (Akyurek et al., 2018). With the contribution of these recommendations, it is essential to promote strategies based on new and engaging activities like dance to increase physical activity among women and bring about positive changes in health and performance.

In this context, the physiological, endocrine, cognitive, and psychological benefits of Zumba dance activities have been explained (Coubard et al., 2011; Duberg et al., 2013; Kattenstroth et al., 2013; Kim et al., 2011; Murrock & Graor, 2014; Shimamoto et al., 1998). It can enhance balance, strength, flexibility, and cardiovascular function, making it recognized as an aerobic exercise (Belardinelli et al., 2008). Zumba dance is an exercise program that originated in Colombia in the 1990s and has since gained significant popularity worldwide (Barranco-Ruiz & Villa-González, 2020). In order to maintain rhythmic movements, which are an integral part of exercise, physical activity is not only a static muscle work, but also requires a certain rhythm and movement pattern (Civan et al., 2022). Scientific studies have demonstrated numerous positive effects of Zumba Fitness on body composition and physical fitness in women. As a result, it is considered a highly successful program for increasing physical activity levels among sedentary women (Barranco-Ruiz & Villa-González, 2020). A literature review has indicated that Zumba Fitness has a promising, albeit small, positive impact on body composition, muscle strength, balance, and quality of life (Barranco-Ruiz & Villa-González, 2020). Additionally, a study examining the effects of Zumba exercises on anthropometric characteristics found that 12 weeks of regular Zumba exercises had a positive impact on anthropometric characteristics in women (Bayrakdar et al., 2020). This study suggests that Zumba exercises can improve body composition and assist with weight management in women (Bayrakdar et al., 2020).

In another study, an experiment was conducted on a group of overweight and obese women living in Malta to assess the performance of an 8-week Zumba dance program. The results showed that the 8-week Zumba program was effective in aiding women in their weight loss journey (Micallef, 2015). Additionally, there is data indicating that Zumba dance enhances women's fitness levels. Given that Zumba dance is a high-energy dance activity, it can be sustained and contribute to an overall improvement in fitness levels (Micallef, 2015).

Finally, it is important to note that while existing evidence indicates positive effects of Zumba Fitness on body composition, mental health, and cardiovascular health, there is a lack of direct research focusing specifically on the impact of Zumba Fitness on physical fitness. Therefore, there is a need for more research specifically examining the effects of Zumba Fitness on physical fitness. Consequently, the aim of this study is to investigate the effects of an 8-week Zumba exercise program on weight, body fat percentage (BF%), body muscle mass (BMM), grip strength, back strength, flexibility, and MaxVo2 parameters in sedentary women. With this study, the goal is to recommend fitness-oriented exercise training for sedentary women and, in turn, enhance fitness effectiveness.

This study is structured around the following hypotheses:

Hypothesis 1: The results of Zumba exercise programs applied to sedentary women are effective in terms of weight, body fat percentage (BF%), and body muscle mass (BMM).

Hypothesis 2: The results of Zumba exercise programs applied to sedentary women are effective in terms of grip strength.

Hypothesis 3: The results of Zumba exercise programs applied to sedentary women are effective in terms of back strength.

Hypothesis 4: The results of Zumba exercise programs applied to sedentary women are effective in terms of flexibility.

Hypothesis 5: The results of Zumba exercise programs applied to sedentary women are effective in terms of MaxVo2.

These hypotheses serve as the foundation for the research and aim to assess the impact of an 8-week Zumba exercise program on various physical fitness parameters in sedentary women.

METHOD

Study Design

Before the 8-week Zumba exercise program, the participant's height, weight, Body Fat Percentage (BFP), Body Muscle Mass (BMM), grip strength, back strength, flexibility, and Maximal Oxygen Consumption (MaxVO2) values were recorded. The participants engaged in an eight-week exercise program consisting of 60-minute sessions three days per week. After eight weeks, measurements for height, weight, BFP, BMM, grip strength, back strength, flexibility, and MaxVO2 were retaken.

Participants

This study included 24 female volunteers (age: 21.54 ± 1.84 , height: 163.75 ± 4.15) who were enrolled at Hasan Dogan School of Physical Education and Sports at Karabük University. They were non-athletes and had no history of any diseases or sports-related injuries. The participants were randomly assigned to the experimental group (12 participants) and the control group (12 participants). The participants in the study were not applied any nutrition program for 8 weeks and were asked to continue their eating habits as they were. Informed consent forms were provided to the participants, explaining the risks and benefits of the study, and their approval was obtained. All measurements were conducted following the Helsinki Declaration. The ethical committee of Bayburt University approved all procedures of this study on May 26, 2023, with decision number 202.

Data Collection Tools

Height, Weight, and Body Composition Measurements

The body composition values of the participants in the study were assessed using a bioelectrical impedance analyzer (InBody 120, Biospace, California, USA) with a sensitivity of 0.01 kg. Body composition analysis provides precise measurements of bone mass, body water, and muscle mass, as well as the measurement of fat content for specific body segments. This is achieved by passing a low electrical current through the body via electrodes that come into contact with the hands and feet (Czartoryski et al., 2020). Height measurement was taken in centimeters with participants standing barefoot on a firm, flat surface.

Hand Grip and Back Strength Measurements

Hand grip strength was measured using the Takkei brand hand dynamometer. Back strength was measured using the Takkei brand back and leg dynamometer.

Flexibility Measurement

The flexibility of the participants was measured using the Sit and Reach test. Participants sat on the Sit and Reach box, and with their hands extended forward, they bent their bodies forward without bending their knees, reaching the furthest point possible. The measurement value was recorded after a 1-2 second hold at the maximum point.

MaxVO₂ Measurement

The maximal oxygen utilization capacity of the subjects was determined by applying the Bruce Test Protocol, which is the most commonly used clinical exercise test and is performed by increasing the incline and speed in 3-minute periods. According to this protocol, the run starts with a speed of 2.7 km/h and 10% incline and the speed and incline increase every 3 minutes. Subjects' reaching maximal heart rate (220-h), respiratory exchange coefficient exceeding 1,1 or fatigue to the point of not being able to continue the test were considered as criteria for termination of the test. Oxygen consumption of the subjects was monitored by indirect calorimetry (Cosmed Fitmate) and maxVO₂ value was determined. Respiratory exchange ratio (RER) indirectly from VO₂ and carbon dioxide elimination (VCO₂) values measured and recorded directly in all stages of the test calculated. Calculations were performed simultaneously with the measurements using programs available in the K4 b2 portable indirect calorimeter software. Before starting the tests, the analyzer was calibrated each test day with a certified gas mixture of known concentration (O₂= 15.6%, CO₂= 4.1%, N₂= Balance), 3L syringe as recommended by the manufacturer. Testler sırasında oksijen analizörünün hafızasına kaydedilen veriler bilgisayara aktarıldı. Data recorded in the oxygen analyzer's memory during the tests transferred to the computer (Çamçakallı, 2010).

Zumba Exercise Program

In the research group, a complex choreography consisting of various dance movements accompanied by different music genres was applied as Zumba exercise three days a week, at an intensity of 50% to 60% of the target heart rate, for a duration of 60 minutes (including warm-up and cool-down) (Lukic, 2006). Each Zumba exercise session consisted of 8-10 minutes of warm-up exercises with Zumba music at 90-100 bpm and 70-80 bpm cool-down exercises. The central part of the exercise lasted for 50 minutes and included Zumba Basic 1 steps (merengue, salsa, samba, cha cha cha, reggaeton, cumbia, oriental, belly dance, etc.). During the central part, original Zumba music was used for 3-4 minutes, with 15-30 seconds of rest between music changes (Ljubojević et al., 2014).

Ethics Committee Permission

This article adheres to research and publication ethics principles, journal writing rules, and publication standards. Any potential ethical violations associated with this article rest solely with the authors. This study received ethics committee approval, Dated 18.05.2023 and numbered E-15604681-100-133618 from the Bayburt University Ethics Committee.

Statistical Analysis

The data obtained were obtained using the SPSS 25 statistical package program. Shapiro Wilk-W test was used to determine whether the data showed normal distribution and it was determined that the data did not show normal distribution. The Wilcoxon Test was used for in-group pre-test and post-test comparisons and the significance level was accepted as $p < 0.05$.

FINDINGS

Anthropometric characteristics, claw strength, back strength, flexibility and VO2 Max values of sedentary women participating in the study were analyzed according to pre-test and post-test values.

Table 1. Age and Height Values of the Participants

Groups	Age (years)	Length (cm)
Experiment (n:12)	21,25±2,17	163,75±4,15
Control (n:12)	21,83±1,46	165,58±4,56
The whole group (n:24)	21,54±1,84	164,67±4,37

When Table 1 is examined, the mean age of the experimental group was found to be 21.25±2.17 years, and the height was 163.75±4.15 cm, while the mean age of the control group was 21.83±1.46 years, and the height was 165.58±4.56 cm. The combined mean age and height of the experimental and control groups were 21.54±1.84 years and 164.67±4.37 cm, respectively.

Table 2. Weight, BFP, BMM Values of the Participants

Variables	Group	Pre-Test		Post-Test		Z	P
		Mean±Sd.					
Weight (kg)	Experiment	56,79±5,56	55,28±5,33	-2,99	0,00*		
	Control	57,74±4,13	58,08±4,48	-0,82	0,40		
BFP (%)	Experiment	24,25±6,00	23,18±6,18	-2,04	0,04*		
	Control	27,72±5,38	28,43±5,48	-1,96	0,05*		
BMM (kg)	Experiment	23,00±1,92	23,79±1,84	-2,55	0,01*		
	Control	22,44±2,16	22,21±1,96	-0,74	0,45		

$p < 0.05$

In Table 2, the findings related to weight, BFP (Body Fat Percentage), and BMM (Body Muscle Mass) values of the participants are presented: 1. Weight (kg): • In the experimental group, there was a statistically significant decrease in weight from the pre-test (56.79 ± 5.56 kg) to the post-test (55.28 ± 5.33 kg) with a Z-score of -2.99 ($p = 0.00^*$). In the control group, there was no statistically significant change in weight from the pre-test (57.74 ± 4.13 kg) to the post-test (58.08 ± 4.48 kg) with a Z-score of -0.82 ($p = 0.40$). Body Fat Percentage (%): In the experimental group, there was a statistically significant decrease in BFP from the pre-test (24.25 ± 6.00%) to the post-test (23.18 ± 6.18%) with a Z-score of -2.04 ($p = 0.04^*$). In the

control group, there was a statistically significant increase in BFP from the pre-test ($27.72 \pm 5.38\%$) to the post-test ($28.43 \pm 5.48\%$) with a Z-score of -1.96 ($p=0.05^*$). Body Fat Percentage (%): In the experimental group, there was a statistically significant increase in Body Muscle Mass from the pre-test (23.00 ± 1.92 kg) to the post-test (23.79 ± 1.84 kg) with a Z-score of -2.55 ($p=0.01^*$). In the control group, there was no statistically significant change in Body Muscle Mass from the pre-test (22.44 ± 2.16 kg) to the post-test (22.21 ± 1.96 kg) with a Z-score of -0.74 ($p=0.45$).

Table 3. Paw Strength, Back Strength, Flexibility and VO2 Max Values of the Participants

Variables	Group	Pre-Test	Post-Test	Z	P
		Mean±Sd.			
Right Hand Claw	Experiment (n:12)	31,79±4,26	31,55±4,16	-0,23	0,81
	Control (n:12)	30,31±2,93	30,45±2,81	-0,51	0,60
Left Hand Claw	Experiment (n:12)	30,20±4,28	30,56±4,68	-1,45	0,14
	Control (n:12)	29,84±1,82	29,73±1,76	-0,07	0,93
Back Strength	Experiment (n:12)	83,75±20,79	102,50±24,54	-2,82	0,00*
	Control (n:12)	82,91±21,79	89,58±15,14	-1,91	0,05
Flexibility	Experiment (n:12)	29,83±2,62	32,08±2,10	-2,73	0,00*
	Control (n:12)	30,50±2,74	29,66±3,14	-1,31	0,18
VO2 Max	Experiment (n:12)	40,44±4,62	42,44±3,12	-2,27	0,02*
	Control (n:12)	39,17±4,42	38,70±3,89	-0,23	0,81

$p<0.05$

Tablo 3 has been examined, and no statistically significant difference has been observed between the pre-test values (mean ± standard deviation) and post-test values in the experimental group for the right paw (pre-test: 31.79 ± 4.26 , post-test: 31.55 ± 4.16) with a Z-score of -0.23 ($p=0.81$). Similarly, in the control group, no statistically significant difference was observed for the right paw (pre-test: 30.31 ± 2.93 , post-test: 30.45 ± 2.81) with a Z-score of -0.51 ($p=0.60$). For the left paw values, no statistically significant difference has been observed between the pre-test (mean ± standard deviation) and post-test values in the experimental group (pre-test: 30.20 ± 4.28 , post-test: 30.56 ± 4.68) with a Z-score of -1.45 ($p=0.14$). Likewise, in the control group, no statistically significant difference was observed for the left paw (pre-test: 29.84 ± 1.82 , post-test: 29.73 ± 1.76) with a Z-score of -0.07 ($p=0.93^*$). As for the back values, there has been a statistically significant increase in the experimental group between the pre-test (mean ± standard deviation) and post-test values (pre-test: 83.75 ± 20.79 , post-test: 102.50 ± 24.54) with a Z-score of -2.82 ($p=0.00^*$). However, no statistically significant difference has been observed in the control group (pre-test: 82.91 ± 21.79 , post-test: 89.58 ± 15.14) with a Z-score of -1.91 ($p=0.05$). Regarding flexibility, there has been a statistically significant increase in the experimental group between the pre-test (mean ± standard deviation) and post-test values (pre-test: 29.83 ± 2.62 , post-test: 32.08 ± 2.10) with a Z-score of -2.73 ($p=0.00^*$). In contrast, no statistically significant difference has been observed in the control group (pre-test: 30.50 ± 2.74 , post-test: 29.66 ± 3.14) with a Z-score of -1.31 ($p=0.18$). Finally, for VO2 Max, there has been a statistically significant increase in the experimental group between the pre-test (mean ± standard deviation) and post-test values (pre-test: 40.44 ± 4.62 , post-test: 42.44 ± 3.12) with a Z-

score of -2.27 ($p=0.02^*$). However, no statistically significant difference has been observed in the control group (pre-test: 39.17 ± 4.42 , post-test: 38.70 ± 3.89) with a Z-score of -0.23 ($p=0.81$).

DISCUSSION

When reviewing similar studies in the literature, it has been found that the Zumba exercise program has several positive effects on body composition and physical fitness in women. Consequently, the Zumba exercise program has been reported to increase the physical activity levels of sedentary women and is considered a successful program (Barranco-Ruiz & Villa-González, 2020).

Table 2 presents the findings regarding the weight, BFP (Body Fat Percentage) and BMM (Body Muscle Mass) values of the participants in our findings: 1. Weight (kg): • In the experimental group, there was a statistically significant decrease from pretest (56.79 ± 5.56 kg) to posttest (55.28 ± 5.33 kg) with a Z-score of -2.99 ($p=0.00^*$). In the control group, there was no statistically significant weight change from pretest (57.74 ± 4.13 kg) to posttest (58.08 ± 4.48 kg) with a Z-score of -0.82 ($p=0.40$). Body Fat Percentage (%): In the experimental group, there was a statistically significant decrease in BFP from pretest ($24.25 \pm 6.00\%$) to posttest ($23.18 \pm 6.18\%$) with a Z-score of -2.04 ($p=0.04^*$). In the control group, there was a statistically significant increase in BFP from pretest ($27.72 \pm 5.38\%$) to posttest ($28.43 \pm 5.48\%$) with a Z-score of -1.96 ($p=0.05^*$). Body Fat Percentage (%): In the experimental group, there was a statistically significant increase in Body Muscle Mass from pretest (23.00 ± 1.92 kg) to posttest (23.79 ± 1.84 kg) with a Z-score of -2.55 ($p=0.01^*$). In the control group, there was no statistically significant change in Body Muscle Mass from pretest (22.44 ± 2.16 kg) to posttest (22.21 ± 1.96 kg) with a Z-score of -0.74 ($p=0.45$).

The literature reviews have indicated that Zumba Fitness has shown promising but positive effects on body composition, muscle strength, balance, and quality of life (Barranco-Ruiz & Villa-González, 2020). In another study, it was found that 12 weeks of regular Zumba exercises had a positive impact on anthropometric features in women (Bayrakdar et al., 2020). In another study, an experiment was conducted on a group of overweight and obese women in Malta to assess the performance of 8 weeks of Zumba dancing. The results showed that 8 weeks of Zumba was effective in the weight loss process for women (Micallef, 2015). They also investigated the effect of 8 weeks of Zumba exercises on the fitness levels of women and reported a significant decrease in weight and body fat percentages among sedentary women after the exercise program (Oktay, 2015). They examined the effect of Zumba exercises on women's body composition and observed a significant decrease in body weight and fat percentage after the exercise program (Ljubojević et al., 2014). These findings are consistent with the effects of our study on body composition.

In our study, the pre-test and post-test values for handgrip strength (both right and left) did not show a statistically significant difference in both the experimental and control groups. However, for back strength, flexibility, and VO₂ Max, there was a statistically significant difference in pre-test and post-test values in the experimental group (Table 3).

Studies that have examined the effects of Zumba exercises on handgrip strength in the literature have reported similar findings to your study. For example, a study conducted over 12 weeks of Zumba exercise found no significant difference in handgrip strength in women (Cugusi et al., 2015). Similarly, another study that investigated 8 weeks of Zumba exercise did not find a significant difference in handgrip strength (Oktay, 2018). These findings are consistent with the lack of significant effects on handgrip strength observed in your study.

In studies examining the effects on flexibility, back strength and maximal oxygen consumption (VO₂max), a study on 8-week Zumba exercise found a significant increase in

maximal oxygen consumption, flexibility and back strength (Oktay, 2018), In an 8-week Zumba exercise program, he investigated the effects of Zumba and exercise exercises on physical fitness parameters in young women and found that there was a significant increase in flexibility and leg strength after the exercise program (Ağaoğlu, 2019), Zumba exercises significantly increased VO₂max levels (Suminar et al., 2018), Luetgen, Foster, Doberstein, Mikat and Porcari (2012) also reported a significant increase in MaxVo₂ levels thanks to Zumba exercises. When examining the effects of Zumba exercise on maximal oxygen consumption (VO₂max), Krishnan et al. (2015) reported a 7.1% improvement after 16 weeks of Zumba exercise. Donath et al. (2014) reported a significant 21% increase in VO₂max in the 6-minute walk test, a field test, after Zumba exercise. There is also data that Zumba dance improves women's fitness. Since Zumba dance is a high-energy dance activity, it can be kept and general fitness level can be increased (Micallef, 2015). Our findings are in line with the results in the literature.

Conclusion

In conclusion, an 8-week Zumba exercise program has been found to have positive effects on weight, body fat percentage, body muscle mass, MaxVO₂, flexibility, and strength parameters.

In light of all this information, based on our study and literature review, it is evident that individuals participating in Zumba dancing, being exposed to a high-energy dance activity, experience positive effects on their health. Furthermore, it has been scientifically proven that Zumba dancing not only helps prevent high weight and body fat percentage in sedentary women but also improves their fitness levels (body muscle mass, back strength, flexibility, and MaxVO₂). Therefore, it is suggested that all sedentary women consider engaging in this dance regularly. Future research may explore whether Zumba dancing has effects beyond physical fitness, such as on the immune system and autophagy.

Limitations and Recommendations

This study was limited to a total of 24 sedentary women, 12 in the experimental group and 12 in the control group, with an average age of 21 years, who did zumba exercise for 8 weeks and 3 days a week. It is thought that increasing the number of participants and conducting studies investigating the effects of exercise in different age, gender and different dance types will contribute to sports science.

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