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EFFECT OF PRACTICING SELECT INDIAN CLASSICAL DANCE FORMS ON BODY COMPOSITION STATUS OF BENGALEE FEMALES: AN ANTHROPOMETRIC STUDY

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ABSTRACT ■ Emerging epidemic of obesity has led to focus on the exercise training and on regular practicing of moderate-to-vigorous intensity physical activity. Bharatnatyam and Kathak are two most popular traditional Indian classical Dance forms which have been practiced for a long period of time mainly for recreational purpose. They involve adoption of different body postures, movements and thereby may influence body composition. Present study has been undertaken in this context to assess the impact of regularly practicing these two dance forms on body composition of young adult Bengalee females. It has been found that individuals practicing both the two dancing forms have favorable body composition parameters adjudged anthropometrically, compared to their age and sex matched control group individuals of similar socioeconomic status. The favorable impact on body composition is more pronounced in individuals practicing Bharatnatyam form of dance.

Key words: overweight, Bharatnatyam, Kathak, BAI, body fat

INTRODUCTION

Due to growing prevalence of overweight and obese conditions in individuals in all ages throughout the world (Misra et al 2009), there has been resurgence of interest in effect of practicing different forms of physical exercises mainly for body weight optimization from public health perspective. Dance, a popular traditional recreational type of physical activity, demands organization of exercise and accompanying music of a certain tempo, rhythm and dynamics (Kostiæ et al 2006). It consists of various steps, skips, jumps, turns and movements which are performed in all directions and on various plains and are used in accordance with the shape and abilities of the person exercising. Bharatnatyam is one such very popular traditional Indian classical dance forms. It is basically a low impact dancing, having its genesis in 'devdasi' dance of southern Indian temples. It is famous for its precise technique, postures, rhythm as well as expressions. There are some special types of exercise or initial basic steps, *adavu,* which are necessary to be learnt before performing the dance. It involves a lot of neck movement and finger gestures i.e. 'mudras' and adoption of postures like, sitting, bending, standing, twisting; which help prepare the body for adopting the dance style

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requiring extreme sidewise knee bending and body flexibility. On the other hand, Kathak is a typical form of Indian classical dancing originating in northern India. It generally involves rhythmic footwork, linear and circular extension of the body. In this dance all the body parts move smoothly, and it demands high level of physical activity. There are some special movements like skips, jumps and turns in all direction which ensures better posture and flexibility. In Kathak dance, the dancer is to put her weight on the floor and taps the feet to rhythm with ankle bells or 'ghunghroos' secured round the ankles. Now, from the physiological point of view, regular training in Bharatnatyam and Kathak dancing may have some impact on body composition variables but information regarding health impact of Indian dancing specifically of Bharatnatyam and Kathak on body composition is not much available. Present work has been undertaken, in this context, to study the effect of Bharatnatyam and Kathak dancing on body composition variables, using anthropometric technique.

MATERIALS AND METHODS

At the beginning of the study, institutions imparting training on Indian classical dancing, especially on Bharatnatyam and Kathak, were approached for obtaining permission to access the individuals receiving those dancing trainings. On obtaining initial consent, the names of volunteers were enlisted and the objective and study requirement were explained to them elaborately. Present study involved 43 Bharatnatyam dancers and 34 Kathak dancers constituting Bharatnatyam Dancing Group (BDG) and Kathak Dancing Group (KDG) respectively. The inclusion criteria was that female individuals should have received training in the dance forms for a minimum period of 5 years and practice it regularly for at least half an hour for 3-5 times per week. Twenty nine adult females of comparable age and socio-economic background but not receiving training and / or practicing in any form of exercise including dance constituted the Control Group (CG). Individuals regularly practicing other form of exercise in addition to Bharatnatyam and Kathak dance, any other forms of dance and having any type of chronic metabolic problems were excluded from the study. On the scheduled day, arranged on mutual convenience, the information about the individuals - age in completed years, daily activities, food habits, socio-economic condition (Patro et al 2012) was recorded first in pre-designed schedules. The anthropometric measurements were taken thereafter. Each measurement was obtained three times and the average value was calculated. Body height (cm), using a stadiometer with an accuracy of 0.1cm, body weight (kg) using electronic scale with an accuracy of 0.1kg with individuals in light clothing and without shoes, were measured. Ideal body weight of each group of individuals was calculated separately following Broca's Index; which gives a generalized idea about the body weight status of the individuals. BSA and BMI were calculated. Body adiposity Index (BAI), a relatively new index for obesity assessment was calculated (Bergman 2011). Waist circumference was measured at the umbilical level with the subjects standing and breathing normally during measurement and Hip circumference (HC) at the maximum circumference over the buttocks with the arms relaxed at the sides were measured using a non stretch measuring tape; waist hip ratio (WHR) and waist to height ratio (WHtR) were calculated. Conicity Index was also calculated (Taylor et al 2000). Body fat was estimated using age and sex specific equation

(Deurenberg et al 1991). Absolute value of body fat and fat free mass were calculated. All the anthropometric parameters used in the present study are the important parameters which are obesity indicating parameters and are extensively used in the body composition research. Obtained data were analysed with One-way ANOVA to find out significant difference between the groups of individuals. P value less than 0.05 was considered significant.

RESULTS

In the present study a total of 106 adult female individuals voluntarily participated [(BDG=43), (KDG=34) and (CG=29)]. All of them belonged to Bengalee Hindu Caste Population (BHCP) and were from upper middle class strata of the society.

No significant difference (P >0.05) has been found between BDG and KDG individuals in terms of exercise components.

Table 1: Background information of the study participants

Variables	BDG	KDG	CG
Sample size	43	34	29
Age (years)	21.4 ± 2.49	21.9 ± 3.21	21.0 ± 3.18
Religion	Hindu	Hindu	Hindu
Socio-economic status	Upper middle	Upper middle	Upper middle
Life style	Sedentary in nature	Sedentary in nature	Sedentary in nature
Smoking/alcoholism	Nil	Nil	Nil
Exercise (dancing) experience (year)	7.8 ± 2.07	7.9 ± 2.12	-
Exercise (dancing) frequency (days per week)	4.1 ± 0.98	4.3 ± 1.05	-
Exercise (dancing) duration (hours)	1.2 ± 0.63	1.2 ± 0.58	-

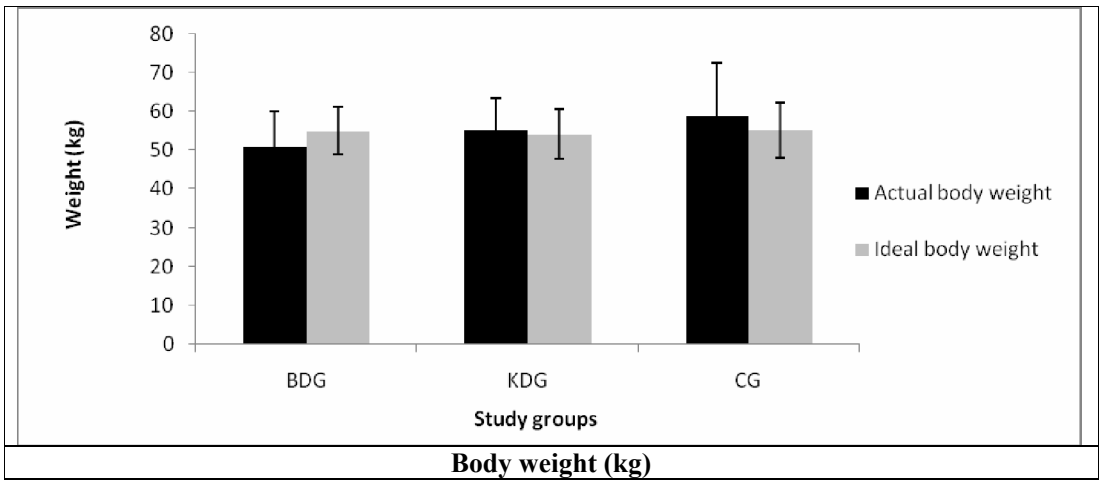

Fig. 1: Comparison among BDG, KDG and CG individuals in terms of Body weight with reference to Ideal body weight

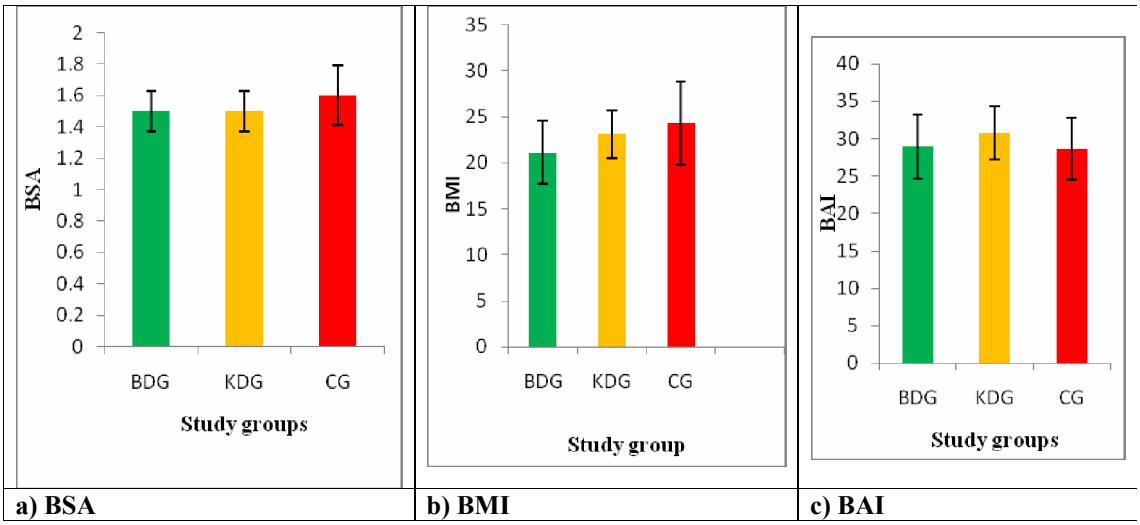

Fig. 2: Comparison among BDG, KDG and CG individuals in terms of BSA, BMI and BAI

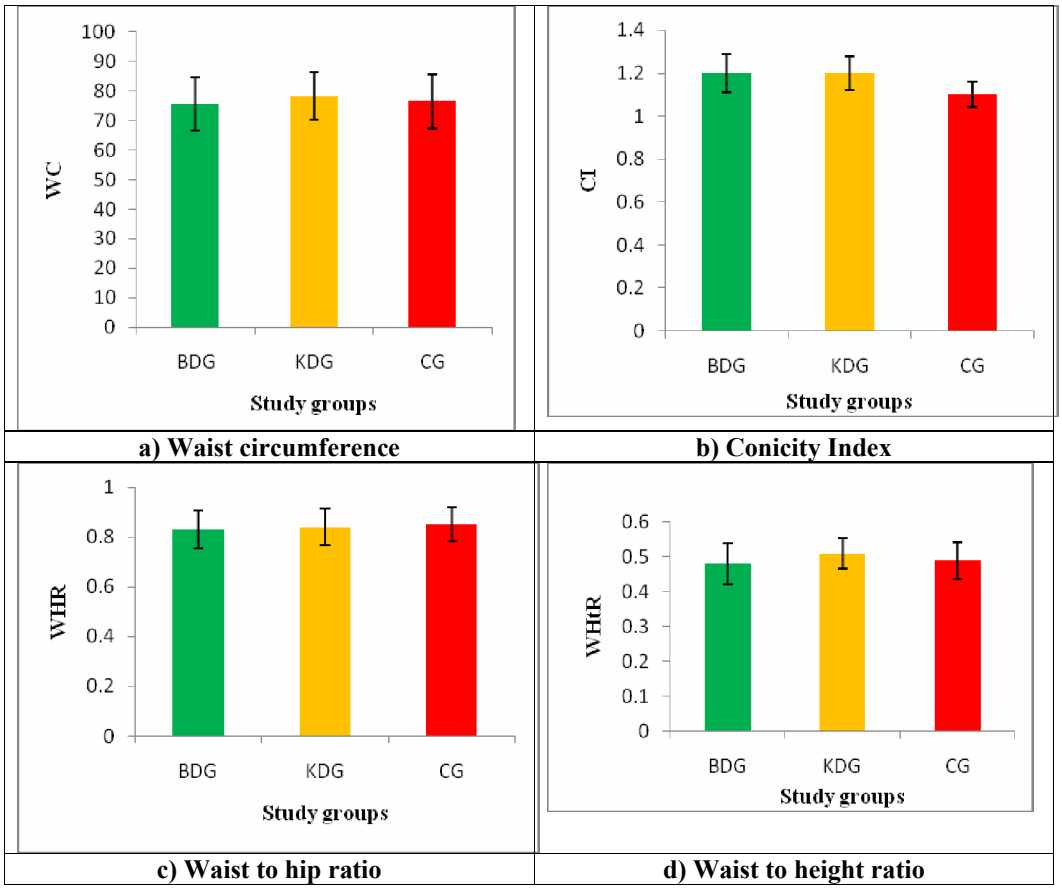

Fig. 3: Comparison between BDG, KDG and CG individuals in term of Waist circumference, Conicity Index, Waist to hip ratio, Waist to height ratio

In Figure 1, difference between ideal body weight and actual body weight have been presented in the three study groups.

In Figure 2 comparisons have been presented among the three study groups in terms of BSA, BMI and BAI.

Significant difference has been found between BDG, KDG and CG individuals in terms of body weight. For BDG individuals mean Ideal body weight was 4.1 kg higher compared to the original body weight, where as for KDG and CG individuals actual body weight are 0.9 and 3.6 kg higher. BDG, KDG and CG individuals differ in terms of BSA, BMI and BAI also.

In Figure 3 comparisons have been made among the three study groups in terms of waist circumference, conicity index, waist to hip ratio and waist to height ratio.

Mean value of waist circumference is lower in BDG individuals compared to KDG and CG counterparts. For waist to height ratio individuals belonged to KDG have higher mean value compared to BDG and CG individuals.

In Figure 4, comparisons have been graphically presented among the three study groups in terms of fat mass and fat free mass. It has been found that a significant difference ($P < 0.01$) exist between BDG, KDG and CG individuals in terms of absolute body fat. No significant difference has been found in terms of fat free mass.

Correlation coefficient between the measured anthropometric variables in BDG individuals has been presented in Table 1 in matrix form. In BDG individuals, significant positive correlation has been found for most of the parameters; BMI and BAI showed a good correlation; with body fat highest correlation were found for body weight and BMI. BAI also has a good correlation with body fat. Among the central obesity indices WC has strong correlation with body fat, body weight, BMI and BSA in descending order.

Correlation coefficient between the measured anthropometric variables in KDG individuals has been presented in Table 2 in matrix form.

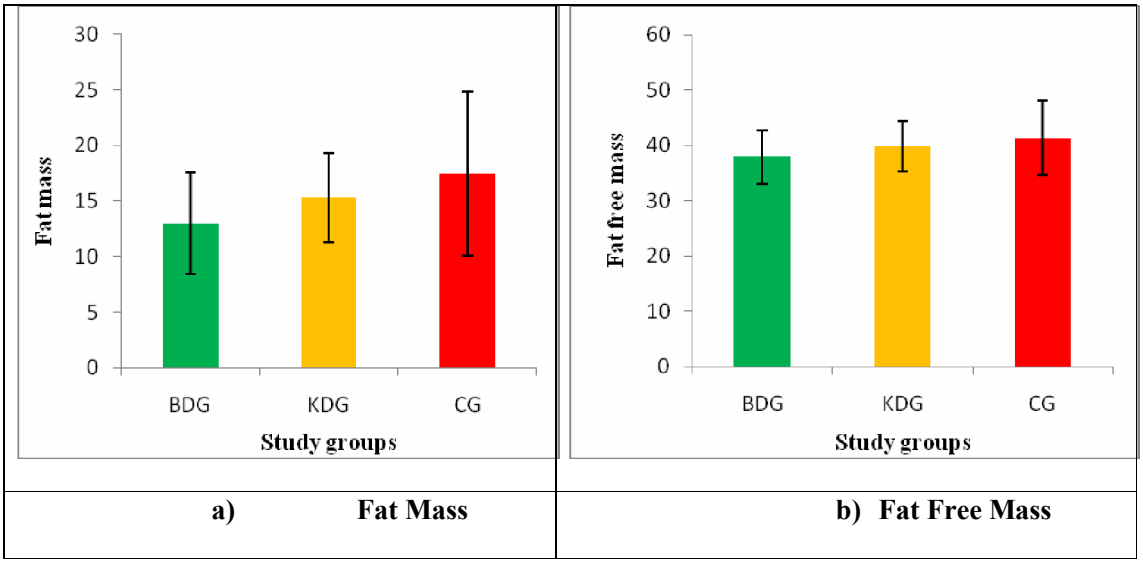

Fig. 4: Comparison between BDG, KDG and CG individuals in term of fat free mass

Table1: Correlation matrix among anthropometric variables in BDG individuals

	Body height	Body weight	BSA	BMI	BAI	CI	Absolute Body Fat	WC	WHR	WHtR
Body height	1	0.43**	0.67***	-0.02 ^	-0.46**	-0.04 ^	0.20 ^	0.05 ^	-0.13 ^	-0.27 ^
Body weight		1	0.96***	0.89***	0.58***	0.07 ^	0.97***	0.74***	0.14 ^	0.61***
BSA			1	0.72***	0.35*	0.04 ^	0.85***	0.64***	0.06 ^	0.43**
BMI				1	0.83***	0.08 ^	0.97***	0.73***	0.18 ^	0.76***
BAI					1	0.03 ^	0.71***	0.53***	-0.04 ^	0.67***
CI						1	0.10 ^	0.71***	0.88***	0.69***
Absolute Body Fat							1	0.76***	0.18 ^	0.71***
WC								1	0.69***	0.95***
WHR									1	0.70***
WHtR										1

*P<0.05, **P<0.01, ***P<0.001, ^ ns

Table2: Correlation matrix among anthropometric variables in KDG individuals

	Body height	Body weight	BSA	BMI	BAI	CI	Absolute Body Fat	WC	WHR	WHtR
Body height	1	0.70***	0.85***	0.19 ^	-0.38*	0.31 ^	0.52**	0.53**	0.20 ^	0.14 ^
Body weight		1	0.97***	0.83***	0.26 ^	0.33 ^	0.97***	0.82***	0.22 ^	0.63***
BSA			1	0.68***	0.07 ^	0.34 ^	0.88***	0.78***	0.23 ^	0.50**
BMI				1	0.68***	0.17 ^	0.93***	0.69***	0.11 ^	0.73***
BAI					1	-0.33 ^	0.41*	0.07 ^	-0.44	0.28 ^
CI						1	0.32 ^	0.79***	0.94***	0.77***
Absolute Body Fat							1	0.83***	0.24 ^	0.73***
WC								1	0.70***	0.91***
WHR									1	0.71***
WHtR										1

*P<0.05, **P<0.01, ***P<0.001, ^ ns

From the correlation matrix it has been found that in KDG individuals also BMI and BAI has a good correlation. WC possesses a strong correlation with the BMI and body fat. Compared to WHR, WHtR has a strong correlation with the body fat.

Correlation matrix between the measured anthropometric variables in CG individuals has been presented in Table 3.

For CG individuals here also a strong positive correlation has been found for WC and WHtR with the body fat.

DISCUSSION

As there is increasing evidence of growing prevalence of non communicable diseases worldwide, it is a major public health problem of any society. Evidence is accumulating on the negative physiological impact of sedentary lifestyle (Tremblay et al. 2010) and obesity is one of the major consequences of it. Different intervention strategies have been implemented and dancing, as a physical exercise is a growing choice.

Although numerous sophisticated body

Table 3: Correlation matrix among anthropometric variables in CG individuals

	Body height	Body weight	BSA	BMI	BAI	CI	Absolute Body Fat	WC	WHR	WHtR
Body height	1	0.63***	0.78***	0.27^	-0.13^	0.07^	0.49**	0.44*	-0.08^	0.04^
Body weight		1	0.98***	0.91***	0.51**	0.07^	0.98***	0.87***	0.21^	0.68***
BSA			1	0.81***	0.38*	0.09^	0.92***	0.83***	0.16^	0.57**
BMI				1	0.70***	0.05^	0.96***	0.85***	0.31^	0.82***
BAI					1	0.12^	0.59***	0.57**	-0.10^	0.69***
CI						1	0.01^	0.53**	0.62***	0.57**
Absolute Body Fat							1	0.84***	0.20^	0.71***
WC								1	0.52**	0.91***
WHR									1	0.62***
WHtR										1

*P<0.05, **P<0.01, ***P<0.001, ^ ns

composition assessment techniques are available today e.g. DXA, CT, MRI, impedance but routine evaluation on a wide scale requires methods that are simpler than these methods. Anthropometry in this respect is a good choice that gives accurate measures of body adiposity. Simply body weight can give an idea of overweight. Broca's Index is a simple but effective tool to calculate the Ideal Body Weight (IBW) from height of any individual. In the present study significant difference has been found among the study participants in respect of body weight. Further it has been found that in BDG individuals actual body weight is lower compared to IBW; similar result has been found for KDG where as the opposite has been found for CG. The finding of the present study i.e. dancing group individuals have significantly lower value of body weight compared to control group is in agreement with the study of Cakmakci et al (2011). The waist-to-hip ratio (WHR), as a marker of central adiposity has been used extensively but several studies suggest that waist circumference alone may be a more useful and accurate tool in adults (Rankinen 1999) and pediatric population (Goran 1998). In the present study mean value of WHR is higher in CG individuals compared to the dancing groups; lower mean value was observed in BDG compared to their KDG counterpart. The Conicity Index (CI), another abdominal adiposity indicator evaluates waist circumference in relation to height and weight. It has been found that CI appears to have a prognostic value similar to that of WHR in adults (Valdez 1993). In the present study mean value of CI is higher, although not significantly, in KDG compared to that of BDG and CG. The use of waist-to-height ratio

(WHtR) for detecting central obesity and its associated health risks was first proposed in the mid 1990s (Hsieh1995, Ashwell 1996) and gradually interest in the effectiveness of this measure is rising (Ashwell M 2009, Freedman DS 2007). In the present study it has been observed that BDG individuals have higher mean value compared to the other two groups.

For assessing the body composition body fat is the most essential one and in the present study body fat is significantly different among the study groups. Dancing groups both BDG and KDG have significantly ($P < 0.05$) lower values of body fat but comparable fat free mass compared to CG individuals. Present finding is in agreement with the study of Lichtenbelt et al (1995); between the dancing groups, BDG have lower value of body fat compared to KDG individuals.

In the present study the favorable impact of receiving Bharatnatyam dancing has been found and this is in agreement with the study of Mukherjee et al (2012).

From the correlation matrix it has been found that the trend of correlation between anthropometric parameters is similar in three study groups. Waist circumference has high correlation with body weight and body fat in all study groups. No significant difference has been found with Waist to hip ratio and body weight and Waist to hip ratio body fat where as with waist to height ratio a strong positive association has been found with body weight and body fat in both dancing and control group. It has also been found that CI, although used as an obesity parameter, has shown a poor relation with body fat for the three study groups. In the present study different degree of impact of Bharatnatyam and Kathak dancing on body composition has been found is probably due to the difference of dance style involved, because there is no significant difference found in terms of experience, frequency daily duration of practice and also their socio-economic status.

CONCLUSION

From the present study it can be concluded that regular practicing of Indian classical dance has favorable impact on body composition parameters adjudged anthropometrically. Moreover it may also be mentioned that the favorable impact on body composition is more pronounced in individuals practicing Bharatnatyam form of dance compared to Kathak.

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