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EFFECT OF 12 WEEKS ZUMBA BASED TRAINING ON PHYSICAL FITNESS IN YOUNG HEALTHY ADULTS

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ABSTRACT

Zumba is a Latin inspired, dance fitness class that incorporates Latin and international music and dance moves creating a dynamic fitness program. The program integrates basic principles of aerobic, interval and resistance training to maximize caloric output, cardiovascular benefits and also total body toning. The purpose of our study is to find the effect of Zumba on fitness parameters like BMI, flexibility, strength, endurance and aerobic capacity. 40 subjects (mean age=20.08 years) were recruited to participate in a 12 week Zumba based program, which met 1 hour 2 times per week. Subjects were randomly assigned to experimental group (n=20) and control (n=20) group. A pre assessment was done prior to the sessions followed by post assessment using a fitness battery. Analysis was done using T-test which showed significant level of improvement ($p < 0.05$) in all except of lower limb anaerobic strength seen in jump n reach test ($p = 0.03$). The study demonstrated that in active women age between 18-24 years exposed to 12 week Zumba based exercise conducted for 1 hour 2 days a week was enough to show statistically significant improvement in BMI, lower limb and trunk flexibility, upper limb, lower limb and trunk endurance, lower limb strength and aerobic capacity as compared to the control group. This study suggested that Zumba based exercise program is effective in improving flexibility, strength, endurance and aerobic capacity.

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INTRODUCTION

Physical Inactivity is associated with many of the leading causes of death, chronic morbidity and disability.¹ Nationwide studies conducted show that 54.4% of the population in India is inactive, urban population being more inactive than the rural population.² Hence, there is a need of creating exercise training program that addresses the specific concerns of physical inactivity, that are accessible and enjoyable, and that have been shown to have health benefits.³

Zumba is Latin-inspired dance workout first developed in Columbia in the mid- '90s by celebrity fitness trainer Alberto "Beto" Perez. Zumba was actually developed by "accident", when Beto forgot to bring his traditional aerobics music to class one day. The only music he had was a few Latin music tapes in his car. In his class, he let the music motivate him, just as if he were in a club, and began dancing to Salsa, Rumba, and Merengue. His participants loved it and Zumba was born.⁴

The program integrates basic principles of aerobic, interval, resistance training to maximize caloric output, cardiovascular benefits and also total body toning. Cardio-based dance movements are easy to follow steps which need no previous experience in dance that target various muscles like gluteus, core, abdominals, lower limb, upper limb muscles, and the most important muscle of the body – the heart muscles.⁵

Zumba is shown to be beneficial to improve fitness and well-being amongst individuals.⁶ Many of the dance steps used in the routines emphasize the hips and midsection to help strengthen the core. The jumps and lunges that are parts of the choreographed movements help work the quads, hamstrings and glutes. The dance moves are designed to enhance flexibility.⁷ The high-and low-intensity intervals make Zumba an excellent cardio. It is considered an effective type of physical activity able to improve aerobic capacity.⁸ 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.⁹

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Certain tests that have routinely been used to assess components of physical fitness in national surveys and schools are shuttle walk test for cardio vascular endurance, sit and reach for flexibility, curl up, pushup and planks for muscular endurance, jump and reach for leg muscle function.^{10,11}

Even despite the various studies done to determine the effectiveness of Zumba as a means of fitness, there is still a definite discrepancy between its growing trend and research done on the topic. There is especially a lack of research done pertaining to Zumba in the Indian population, hence it becomes important to conduct a study that clearly demonstrates the efficacy of this high energy fun to do workout amongst this racial subdivision.

METHODS

Ethical approval was obtained from the departmental ethics committee of MGM School of Physiotherapy, Navi Mumbai before commencement of the study. 40 students of MGM School of Physiotherapy, willing to participate, between the age group 18-24 were selected on the basis of inclusion and exclusion criteria. An informed consent was obtained from all the participants. Subjects with any recent injury or surgery, cardiac illness, cognitive or neurological conditions were excluded from the study. Subjects were divided into 2 groups, Group A- Experimental Group(n=20) and Group B- Control Group(n=20). All 40 subjects were assessed prior to commencement of the Intervention using Fitness Battery test. The following tests were included in the Fitness Battery Test:

Outcome Measure 1: Sit and Reach (SnR): This test involves sitting on the floor with legs stretched out straight ahead with feet placed flat against the box, both knees should be locked and pressed flat to the floor. With the palms facing downwards and hands on top of each other the subject reaches forward along the measuring line as far as possible. The subjects hold the position for 1-2 seconds while the distance is recorded. There should be no jerky movements. The score is recorded to the nearest centimeter or half inch as the distance reached by the hand.¹² (Figure 1 and 2)



Figure 1



Figure 2

Outcome Measure 2: Jump and Reach test (JnR): The participant stands side on to a wall and reaches up with the hand closest to the wall. Keeping the feet flat on the ground, the point of the finger tips is marked or recorded. The participant then stands away from the wall and leaps vertically as high as possible using both arms and legs to assist in projecting the body upwards scoring is the difference in distance between standing reach height and jump reach height. The best of 3 attempts is recorded.¹³ (Figure 3)



Figure 3

Outcome Measure 3: Home Push up Test: This test is modified method of the push up test. The participants kneel on the floor, hands on either side of the chest with keeping the back straight. Then the chest is lowered towards the floor till his/her elbow. The participant does maximum pushups until exhaustion.¹⁴ (Figure 4)



Figure 4

Outcome Measure 4: Curl up test: The test begins by the subjects lying on their back with knees bent approximately 140 degrees, feet flat on the floor and legs slightly apart with palms resting on thighs. Keeping the heels in contact with the mat the subjects curls up slowly until the inferior of the scapula clears the ground. The subject performs maximum repetitions as they can.¹⁵(Figure 5)



Figure 2

Outcome Measures 5: Plank Test: The subject lies down in prone position, where elbow and forearm are supported on ground with the hips lifted off the floor. The subject holds the position for maximum duration.¹⁶ (Figure 6)



Figure 6

Outcome Measures 6: Chair stand test: The subject sits on the chair that is supported against a wall with feet shoulder width apart and touching the floor. From sitting position, the subject stands up completely and back down for 10 repetitions as fast as possible. The examiner records the time.¹⁷(Figure 7 and 8)



Figure 7



Figure 8

Outcome Measures 7: Saehan Back, Leg and Chest Dynamometer.

Torso Lift (Dynamo B): the subject stands on the base with feet shoulder width apart, knees relaxed, arms straight and palms down. He/she then bends the torso at the hip, pulls the bar straight up and holds without leaning back.

Leg Lift (Dynamo Sq): Subject stands on the base with feet wider than shoulder width apart knees relaxed, arms straight and palms down. Ensuring that the chain is perpendicular to the base, the subject pulls the chain straight up using his legs and holds the chain without leaning back.¹⁸ (Figure 9 and 10)



Figure 9



Figure 10

Outcome Measure 8: Incremental Shuttle Walk Test (ISWT): In the test the subject will be asked to walk between two cones spaced 10 meters apart. The participant will begin by walking at a very slow pace; this pace is set by a beep. The beep will get faster gradually. The subject can discontinue if they are too breathless or tired to continue.¹⁹(Figure 11)

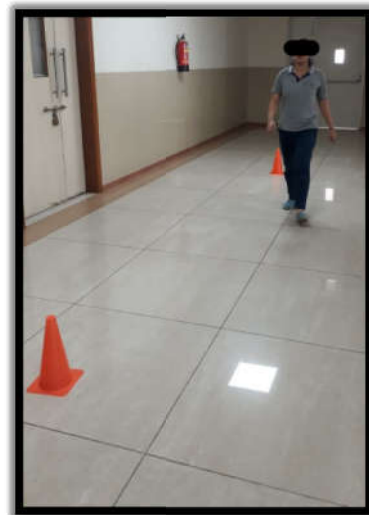


Figure 11

The Interventional Group (Group A) performed Zumba based exercise in group sessions for 12 weeks which were held two days in a week for 45 minutes.

The sessions included

Warm Up: Warm up sessions included basic footwork patterns such as step touch with variations in arm, shoulder, chest and

back movements, small intensity cardio workout with large range of movements and muscle activation targeting core and lower limb.

Workout: various Zumba techniques such as Merengue, Salsa, Cumbia and Reggaton were practiced along with functional training activities that included squats, lunges, Russian twists, reverse planks, pelvic rotations, burpees and heel raises.

Cool Down: cool down segment lasted for 3-5 min with a gradual decrease in heart rate. Rhythmic slow Cumbia or tango, low mellow songs were used for static stretching with breathing techniques.

RESULT

The data was obtained using SPSS 25. The baseline values of mean age, height, weight, and BMI for both the groups are presented in table 1. No significant difference was noted between the groups with respect to age ($p=0.57$), Height ($p=0.12$) and BMI ($p=0.31$). Significant difference was noted with respect to weight ($p=0.02$) between both the groups.

Pre intervention- Post intervention intra group analysis for groups A and B are presented in Tables 2 and 3 respectively. Table 4 shows inter group analysis post intervention. The p values marked with an “*”, are statistically significant.

Post-intervention score of sit and reach test showed significant change in flexibility by 2.87cms ($p= 0.00$) in Group A as compared to Group B ($p = 0.8$). Between group comparison showed statistically significant change in flexibility ($p =0.00$). Post-intervention score of curl-up increased by 11.22 repetitions ($p=0.00$) and duration of plank test increased by 12.05 seconds ($p=0.00$) indicating significant increase in core strength in Group A as compared to Group B ($p=0.45$) ($p=0.06$). Between group comparison showed statistically significant change in core strength ($p =0.00$) ($p=0.01$). Post intervention score of for strength increased by 2.58cms in Jump and Reach ($p =0.03$), Trunk and lower limb Dynamometer showed significant change in back extensor strength 7.45kgs ($p=0.00$) and lower extremity strength 8.66kgs ($p=0.00$ in Group A as compared to Group B ($p= 0.35$) ($p=0.14$) ($p=0.65$).

Table 1 Baseline parameters for Group A and Group B

	Group A	Group B	P Value	Mean Difference	Standard Error Difference	95% Confidence Interval of Difference	
						Lower	Upper
Age(in year)	19.96(1.26)	20.2(1.55)	0.57	-0.24	0.43	-1.11	0.62
Height (in cms)	157.37(5.59)	159.92(4.94)	0.12	-2.55	1.62	-5.82	0.72
Weight Pre (in kgs)	58.54(8.34)	66.52(13.16)	0.02*	-7.98	3.32	-14.67	-1.28
BMI Pre (in kg/m ²)	25.17(3.87)	26.55(4.98)	0.31	-1.38	1.35	-4.11	1.35

Table 2 Pre Intervention- Post intervention analysis for Group A

	Pre	Post	P Value	Mean Difference	Standard Error Difference	95% Confidence Interval of Difference	
						Lower	Upper
Weight (in kgs)	58.54(8.34)	56.65(8.02)	0.00*	2.54	0.31	1.25	2.54
BMI (in kg/m ²)	25.17(3.87)	24.19(3.69)	0.00*	0.98	0.18	0.61	1.36
SnR (in cms)	2.96(5.91)	5.83(5.39)	0.00*	2.87	0.62	-4.15	-1.59
JnR (in cms)	26.07(5.32)	28.65(7.08)	0.03*	2.58	1.14	-4.95	-0.22
Push Up (no. of reps)	34.69(13.92)	43.91(15.32)	0.00*	9.28	2.16	-13.70	-4.73
Curl Up (no. of reps)	32.3(9.97)	43.52(12.45)	0.00*	11.22	2.45	-16.29	-6.14
Plank (in seconds)	42.09(15.36)	54.14(17.6)	0.00*	12.05	2.24	-16.68	-7.41
Chair Stand (in seconds)	16.93(1.94)	12.35(2.01)	0.00*	4.58	0.47	3.60	5.57
Dynamo Sq (in kgs)	43.78(13.16)	51.83(13.64)	0.00*	8.66	2.38	-12.97	-3.12
Dynamo B (in kgs)	52.7(11.44)	60.22(12.57)	0.00*	7.45	1.57	-10.77	-4.27
ISWT(in meters)	342.61(51.28)	413.04(74)	0.00*	70.43	14.38	-100.27	-40.60

Values Expressed as Mean(SD)

KEY- SnR Values of Sit and Reach test; JnR: Values of Jump and Reach test; Push Up: Values of Push up test; Curl Up: Values of Curl Up test; Plank: Values of Plank Test; Chair Stand: Values of Chair Stand test; Dynamo Sq: Values of Dynamometer Leg Lift test; Dynamo B: Values of Dynamometer Torso Lift test; ISWT: Values of Incremental Shuttle Walk test distance.

Table 3 Pre Intervention- Post intervention analysis for Group B

	Group A	Group B	P Value	Mean Difference	Standard Error Difference	95% Confidence Interval of Difference	
						Lower	Upper
Weight (in kgs)	66.52(13.16)	66.58(12.22)	0.93	-0.06	0.69	-1.52	1.39
BMI (in kg/m ²)	26.55(4.98)	26.81(5.24)	0.42	-0.26	0.31	-0.91	0.40
SnR (in cms)	0.35(5.69)	0.47(5.81)	0.80	0.12	0.47	-1.11	0.87
JnR (in cms)	22.55(6.42)	23.2(5.6)	0.56	0.35	1.10	-2.94	1.64
Push Up (no. of reps)	27.8(12.41)	27.95(11.02)	0.85	0.15	0.78	-1.77	1.47
Curl Up (no. of reps)	30.85(10.03)	31.9(11.51)	0.45	1.05	1.36	-3.90	1.80
Plank (in seconds)	29.1(12.78)	32.77(13.85)	0.06	3.67	1.82	-7.48	0.14
Chair Stand (in seconds)	15.85(2.43)	15.2(3.31)	0.25	0.65	0.55	-0.51	1.81
Dynamo Sq (in kgs)	45.25(11.01)	44.45(10.69)	0.65	-0.8	1.75	-2.87	4.47
Dynamo B (in kgs)	46(11.99)	48.1(13.22)	0.14	2.1	1.37	-4.97	0.77
ISWT(in meters)	336(60.73)	334(62.95)	0.68	-2	4.79	-8.03	12.03

Values Expressed as Mean(SD)

KEY- SnR Values of Sit and Reach test; JnR: Values of Jump and Reach test; Push Up: Values of Push up test; Curl Up: Values of Curl Up test; Plank: Values of Plank Test; Chair Stand: Values of Chair Stand test; Dynamo Sq: Values of Dynamometer Leg Lift test; Dynamo B: Values of Dynamometer Torso Lift test; ISWT: Values of Incremental Shuttle Walk test distance.

Intergroup comparison showed statistically significant improvement in back extensor strength by 5.42kgs (p=0.01). Between Group comparison did not show any significant change in values of Jump and Reach test (p=0.23) and Dynamometer Leg Lift (p=0.06). The post intervention values of Chair Stand test improved significantly by 4.58 centimeters (p=0.00), while there was no significant change in the values of Group B (p=0.25). Inter group analysis for Chair stand test showed significant change (p=0.00). Post-intervention score of Push-up test showed significant improvement in Upper body endurance by 9.28 repetitions (p=0.00) in Group A as compared to Group B. Intergroup comparison showed statistically significant improvement in upper body strength (p=0.00).

realignment of the fibers. Micro failure occurs with controlled cyclic loading that is necessary for permanent elongation or increase in flexibility.²³

Participants of Group A have showed a significant change in both Jump and Reach Test values (mean difference=2.58, p=0.03) and Dynamometer Leg Lift Tests values (mean difference=8.05, p=0.00), indicating an increase in lower limb muscle strength. Hence our study contradicts the results of previous studies that have shown no significant improvement in lower limb muscles strength²⁴. This increase in lower limb muscle strength post 12 weeks Zumba based exercises could be due to the functional training (squats, lunges, heel raises, burpees, etc.) conducted as part of our Zumba based exercise sessions.

Table 4 Inter Group Analysis

	Group A	Group B	P Value	Mean difference	Standard Error Difference	95% confidence Interval of Difference	
						Lower	Upper
Weight Diff (in kgs)	1.89(1.49)	-0.095(2.99)	0.01*	1.98	0.71	0.56	3.41
BMI Diff(in kg/m2)	1.17(1.26)	0.049(1.43)	0.01*	1.00	0.41	0.29	1.95
SnR Diff(in cms)	2.87(2.95)	0.12(2.11)	0.00*	1.12	0.79	1.15	4.35
JnR Diff(in cms)	2.59(5.46)	0.65(4.90)	0.23	1.94	1.59	-1.28	5.15
Push Up Diff (no. of reps)	9.21(10.37)	0.05(3.44)	0.00*	9.16	2.43	4.26	14.08
Curl Up Diff (no. of reps)	12.09(10.57)	1.05(6.08)	0.00*	11.04	2.73	5.53	16.55
Plank Diff (in seconds)	12.04(10.72)	3.67(8.13)	0.01*	8.37	2.94	2.44	14.31
Chair Stand Diff (in seconds)	4.62(2.27)	0.65(2.47)	0.00*	3.97	0.72	2.51	5.43
Dynamo Sq Diff(in kgs)	5.7(12.79)	-0.8(7.84)	0.06	6.50	3.30	-0.16	13.15
Dynamo B Diff (in kgs)	7.52(7.51)	2.1(6.13)	0.01*	5.42	2.11	1.16	9.69
ISWT Diff(in meters)	70.43(68.98)	-6(20.62)	0.00*	76.43	16.04	44.05	108.82

Values Expressed as Mean(SD)

KEY-Weight Diff: Pre Intervention- Post Intervention Difference values of Weight; BMI Diff: Pre Intervention- Post Intervention Difference values of BMI; SnRDiff:Pre Intervention- Post Intervention Difference values of Sit and Reach test; JnRDiff:Pre Intervention- Post Intervention Difference values of Jump and Reach test ;Push Up : Pre Intervention- Post Intervention Difference values of Push up test; Curl Up Diff: Pre Intervention- Post Intervention Difference values of Curl Up test; Plank : Pre Intervention- Post Intervention Difference values of Plank Test; Chair Stand : Pre Intervention- Post Intervention Difference values of Chair Stand test; Dynamo Sq:Pre Intervention- Post Intervention Difference values of Dynamometer Leg Lift test; Dynamo B : Pre Intervention- Post Intervention Difference values of Dynamometer Torso Lift test; ISWT Diff: Pre Intervention- Post Intervention Difference values of Incremental Shuttle Walk test distance.

DISCUSSION

The results of this study showed a significant decrease in weight (p=0.00, mean difference 1.89) of participants of Group A. Our results were in accordance with other studies that show that Zumba training reduces total fat mass in young individuals.²⁰ Since both the groups were not matched at their baselines with regard to weight and BMI, there can be no direct comparison between Group A and B with regards to these parameters. Despite this, since the mean difference of weight post intervention in Group A was 1.89kgs while that of Group B was 0.06 kgs, we can conclude that Zumba Intervention resulted in weight reduction. This reduction in mean weight could be due to Zumba incorporating cardio boosting dance segments and resistance training exercise.²¹ With Aerobic Training there is a decreased rate or depletion of muscle glycogen at sub-maximal work levels which is due to increased capacity to mobilize and oxidize fat and increase fat mobilization and fat metabolizing enzymes.²²

The participants of Zumba Intervention group showed a significant increase in values of Sit and Reach Test (mean difference=2.87, p=0.00), indicating increase in flexibility. This result is contradictory to the results of previous studies which indicate that Zumba training does not improve flexibility²⁰. This increase in flexibility could be due to various hamstrings and back muscles stretching exercises that were performed as a part of the cool down session of our intervention. Stretching post intervention causes breaking of collagen bonds and

Zumba has also proven to improve maximal trunk extension strength²⁵. This finding is in agreement with our results, as is seen in post assessment values of Dynamometer Torso Lift Test(mean difference=7.52,p=0.00) of Zumba group. The increase in trunk extensors could be attributed to the functional training exercises (squats, pelvic rotations, reverse planks, etc) included in our sessions as well as the increased strength and endurance of core and lower limb musculature. The increase in the strength of the lower limb, trunk and upper limb muscles is due to the hypertrophy of the muscle fibers that occurs as a result of exercises. There is hyperplasia of muscle fibers and remodeling of type IIB to type IIA fibers.²⁶

While there is a lack of evidence that states effect of Zumba on muscle endurance, our study suggests significant increase in lower limb and core muscle endurance after a 12 week Zumba trial. This was seen by increase in duration of holding a plank (mean difference=12.05, p=0.00) and significant decrease in time taken to complete 10 repetitions of Chair Stands (mean difference=4.58, p=0.00) in the Zumba group. There is a lack of research done to assess the endurance of upper limb muscles post Zumba training. The results of the Push Up test of our study shows significant improvement in the post assessment of Zumba group (mean difference=9.22,p=0.00) indicating an increase in upper limb muscle endurance. This increase is due to the rhythmic punching movements, arm raises, swinging arms along with the functional training done during the session.²⁷ The muscles respond to endurance training by

increase in their oxidative and metabolic capacities which allows better use oxygen.

There was a significant (mean difference=70.43,p=0.00) increase in the distance walked on Incremental shuttle Walk Test of participants of Zumba Group, indicating an increase in aerobic Capacity. This result is in accordance with previous studies conducted which state that Zumba is an effective means for improving aerobic capacity of young individuals.²⁸ This increase occurs due to moderate to high intensity activities within Zumba increasing the gas exchange across the alveolar – capillary membrane .Increased metabolism during exercise results in more oxygen extraction from the arterial blood, minute ventilation increases as respiratory frequency and tidal volume increase.²⁹

This study did not have any restriction or suggestion with respect to dietary intake of the subjects. This limitation must be kept in mind as it may have affected results of post assessment. The sample size of this study was considerably limited due to space constraint. Another limitation of our study is the effect of motivation that may have hampered the results during the post assessment.

This research exclusively studied the effect of Zumba on young, healthy individuals. Hence it remains a subject for further research to study the effects of Zumba in the elderly population. It can also be studied if Zumba based exercise can be incorporated for improvement of health parameters in population with non-communicable diseases like Diabetes Mellitus and Hypertension.

CONCLUSION

12 weeks of Zumba based exercises were effective in improving all the components associated with physical fitness amongst young healthy individuals. Further research is required to determine whether these gains are made in patients with lifestyle related diseases

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