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IMPACT OF BHARATNATYAM DANCING ON SELECT ANTHROPOMETRIC INDICES RELATED WITH CARDIOVASCULAR HEALTH STATUS: A STUDY IN ADULT BENGALEE FEMALES

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Abstract

Approximately, two-thirds of premature deaths in adults, and three-out-of-four of all adult deaths are attributable to non-communicable diseases, which are mainly due to cardiovascular diseases (CVD), the leading cause of both mortality and disability worldwide. As obesity, independently identified as the fifth leading cause of global death worldwide, is a major modifiable risk factor for various chronic metabolic illnesses including CVD, proper timely assessment of obesity, in particular regional obesity, can prevent the rapid progression of the disease. In this backdrop, a study has been carried out to assess the impact of Bharatnatyam, an Indian traditional classical dance form, on select anthropometric obesity indices (namely BMI, BF%, WC, WHR, WHtR, SAD, BRI) determiningCV health status. Measurements were obtained from consenting volunteers having a minimum experience of five years in that dance form and practicing it at least five times a week on and average for half an hour period. Data were compared with suitable control group individuals with no such involvement in any form of dancing or other physical activities. It has been found that individuals belonging to Bharatnatyamdancing group category have significant ($P<0.01$) favorable values of measured parameters and obesity indices adjudged anthropometrically compared to their non-dancing counterparts. Hence it may be concluded that receiving training on Bharatnatyam dancing and regular practice thereof may prevent the onset of obesity and thereby progression of CVD.

Keywords: Lifestyle diseases, regional obesity, BRI, traditional recreational activity, India

Introduction

Approximately, two-thirds (63%) of premature deaths in adults (aged 15–69 years), and three-out-of-four of all adult deaths are attributable to non-communicable diseases, which are mainly due to Cardiovascular diseases (CVD) (WHO 2008), the leading cause of both mortality and disability worldwide (Murray *et al* 2010). It has been predicted that by 2030, over 23.3 million people will die annually from CVD (Mathers*et al* 2006), and most alarmingly, most of which will occur in low-and-middle income countries, that are undergoing rapid nutritional and socio-economic changes in recent times. Due to these changes, there is dramatic shift in behavior and lifestyle, with a high prevalence of sedentary lifestyle creating energy imbalance leading to a state of being overweight and obese, well established risk factors for various chronic metabolic diseases including cardiovascular diseases (CVD) (Dhana*et al* 2016), which already independently recognized as the fifth leading cause of global death worldwide (Maessen*et al* 2014). Compared to general obesity or body fat accumulation in whole body, central obesity or body fat accumulation in specific region poses much greater risk for CVD. The intervention and prevention strategies have shown the effectiveness of lifestyle modification with emphasis on regular physical activity. For less developed and developing countries, interventions to address the growing prevalence of obesity, should be such that are culturally appropriate, cost effective, simple, enjoyable and easy to continue for long period of time; in this regard, traditional physical activities which are culturally rooted, with their social and spiritual health values can be important among different ethnic populations. Despite the rich and glorious history of these traditional activities, studies regarding health benefits of many traditional sports and physical activities have been under-studied and consequently under-documented; it has created a significant knowledge gap in the area of health promotion through various traditional yet still popular physical activities. Dance, an active, non-competitive form of age old recreational activity, has a unique characteristic that all of the people participating in the particular activity perform certain movements in the same rhythm, tempo and dynamics (Kostić*et al* 2006), thereby activating different muscle groups simultaneously; dance also requires adoption of different postures like, sitting, bending, standing, knee bending. Bharatnatyam, one of the most popular Indian Classical Dance forms, is of no exception. Previously it has been found to have beneficial role in achieving favorable body composition (Banerjee*et al* 2014, Mukherjee *et al* 2014), enhancing fitness in terms of motor ability (Bhattacharjee*et al* 2014), and pulmonary function status

(Kundu*et al* 2014). Present study has been undertaken to assess the impact of regular practicing BharatnatyamDancing (BD) on some anthropometric body shape indices that also indicate risk of cardiovascular diseases.

Methodology

Present study was conducted on randomly selected 81 adultunmarried Bengalee female volunteers,of age range 25-30 years, regularly receiving BDtraining for at least a period of five years and practicing at least five times a week on and average for half an hour period, and 93 adult Bengalee females of comparable age, and socioeconomic background and not undertaking any form of exercise training including any form of dancing, leading a sedentary life; they respectively constituted the Bharatnatyam Dancing Group (BDG) and Control Group (CG). Individuals receiving BDtraining for less than five years, being trained in other forms of exercise and also other forms of dancing, and with self-reported any chronic illness were excluded as subjects from the study. Prior to the commencement of the study, necessary ethical permission and individual consent were obtained after explaining the study requirements. Anthropometric and demographic data were obtained for each subject. Demographic data included age(year), marital status, occupation, lifestyle status and like information. Socio economic status of the participating individuals was assessed using Kuppuswami socio economic scale. BMI was calculated using ratio of measured body weight (kg) tosquared value of stature (m), with participants in light indoor clothing and without shoes. Body fat percentage was calculated (Deurenberg*et al*1991) Waist circumference (WC), (to the nearest 0.1 cm), was measuredusing a non-stretchable, flexible tape at the umbilicus with the participants in a standing posture at the end of a normal expiration. Hip Circumference (HC), (to the nearest 0.1 cm), was measured at the widest portion of buttock and Waist to Hip circumference ratio (WHR) and waist circumference to Stature ratio (WHtR)were calculated.Sagittal Abdominal Diameter (SAD) (cm) was measured (de CarvalhoVidigal*et al* 2013). Body Roundness Index (BRI) (Thomas*et al* 2013) was also calculated. The measurement procedures were carried out in morning hours. All variables were analyzed to find the significant difference, if any, and $P < 0.01$ was considered statistically significant.

Results

In the present study participants were young adult Bengalee females residing in and around Kolkata, the capital of West Bengal. All of the individuals belonged to Bengalee Hindu Caste Population (BHCP) and were from middle class strata of the society.Basic socio-demographic characteristics of the participating volunteers have been presented in Table 1.

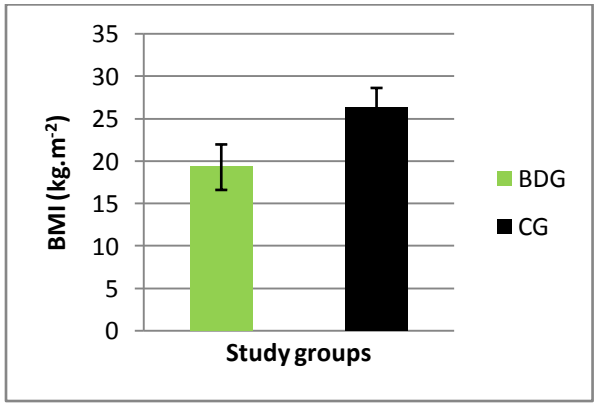
Table 1: Basic socio-demographic characteristics of the participating volunteers

Variables	**BDG** (81)	**CG** (93)
Age (year) ^	26.3 ± 1.75	26.6 ± 1.42
Marital status	Unmarried	Unmarried
Addiction (smoking, alcoholism or like)	Nil	Nil
Family history of CVD	No previous history of self and parents	No previous history of self and parents
Any regular medication for any chronic diseases	Nil	Nil
Lifestyle	Sedentary in nature	Sedentary in nature
Exercise habit	Only BD	Nil

^ns

In the following section, comparisons between BDG and CG individuals in terms of anthropometric indicators of CVD have been presented graphically.

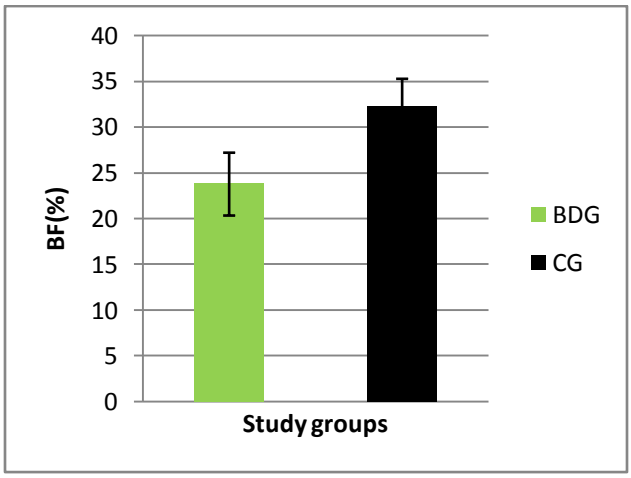
In Figure 1 comparisons between BDG and CG individuals in terms of BMI has been graphically presented.



*P< 0.01

Figure 1: Comparison between BDG and CG in terms of BMI

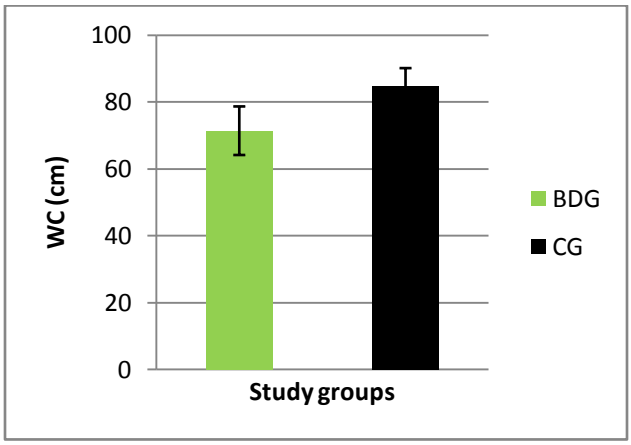
In Figure 2, comparison between BDG and CG individuals in terms of BF%has been graphically presented.



*P< 0.01

Figure 2: Comparison between BDG and CG in terms of BF%

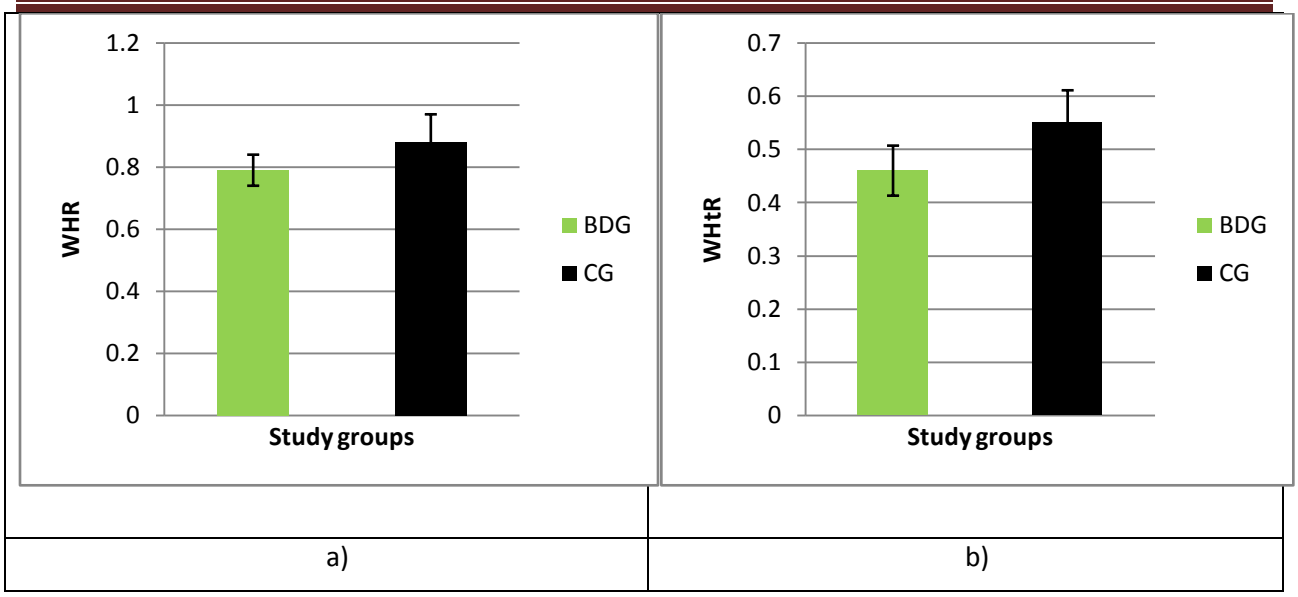
In Figure 3, comparison between BDG and CG individuals in terms of WC has been graphically presented.



*P< 0.01

Figure 3: Comparison between BDG and CG in terms of WC

In Figure 4 a) and b), graphical comparisons between BDG and CG individuals have been presented in terms of WHR and WHtR.

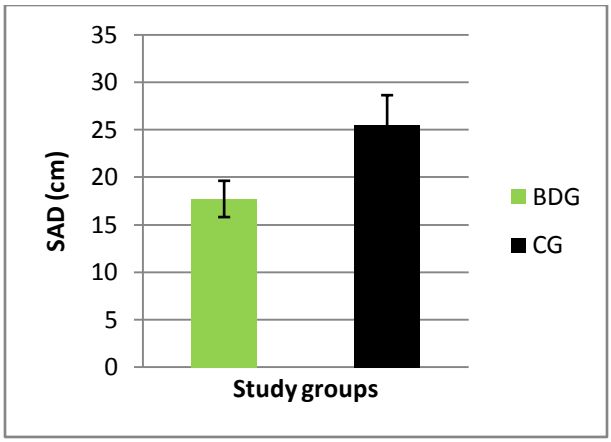


a) b)

*P< 0.01

Figure 4: Comparisons between BDG and CG in terms of WHR and WHtR

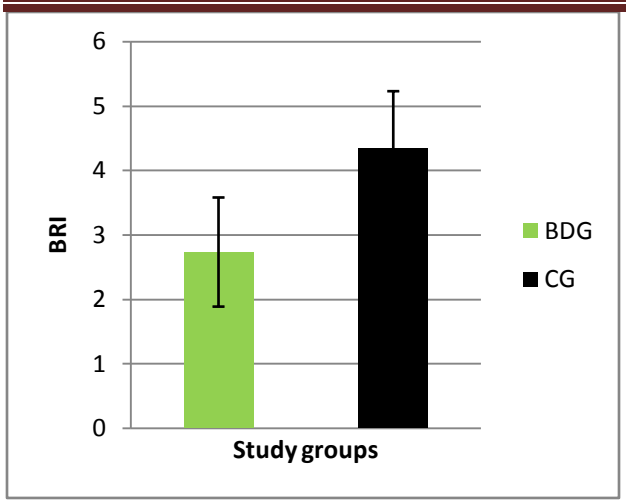
In Figure 5, comparison between BDG and CG individuals in terms of SADhas been graphically presented.



*P< 0.01

Figure 5: Comparison between BDG and CG in terms of SAD

Graphical comparison between BDG and CG individuals in terms of BRI has been presented in Figure6.



*P< 0.01

Figure 6: Comparison between BDG and CG in terms of BRI

Discussion

Epidemiological studies have found a progressive increase in the prevalence of cardiovascular risk factors (dyslipidaemia, elevated blood pressure, disturbances in glycemic control) with increasing body fatness (Shidfar*et al* 2012). Although numerous sophisticated body composition assessment techniques e.g. DXA, CT, MRI, and impedance are available today but routine evaluation on a wide scale requires methods that are simpler and to some extent cost effective. Anthropometry, being simple, affordable and non-invasive methods and can also classify individuals in terms of the risk of diseases related to fat excess/redistribution fairly well, in this respect is a good choice giving reasonably accurate measures of body adiposity.In obesity assessment context, the indicators are divided intoi. those that enable the assessment of total fat and ii. fat distribution (Cornier *et al* 2011); both correlate fairly well with cardiovascular diseases. In the present study, impact of regular practicing of BD activity on established anthropometric indicators of CVD has been evaluated.

Body Mass Index (BMI), a total adiposity phenotype marker, is most common anthropometric indicator of CVDwhich has been broadly studied in all age groups (Bray 2003, Heymsfield*et al* 2002). In the present study, it has been found that individuals receiving training in BDand practicing regularly have favorable values of BMI. The mean value of BMI of the BDG individuals falls under the category of

'Normal weight' where as the CG individuals belong to the 'Obese' category, as per the classification of WHO for South Asian countries(Aziz *et al* 2014)which is quite alarming condition.As regular practicing of BD as a routine physical activity helps to prevent body weight gaining, favorable values of BMI have been found for the BDG individuals; present finding is in consonance with several previous studies regarding BD and also other forms of dancing exercise in adults and also in adolescents (Chatterjee*et al* 2015, Arslan 2011, Banerjee *et al* 2015, Chatterjee*et al* 2014).

Although BMI is most popularly studied and a well-accepted anthropometric indicator for CVD, it suffers from some limitations, as well;inability to distinguish between fat and lean mass and failure to take into account the body fat distribution are included in the list.Hence, to overcome the limitation, regional obesity indicators have also been studied. Waist circumference (WC), an indicator of central obesity,and waist to hip ratio (WHR),an indicator of distribution of body fat, have been suggested as screening tools to identify individuals at risk of cardiovascular diseases (Li *et al* 2013). In the present study, it has been found that BDG individuals have significantly lower mean value of WC compared to their CG counterparts,having much lower value than the cutoff specified for females for being obese; a significantly lower value of WC in BDG individuals couldpossibly be attributed to regular exercising including adoption of different postures in BD; these findings arealso in agreement with some previous studies including from our group (Mukherjee*et al* 2014).A similar trend in findings has also been found in case of WHR also. The use of WHtR for detecting central obesity and its associated health risks was first proposed in the mid-1990s and gradually interest in the effectiveness of this particular measure began rising (Patil*et al* 2011). In the present study, significantly lower mean value of WHtR has been found in BDG individuals compared to their CG counterparts; it has also been found that BDG individuals have mean WHtR value below the cut off (i.e. 0.50) (Mungreiphy*et al* 2012) whereas CG individuals have already crossed the threshold; observations from other previous studies are also in agreement with the present finding (Mukherjee*et al* 2012). SAD has been found to be an important and strong predictor of CV risk (Ohrvall*et al* 2000). In the present study it has been found that mean SAD value of BDG individuals, which is lower than the reported cut off value (Sampaio*et al* 2007), is significantly lower compared to the CG individuals. Body Roundness Index (BRI), developed by Thomas *et al.* in 2013, is another new anthropometric indicator of body shape with values ranging from 1 to 16; rounder individuals tend to have larger values (Chang *et al* 2015) and values closer to 1 are related to more

narrowly shaped lean individuals. In the present study, lower mean value of BRI in BDG individuals compared to CG reflects that BDG individuals are leaner than their counterparts.

Conclusion

From the present study, it may be concluded that regular practicing of BD, one of the most practiced and popular traditionalIndian classical dance forms, has favorable impact on anthropometric body shape indices,indicating a better cardiovascular health status of the adult Bengalee femalespracticing BD regularly. Being an enjoyable form of physical activity, health promotion and prevention of chronic lifestyle diseases such as CVD, may be achieved through proper, structured and regular practice of BD.

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