

Effect of 12 Week Zumba Program and Healthy Diet on Anthropometry, Body Composition and Fitness Parameters in Working Women

Keywords: Zumba; Healthy eating; Physical activity; Anthropometry; Fitness

Introduction

The ZUMBA program is latin inspired, dance fitness class that incorporates some of the basic principles of aerobic, interval and resistance training to maximize caloric output, cardiovascular benefits, and total body toning. A need was felt to find out whether this dance fitness program really has an effect on anthropometry, body composition and fitness parameters. The objective of the present study was to assess and compare the effect of Zumba program alone and Zumba Program coupled with a healthy diet on anthropometric measurements, body composition and fitness parameters in the participants pre and post intervention. A total of 60 working women aged 20-50 years participated in the study for duration of three months. 30 participants followed only the Zumba program ('Z' group) and remaining 30 participants followed a healthy diet along with the Zumba program ('ZD' group). Diet modification was given by a qualified nutritionist. The data was collected through a written questionnaire. Effect of Zumba program alone and Zumba program combined with healthy diet on anthropometric measurements, body composition and fitness characteristics was studied. The two groups were compared with respect to changes in this parameters using paired t test. Macro nutrient intake by two groups before and after intervention was also compared by using paired t test. Both the groups showed no difference in anthropometric, body composition and fitness parameters at baseline. Post intervention change in anthropometric measurements, body composition and fitness characteristics was higher in Zumba with diet group('ZD') than only Zumba ('Z') group. Decrease in weight was 3.2 % in 'Z' group and 10.5% in 'ZD' group. Decrease in BMI was only 0.3 % in 'Z' group whereas in 'ZD' group it was 10.98%. Decrease in fat % was 6.53% in 'Z' group and 10.98% in 'ZD' group. There was no change seen in waist to hip ratio in 'Z' group whereas improvement by 1.1% was seen in 'ZD' group. Thus improvement in anthropometric parameters was more in 'ZD' group than 'Z' group. Cardiovascular endurance increased by 66% in 'Z' group whereas it increased by 55% in 'ZD' group. Muscle endurance increased by 18.5% in 'Z' group whereas it increased by 33.43% in 'ZD' group. Flexibility increased by 22.2% in the 'Z' group and by 35.66% in 'ZD' group. In the present study, Zumba coupled with a healthy diet has proven to be an effective program to improve fitness levels and reduce obesity and adiposity in working women.

Health is a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity [1]. Increased reliance on technology has led to less work-related physical activities like cleaning the house, travelling to work by

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walking, etc. More time may be available for leisure activities but individuals may not engage themselves into any kind of physical activity [2]. Physical inactivity has thus given rise to many chronic diseases. Heart disease, stroke, cancer, diabetes and respiratory infections which are ailments of long duration and slow progression, severely affect people's earnings [2,3]. A well balanced diet and daily physical activity are important in order to achieve weight maintenance and to reduce the risk of chronic diseases.

Dancing is a mode of physical activity that may allow older adults to improve their physical function, health and well-being [4]. Zumba fitness is an effective interval-style, full-body dance workout with built-in variety because every class and every instructor is slightly different. Equally important is the notion that Zumba classes are entertaining which means exercisers are busy burning calories and getting fit while enjoying the fun of Latin dancing [5].

What is ZUMBA program?

The ZUMBA program is latin inspired, dance fitness class that incorporates Latin and international music and dance movements, creating a dynamic, exciting, exhilarating, and effective fitness system. The ZUMBA program integrates some of the basic principles of aerobic, interval and resistance training to maximize caloric output, cardiovascular benefits, and total body toning. The cardio based dance movements are easy to follow steps that include body sculpting, which targets areas such as gluteus, legs, arms, core, abdominals and the most important muscle in the body the 'heart'. The passionate and explosive latin and international music rhythms of ZUMBA program motivate participants during class, making them want to return for ZUMBA program again and again [5,6].

According to our knowledge, so far no research has been done to prove the benefits of Zumba dance in women. So the purpose of the present study was to observe the specific effects of Zumba program in middle aged women. The objectives of the study were

To determine the effect of Zumba programme alone and Zumba program with healthy diet on:

- a. Anthropometric measurements
- b. Body composition
- c. Fitness parameters i.e cardiovascular and muscle endurance, flexibility.

To compare the effect of Zumba program alone with Zumba program and healthy diet on above parameters.

Subjects and Methods

The present study was conducted at Sitara dance Studio, Lower Parel, Mumbai. Working women from different parts of Mumbai were purposively selected based on their age and readiness to participate in the research. Written permission was obtained from the studio. Participants were explained about the research study and written informed consent was taken from them.

The research study was approved by Independent Ethics Committee (IEC) Navi Mumbai. Registration No. MAH/1256/13(T) 60 working, apparently healthy women aged 20-50 years, participated in the study. Participants with severe medical conditions like Arthritis, Cardiovascular diseases were excluded from the study.

Study protocol

Participants were divided into two groups comprising of 30 women each. One group followed a healthy diet along with Zumba program (ZD) and the other group did only Zumba program (Z). The period of study was 12 weeks, from August 2013 to November 2013. Participants attended the classes thrice a week for 12 weeks, conducted by Zumba instructor. Each class was of 60 minutes, comprising 10 minutes of warm up, 45 minutes of Zumba Dance and 5-7 minutes of Cool Down.

Tools used for data Collection

Relevant information on the following points was collected using a questionnaire.

Demographic profile

The background information that included age, gender, occupation, marital status.

Participant's medical history

Past and present health status of the participants that focuses on conditions that require medical clearance was recorded.

Lifestyle evaluation

Lifestyle assessment was done by collecting useful information on alcohol consumption, smoking status, and level of physical activity.

Medical history of the family

This included information about chronic Medical conditions like Diabetes, Thyroid problem, Cardio vascular diseases, Obesity, Blood pressure, Cancer that the family members may have suffered from.

PAR-Q

Physical Activity Readiness Questionnaire had seven questions that were designed to identify individuals who needed medical clearance before taking any physical fitness tests or starting an exercise program. It helped the investigator to assess the participant's fitness status if she was fit to do Zumba for the study period.

Three day diet recall

A three day diet recall (2 weekdays and 1 weekend) technique was used to collect information on food intake. The investigator assisted the participants to recall the food consumed and to estimate the portion sizes of foods consumed. Daily caloric and macro nutrient intake was then calculated [7].

Diet modifications

'ZD' group was asked to follow a healthy, low fat, high protein diet. They were provided with sample diet plan and healthy dietary tips. They were asked to have more of pulses, sprouts, milk and milk products and egg whites, fish, chicken for non vegetarians. They were asked to opt for healthy options when eating out and reduce the intake of junk, fried and high fat food. 'Z' group was asked to continue with their usual diet.

Anthropometric measurements

Anthropometric measurements recorded in the present study included Height, Body weight, Fat percentage, Body mass index, Waist circumference, Hip circumference, Waist to hip ratio was calculated, Waist to height ratio was also calculated [8,9].

Physical fitness testing

Cardio respiratory endurance, muscular endurance, flexibility are the components of Physical Fitness. These were measured using the following tests. Cardio respiratory endurance-Queen's college step test [10,11]. Muscular Endurance-PARTIAL Curl up test [12]. Flexibility- Modified sit and reach test [13].

Statistical analysis

The data was analysed using SPSS version16. Anthropometric measurements, body composition and fitness parameters were observed pre and post intervention for both 'Z' and 'ZD' group and comparison was done within the groups and between the two groups. Pre and post nutrient intake was compared for 'ZD' group. All the comparisons were done using paired T-test. $p < 0.05$ was considered statistically significant.

Results and Discussion

Out of a total of 60 participants 30 participants followed only Zumba dance program ('Z' group) and 30 participants followed a diet program along with Zumba dance (ZD group). In 'Z' group

60% (n=18) and in 'ZD' group 50% (n=15) of the participants were in the age group 20 to 30 years. Both groups had single as well as married participants. Among 'Z' group 40% (n=12) were single and 60% (n=18) were married and among 'ZD' group 53% (n=16) were single and 47% (n=14) were married. In both the groups more than 70 % of participants belonged to nuclear family. 40% (n=12) and 46% (n=14) of the participants in 'Z' group and 'ZD' group respectively had working hours ranging from 6-8 hours. Majority of participants from both the groups were vegetarian 60 % (n=18) of the participants in 'Z' group and 67 % (n=20) of the participants in 'ZD' group reported that they did not have family history of any chronic disease. Majority of participants from both groups were not on any medications during the study period Table 1.

Table 1: Demographic characteristics of participants.

Characteristics		'Z' group (n=30)		'ZD' group (n=30)	
		n	%	n	%
Age(yrs)	20-30	18	60	15	50
	31-40	11	36.7	12	40
	41-50	1	3.3	3	10
Marital status	Single	12	40	16	53
	Married	18	60	14	47
	Divorced	-			
Family type	Joint family	8	27	6	20
	Nuclear family	22	73	24	80
Working hours per day	6-8 hours	12	40	14	46
	8-12 hours	18	60	16	54
Number of meals consumed per day	3-6 meals	21	70	20	67
	6-9 meals	9	30	10	33
Dietary pattern	Vegetarian	18	60	20	67
	Non vegetarian	12	40	10	33
Family history of chronic disease*	Yes	8	27	12	40
	No	22	73	18	60
Presently on any medications**	Yes	3	10	-	
	No	27	90	30	100

*Family history of all chronic diseases like diabetes, CVD, thyroid etc.

**Medications include different vitamin, mineral supplement and other drugs (if any).

Table 2 shows the anthropometric measurements and fitness characteristics of the participants at baseline. All the values are mean ± SD. With respect to these characteristics, at baseline the two groups were not statistically significantly different.

Table 2: Anthropometric measurements, body composition and fitness characteristics of participants at baseline.

	'Z' group n =30	'ZD' group n=30	P value
Anthropometric measurements, body composition and fitness characteristics	Mean ± Std. Deviation	Mean ± Std. Deviation	
Weight in kgs	72.43 ± 14.89	73.7 ± 10.39	0.41
BMI in kg/m ²	29.58 ± 4.18	29.32 ± 4.06	0.596
Fat percentage	36.57 ± 8.25	38.73 ± 5.71	0.2
WHR	0.86 ± 0.09	0.86 ± 0.08	0.917
WHtR	57.92 ± 8.34	55.88 ± 7.45	0.346
Cardiovascular Endurance (ml/kg/min)	22.48 ± 3	24.12 ± 2.98	0.107
Muscle Endurance (no of curlups)	29.16 ± 10.92	25.36 ± 11.61	0.216
Flexibility (reach in cm)	20.52 ± 5.01	18.84 ± 6.69	0.304

Note: values are the mean ± SD.

Table 3 shows anthropometric measurements, body composition and fitness characteristics of participants post intervention. All the values are mean ± SD.

Table 3: Anthropometric measurements, body composition and fitness characteristics of participants post intervention.

	'Z' group	'ZD' group	P value
Anthropometric measurements, body composition and fitness characteristics	Mean ± Std. Deviation	Mean ± Std. Deviation	
Weight in kgs	70.08 ± 14.39	65.98 ± 10.62	0.02
BMI in kg/m ²	28.48 ± 4.09	26.1 ± 4.09	0.042
Fat percentage	34.18 ± 7.87	30.82 ± 5.61	0.083
WHR	0.86 ± 0.09	0.85 ± 0.09	0.357
WHtR	53.96 ± 8.11	54.04 ± 8.13	0.349
Cardiovascular Endurance (ml/kg/min)	37.2 ± 2.81	37.6 ± 3.2	0.608
Muscle Endurance(no of curl ups)	34.64 ± 10.12	33.84 ± 10.05	0.776
Flexibility (reach in cm)	25.08 ± 4.88	25.56 ± 6.63	0.723

After the participation in Zumba program with or without healthy diet program, it was observed that anthropometric characteristics i.e Weight, BMI, WHR and Body composition i.e., fat percentage was higher in 'Z' group as compared to 'ZD' group and fitness characteristics i.e., cardiovascular endurance, muscle endurance and flexibility was higher in 'ZD' group as compared to 'Z' group, [wt(kg) 'Z'=70.08kg, 'ZD'=65.98kg; BMI(kg/m²)'Z'=28.48kg/m², 'ZD'=26.10kg/m²; fat % 'Z'=34.18%, 'ZD'=30.82%; WHR 'Z'=0.86, 'ZD'=0.85; WHtR 'Z'= 53.96, 'ZD'= 54.04; cardiovascular endurance(ml/kg/min) 'Z'=37.20, 'ZD'=

37.60 ; muscle endurance (no of curl ups) 'Z'=34.64, 'ZD'=33.84; flexibility (reach in cm) 'Z'=25.08, 'ZD'= 25.56].

The two groups showed statistically significant difference with respect to weight and BMI ($p < 0.05$) but the difference in other parameters was not significant ($p \geq 0.05$).

Table 4 shows Comparison of anthropometric and fitness characteristics within 'Z' group pre and post intervention. All the values are mean \pm SD.

Table 4: Comparison of anthropometric and fitness characteristics within 'Z' group pre and post intervention.

	Pre	Post	Differences in the Mean Values	P value
Anthropometric measurements, body composition and fitness characteristics	Mean \pm Std. Deviation	Mean \pm Std. Deviation		
Weight in kgs	72.43 \pm 14.89	70.08 \pm 14.31	-2.35	0
BMI in kg/m ²	29.58 \pm 4.18	28.48 \pm 4.09	-0.1	0
Fat percentage	36.57 \pm 8.25	34.18 \pm 7.87	-2.39	0.74
WHR	0.86 \pm 0.09	0.86 \pm 0.09	0	0.29
WHtR	57.92 \pm 7.45	54.04 \pm 8.13	3.06	0
Cardiovascular Endurance (ml/min/kg)	22.48 \pm 3	37.2 \pm 2.81	14.72	0
Muscle Endurance (no of curlups)	29.16 \pm 10.92	34.64 \pm 10.12	5.48	0
Flexibility (reach in cm)	20.52 \pm 5.01	25.08 \pm 4.88	4.56	0

There was decrease in weight (-2.35kg), BMI (-0.1kg/m²), fat percentage (-2.39%) WHtR(-3.07), and increase in cardiovascular endurance(+14.72ml/min/kg), muscle endurance(+5.48 no of curl ups), flexibility (+4.5cm) after three months of Zumba dance training. Except for fat percentage, these changes were statistically significant ($p \leq 0.05$). No change was observed in WHR.

Table 5 shows Comparison of anthropometric and fitness characteristics within 'ZD' group pre and post intervention. All the values are mean \pm SD.

There was decrease in weight (-7.78kg), BMI(3.22kg/m²), fat % (-7.91%), WHR (0.001) WHtR (-1.37) and there was increase in cardiovascular endurance (+13.48 ml/min/kg) muscle endurance (+8.48 no of curl ups), and flexibility (+6.72cm) after following three months of Zumba dance training along with healthy diet practice. Except for WHR, the changes in all the characteristics were statistically significant ($p < 0.05$)

Table 4&5 show that in both, 'Z' and 'ZD' groups there was an improvement in most of the parameters, post intervention. This

suggests that Zumba program alone can be beneficial but Zumba along with healthy diet showed better results. Thus, Zumba program, which is a type of physical activity with aerobic workout and fun of music and dance can be one of the options for women to increase the level of physical activity in their daily life.

Table 5: Comparison of anthropometric and fitness characteristics within 'ZD' group pre and post intervention.

	Pre	Post	Differences in the Mean value	P value
Anthropometric measurements body composition and fitness characteristics	Mean \pm Std. Deviation	Mean \pm Std. Deviation		
Weight in kgs	73.7 \pm 10.39	65.98 \pm 10.62	-7.78	0
BMI in kg/m ²	29.32 \pm 4.06	26.1 \pm 4.09	-3.22	0
Fat percentage	38.73 \pm 5.71	30.82 \pm 5.61	-7.91	0
WHR	0.86 \pm 0.08	0.85 \pm 0.09	-0.01	0.6
WHtR	55.88 \pm 8.34	53.96 \pm 8.11	-1.37	0
Cardiovascular Endurance (ml/min/kg)	24.12 \pm 2.98	37.6 \pm 3.2	13.48	0
Muscle Endurance(no of cur ups)	25.36 \pm 11.61	33.84 \pm 10.05	8.48	0
Flexibility (reach in cm)	18.84 \pm 6.69	25.56 \pm 6.63	6.72	0

Table 6 shows the percentage change in anthropometry and fitness parameters of the 'Z' and 'ZD' groups.

At the end of the intervention period change in all the parameters was higher in 'ZD' group than 'Z' group. Decrease in weight was 3.2 % in 'Z' group and 10.5% in 'ZD' group. Decrease in BMI was only 0.3 % in 'Z' group whereas in 'ZD' group it was 10.98%. Decrease in fat % was 6.53% in 'Z' group and 10.98% in 'ZD' group. There was no change seen in waist to hip ratio in 'Z' group whereas 1.1% decrease was seen in 'ZD' group. This shows that the beneficial effect of Zumba dance along with healthy diet pattern was much more as compared to Zumba dance alone. Improvement was also seen in fitness parameters in both the groups. But cardiovascular endurance was increased by 66% in 'Z' group whereas it was increased by 55% in 'ZD' group. This shows that the desirable effect on cardiovascular endurance can be achieved with Zumba alone. Aerobic dance and intermittent training has shown beneficial effects in improving cardiovascular strength [14].

Muscle endurance increased by 18.5% in 'Z' group whereas it increased by 33.43% in 'ZD' group. Flexibility also improved by 22.2 % in 'Z' group and by 35.66% in 'ZD' group.

Table 6: Percent change in anthropometry and fitness parameters of the 'Z' and 'ZD' groups.

Characteristics	'Z' group		'ZD' group	
	Change	% change	Change	% change
Weight (kg)	-2.35	↓3.2	-7.78	↓10.5
BMI(kg/m ²)	-0.1	↓0.3	-3.22	↓10.98
Fat percentage	-2.39	↓6.53	-7.91	↓20.4
WHR	0.0	0	-0.01	↓1.1
WHtR	-3.06	↓5.3	-1.37	↓2.4
Cardiovascular endurance(ml/kg/min)	+14.72.	↑66	+13.48	↑55
Muscle endurance(no of curl ups)	+5.48	↑18.5	+8.48	↑33.43
Flexibility(reach in cm)	+4.56	↑22.2	+6.72	↑35.66

Table 7 shows the comparison of macronutrient intake before and after the intervention in 'ZD' group. This group did Zumba and followed a high protein low fat diet. Mean daily energy intake reduced from 1860kcal before intervention to 1550kcal after intervention. Mean protein intake increased from 33.94g to 75.5g. Mean carbohydrate intake was reduced from 260g to 240g Mean fat intake reduced from 84.4g to 41.92g All the changes were statistically significant (p=0.00).

Table 7: comparison of nutrient intake pre and post intervention in 'ZD' group.

Nutrients	Pre		Post		P value
	Mean	SD	Mean	SD	
Energy (kcal)	1860	±223	1550	±113	0.000
Protein (grams)	33.94	±10.52	75.5	±5.7	0.000
Carbohydrate (grams)	260	±30.77	240	±15.63	0.000
Fat (grams)	84.4	±26.45	41.92	±3.15	0.000

The role of carbohydrate in weight loss has received considerable attention in light of the current obesity epidemic [14]. Diets low in carbohydrate have been reported to enhance weight loss. The type of carbohydrate in the diet may also be related to body weight [16]. According to a study done on urban south Indian population, higher refined grain intake was significantly associated with higher waist circumference in this population of Asian Indians who habitually consume high carbohydrate diets. Dietary fiber is associated with a lesser degree of weight gain in observational studies. In conclusion, a limited number of relatively short term studies suggest that replacing simple refined and high GI foods by complex carbohydrate in diet might result in lower energy intake and reduced body weight [16,17].

Research have shown that higher protein diet may lead to a greater loss of body weight, fat mass, and preservation of lean

body mass (LBM) compared with normal protein diets. According to a recent study published in may 2009, greater improvements in waist circumference and body composition occurred when carbohydrate was replaced in diet with protein.

In the present study also changes in the macronutrient intake along with Zumba program showed greater beneficial effect on anthropometric parameters as compared to the effect of Zumba program alone Participants in 'Z' group were asked to continue with their usual diet during the study period. There was no significant difference in the intake of energy and macro nutrients by these participants before and after intervention (data not shown).

Summary and Conclusion

In the present study the participants were between 20-50 years of age and were divided in two groups. Both groups did Zumba training program for 12 weeks. One group followed a healthy diet program along with Zumba. After 12 weeks there was difference seen in anthropometric measurements, body composition and fitness parameters in both the groups. In the 'Z' group, significant difference was seen in weight, BMI and fitness parameters after intervention. However, fat % and waist to hip ratio did not show a significant difference.

In 'ZD' group where participants followed a healthy diet along with Zumba, better results were seen. Both anthropometric and fitness parameters showed a significant improvement after intervention, only the waist to hip ratio was not statistically significantly different.

When the two groups were compared, change in anthropometric parameters was higher in 'ZD' group than 'Z' group. Fitness parameters showed good improvement in both the groups. Improvement in cardiovascular endurance was higher in 'Z' group whereas, muscle endurance and flexibility was higher in 'ZD' group.

This suggests that regular physical activity along with healthy diet helps in improving body weight and improves the fitness level. Intervention programs should be undertaken to enhance nutrition education, to encourage people to adopt healthy eating behavior, making healthy food choices, engage in physical activity, and thereby improve their lifestyle and risk to chronic diseases.

Zumba program alone can be a good option for working women, to add enjoyment to their lives and to increase their level of physical activity. With improvement in anthropometric and fitness parameters it may help to reduce the risk of chronic, lifestyle diseases like CVD and diabetes.

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