

Effect of Aerobic Dance on the Body Fat Distribution and Cardiovascular Endurance in Middle Aged Women

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Abstract

Dance aerobics is a popular means of exercise in the urban population. This study evaluates effect of Dance Aerobics on cardiovascular endurance and body fat percentage in middle aged women. To ensure uniformity in the findings, *Cooper Protocol*, a standardised protocol for dance aerobics was followed, ensuring optimal exercise intensity and minimal musculotendinous damage.

120 middle aged women divided in two groups were examined for VO_{2max} and body fat percentage. Group I comprised 60 women engaged in regular aerobic dance sessions, since 6 months. Group II did not engage in any exertional physical activity. Unpaired t test was used. $p=0.001$ considered significant. Aerobic dancers exhibited i) no significant difference in VO_{2max} ($p=0.00201$) ii) lower fat percentage ($p=0.01462$), indicating aerobics is highly effective in weightloss, but effects on cardiovascular endurance are not pronounced. Increasing intensity of existing protocol to achieve increased VO_{2max} may hasten musculotendinous damage. This should be considered before an individual selects aerobic dancing as fitness activity.

Keywords: Cooper Protocol, VO_{2max} , Callipers

Introduction

The aerobic dancing is a popular means of exercise regimen, especially in the urban population. Exercising to music, non requirement of costly equipments or space especially have made dance aerobics very popular in urban areas. Numerous studies carried out on aerobic dance and its effect on body. These have yielded mixed results of the aerobic dancing on various physiological parameters of the population (Kathleen & Rockefeller, 1979; Patricia, 1987; Williford et al, 1989; Garber et al 1992; Grant et al, 2002; Lehri, and Mokha, 2006; Pantelić et al, 2007; Jakubec et al, 2008; Schiffer et al, 2008; Angioi et al, 2009; Keogh et al 2009; Leclarungrayub et al, 2011;

Hopkins et al, 1990). The difference may be due to difference in the cadence and impact of the various dance schedules (Uchechukwu, 2009). The following study considers the effect of dance aerobics on the VO_{2max} and body fat content on middle aged women. The dance schedule followed in the study was based on Cooper Protocol (Bull, 1996).

Materials and Methods:

The study was carried out after obtaining the Institutional Ethical Committee Approval. The study was carried out in two groups. Group I consisted of 60 middle aged women who practiced aerobic dance since atleast 6 months. Each session of aerobic dance

lasted for one hour, thrice a week. Group II consisted of 60 middle aged women not engaged in any exertional physical activity. Prior to testing, required pre-test instructions were given to all volunteers and the tests were properly explained and demonstrated. The total body fat percentage (*Grzonkowski et al, 1989*) and VO_{2max} (*McArdle et al, 2010*) respectively was calculated in the two groups. The skin fold thickness was measured by skin fold calipers (*Gause & Dey, 2005*) at triceps, subscapular region, suprailiac region, abdomen and thighs. The following precautions were followed while taking the measurements by the skin fold callipers:

The volunteers were asked not to eat or drink anything two hours prior to measurement of body fat. The callipers were placed on the exact site marked before. The readings taken in the first 5 seconds only were considered. The callipers were placed perpendicular to the site measured. The sum of skin folds reflected absolute or percentage changes in body fat (*McArdle et al, 2010*). Measurement sites for the callipers were as follows

1. Triceps: Vertical fold in the posterior midline of right upper arm, half way between the tip of shoulder and the tip of elbow; the elbow remains in an extended, relaxed position.
2. Subscapular: Oblique fold just below the bottom tip of of right scapula.
3. Iliac : Slightly oblique fold just above the iliac crest
4. Abdominal : vertical fold 1 inch to right of umbilicus

5. Thigh: vertical fold at the midpoint of right thigh.
6. Biceps : vertical fold at the midline of the right upper arm

Formula for prediction of fat from skin fold:

$$\% \text{ body fat} = 8.997 + 0.24658 (3SKF) - 6.343 (\text{gender}) - 1.998 (\text{race})$$

Where SKF = sum of skin folds

Gender = 0, female 1, male

Race = 0, white 1, black

The equation was age adjusted for specific ages as the % body fat increases with age.

The sum of skin folds reflects absolute or percentage changes in body fat (*Bandyapadhyay, 2005*).

Classification	Men	Women
Essential fat	2-4	10-12
Athletes	6-13	14-20
Fit	14-17	21-24
Acceptable	18-35	25-31
Obese	35 plus	31 plus

The VO_{2max} is the measure of cardiovascular endurance of an individual (*McArdle et al, 2010*). This was measured using the Queens Step Test (*Chatterjee et al, 2005*) - a three-minute step test (each step 16.25 inches). The post exercise recovery heart rate was calculated post each stepping cycle to a four step cadence, ‘up up down down’. The women performed 22 step ups per minute, regulated by a metronome set at 88 beats per minute. The step test began after a brief demonstration and practice. At the completion of 3 minutes, pulse rate was measured for 15 seconds, after 5 to 20 secs of recovery (*Uchechukwu, 2009*). (ST_{PULSE})

Recovery Heart Rate was converted to beats per minute and calculated as.

$$VO_{2max} = 65.81 - (0.1847 \times ST_{PULSE}) \text{ for women}$$

Results & Discussion

The results were tabulated and analysed by SPSS software. The unpaired t test was applied. $p = 0.001$ was considered significant.

Table 1: Comparison of aerobic dancers & working women

Variables	Aerobic dancer		Working woman		Mann-Whitney Test applied		
	Mean	SD	Mean	SD	z-value	p-value	Difference is-
Age (yrs)	38.07	5.22	37.92	3.80	-0.146	0.884	Not significant
Queens step test	38.88	5.33	35.19	5.48	-3.089	0.00201	Not Significant
SFT (%)	27.29	4.06	29.13	3.81	-2.442	0.01462	Significant

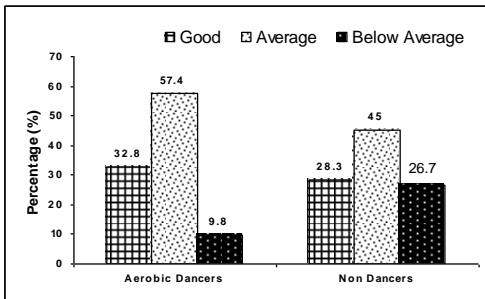


Figure 1: Comparison of Queen's Step Test of Dancers & Non-dancers

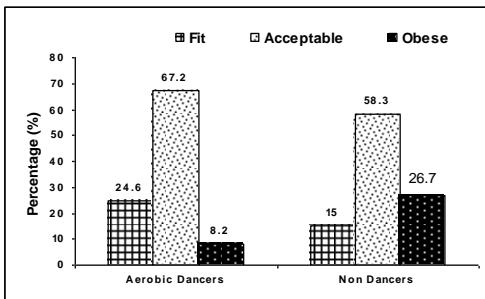


Figure 2: Comparison of Body Fat % of Dancers & Non-dancers

The results show that though the VO_{2max} values are higher in the dancers than the non dancers, the result is not statistically significant ($p=0.00201$) [Fig. 1]. The values for the total body fat percentage however are statistically significant ($p=0.01462$) [Fig. 2].

The vigorous dance activity increases the resting metabolism in the body cells.

There is facilitation of lipid mobilisation and oxidation especially from the visceral adipose tissue (*Guyton and Hall, 1996*). There is probably an increase in estimated daily energy expenditure in aerobic dancers compared to working women that creates a slightly negative energy balance in aerobic dancers, causing calorie expenditure, resulting in the weight loss. This may be the cause of reduced body fat in aerobic dancers.

VO_{2max} is the measure of the cardiorespiratory endurance of the individual (*McArdle et al, 2010*). The slightly increased values of VO_{2max} in the aerobic dancers may be due to decreased peripheral resistance, increased cross sectional diameter of the coronary arteries, and improved tone of the ventilatory musculature (*McArdle et al, 2010*). Nitrous oxide released due to the shear stress may be the reason for these effects. However, for the significant change to occur in VO_{2max} the *Critical Training Threshold* (*Astrand et al, 2003, McArdle et al, 2010*). needs to be achieved. This may not be achieved during a standard Cooper Protocol Aerobic Dance session (*Bull, 1996*).

Conclusion: This is a very important fact which needs to be considered before an individual considers aerobic dance as a fitness activity. If a person is aiming for just weight loss, then the dance aerobics is an ideal choice, however, if the person is aiming for improved cardiovascular status, other physical exertional activities may be considered.

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