



International Journal of Physical Education, Sports and Health

P-ISSN: 2394-1685
E-ISSN: 2394-1693
Impact Factor (ISRA): 5.38
IJPESH 2018; 5(1): 25-29
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www.kheljournal.com
Received: 21-11-2017
Accepted: 22-12-2017

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A study on select novel blood pressure indices in adult bengalee females: Impact of practicing bharatnatyam dancing

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Abstract

Hypertension, attributed significantly by physically inactive lifestyle, is presently regarded as one of the leading predisposing factors for the global burden of diseases. On the other hand, Indian classical dancing, a joyful traditionally recreational activity, may be a good choice for structured physical exercise leading to a better cardiovascular health status, if practiced in a proper manner. For assessing hypertensive status traditionally focus was only on systolic and diastolic blood pressure but it has been found that there are relatively new indices which reflect the blood pressure status more accurately. In this backdrop, present study aims to find out the impact, if any, of receiving the training and practicing of Bharatnatyam dancing, one of the most popular form of Indian classical dancing, on select blood pressure indices (Systolic and Diastolic blood pressure, Pulse Pressure, Pulse Pressure Index, Mean Arterial Pressure and Robinson Index) in adult Bengalee female individuals. It has been found that there is overall favorable impact of receiving the training and practicing of Bharatnatyam dancing on the blood pressure indices. It may be concluded that Bharatnatyam dancing has beneficial effect on blood pressure and blood pressure indices and hence may be helpful to achieve and maintain better cardiovascular health status.

Keywords: Physical inactivity, Hypertension, PPI, Robinson Index, Indian classical dancing

1. Introduction

Hypertension is one of the leading predisposing factors for the global burden of diseases [1]. It has been reported that worldwide two-third deaths from stroke and half of the deaths from coronary artery diseases are attributed to hypertension [2]. It has also been found that cardiovascular mortality and its various clinical manifestations including angina, myocardial infarction, stroke, and cardiac failure are increased in the presence of raised blood pressure (BP) [3]. Sedentary lifestyle, being one of the important risk factors for cardiovascular health status [4] including high blood pressure, is of emerging interest for public health researchers. It has been estimated that the general adult population spends up to 70% of their waking hours in sedentary activities such as watching TV, using a computer, sitting at work, and transportation [5, 6, 7]. Although these reports are from western countries, due to unplanned urbanization and mechanization of both household and occupational work, India is also shifting towards a more or less 'Sedentarism' leading to many non-communicable diseases including high blood pressure. On the other hand, Dance is an accessible and appealing form of physically active widely enjoyed recreational activity [8] and Indian classical dancing as a recreational activity has a glorious history. Bharatnatyam is one of the oldest but still popular Indian classical dancing involving adoptions of different body postures and hence may be regarded as a joyful physical activity which may exert some influence on cardiovascular system adjudged by blood pressure indices. In this regard, traditionally, only 2 blood pressure measures i.e. systolic and diastolic BP were generally used. Although these measures correlate significantly with both fatal and nonfatal cardiovascular events, it is becoming increasingly clear that there are other blood pressure indices to give the clear and true picture of cardiovascular status. Previous study has found the favorable impact of Bharatnatyam dancing on body composition [9] especially body fat [10], motor ability [11], pulmonary function indices [12, 13],

diabetic markers [14] and also body shape indices related with cardio-vascular health status [15]; Since there is dearth of literature for comprehensive studies which focus on the effect, if any, of Bharatnatyam dancing on blood pressure indices reflecting cardio vascular health status, present study aims to find out the impact of receiving the training and practicing regular Bharatnatyam dancing on select blood pressure indices of adult Bengalee female population.

2. Materials and Methods

Present study was conducted on randomly selected 87 adult unmarried Bengalee female volunteers, of age range 25-30 years, regularly receiving Bharatnatyam dancing training for at least a period of five years and practicing at least six times a week on and average for half an hour period, and 110 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 constituted the Bharatnatyam Dancing Group (BDG) and Control Group (CG) respectively. Individuals receiving Bharatnatyam dancing training 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 (self or familial history) 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 Kuppaswami socio economic scale [16]. BMI was calculated using ratio of measured body weight (kg) to squared value of stature (m), with participants in light indoor clothing and without shoes. After allowing the individuals to rest for 15 minutes, in a quiet and calm environment, resting heart rate and Systolic and Diastolic blood pressure (SBP and DBP) was recorded in sitting condition thrice at an interval of five minutes using an automated blood pressure monitor and the mean was taken as the final blood pressure [17]. Pulse Pressure (PP) [18], Mean Arterial Pressure (MAP) [19], Pulse Pressure Index (PPI) [20] and Robinson Index [21], commonly known as Rate Pressure Product (RPP) [17], were calculated. The measurement procedures were carried out in morning hours. All variables were analyzed to find the significant difference, if any and P < 0.05 was considered statistically significant.

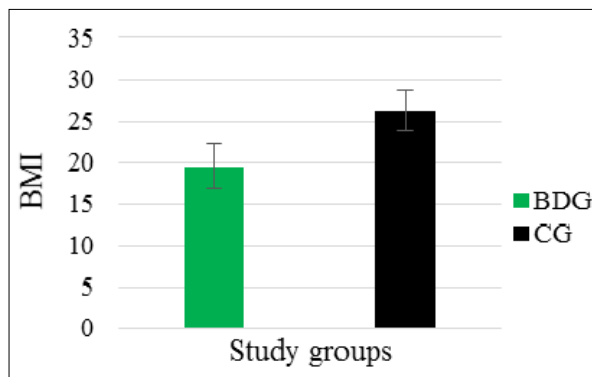
3. Results & Discussion

In the present study participants were adult Bengalee females (age BDG 26.3 ± 1.75 years and CG 26.6 ± 1.42 years) 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.

Table 1: Background characteristics of the participating volunteers

Variables	BDG	CG
Marital status	Unmarried	Unmarried
Addiction (smoking, alcoholism or like)	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

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

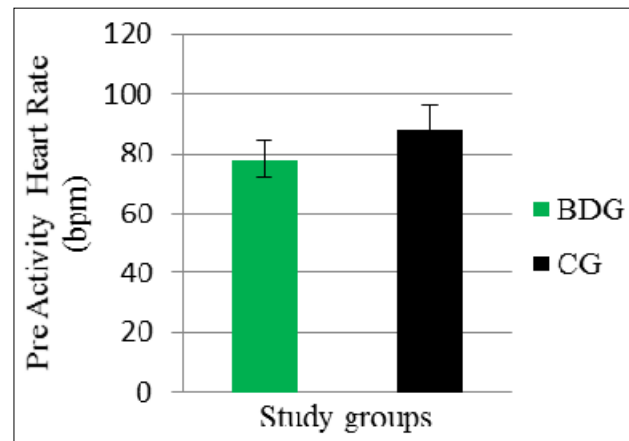


BMI *
*P < 0.05

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

In the following section, comparisons between BDG and CG individuals in terms of recorded and calculated blood pressure indices have been presented graphically.

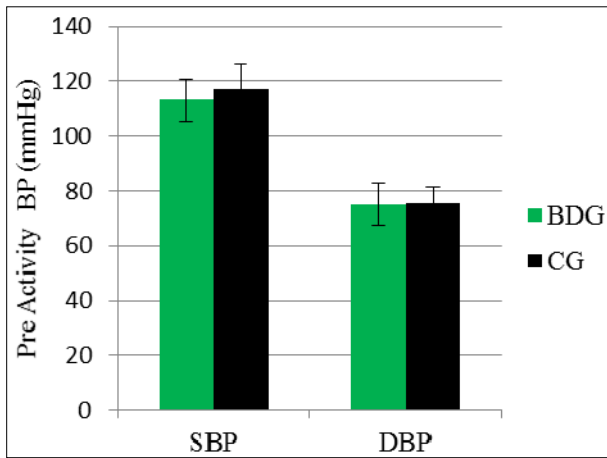
In Figure 2 comparison between BDG and CG individuals in terms of resting heart rate have been graphically presented.



Pre Activity Heart Rate *
*P < 0.05

Fig 2: Comparison between BDG and CG in terms of Pre Activity Heart Rate

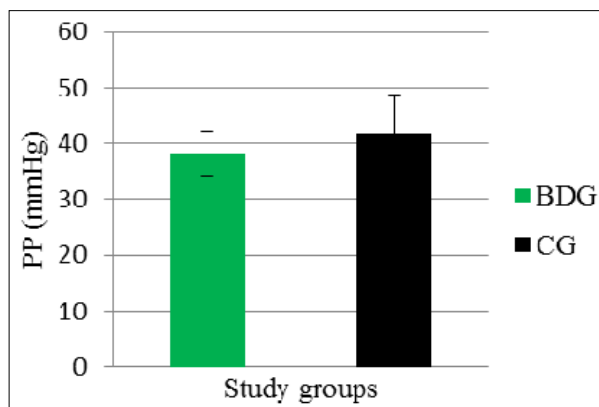
In Figure 3 comparison between BDG and CG individuals in terms of resting SBP and DBP have been graphically presented.



Pre Activity Blood Pressure
SBP*P<0.05, DBP^

Fig 3: Comparison between BDG and CG in terms of Pre Activity Blood Pressure

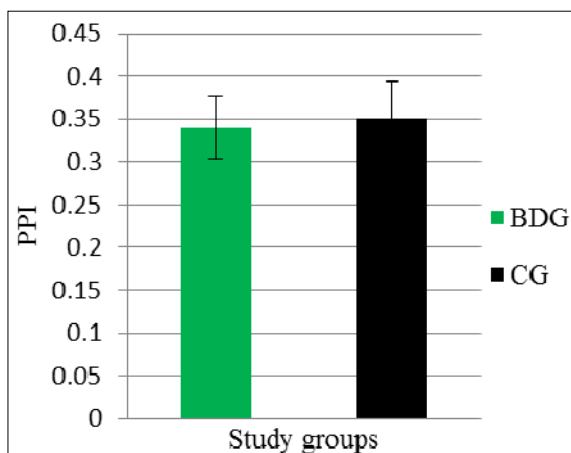
In Figure 4, comparison between BDG and CG individuals in terms of PP has been graphically presented.



Pulse Pressure*
*P<0.05

Fig 4: Comparison between BDG and CG in terms of Pulse Pressure

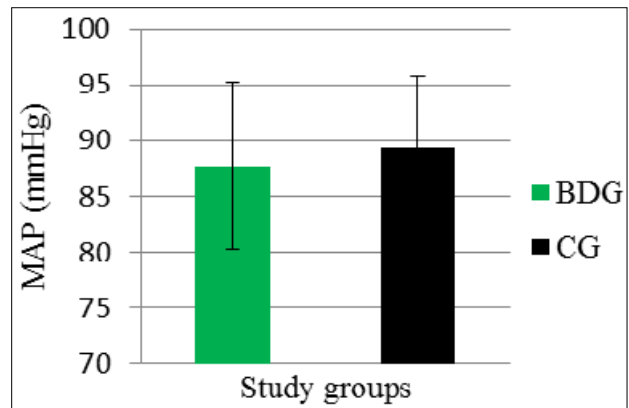
In Figure 5, comparison between BDG and CG individuals in terms of PPI has been graphically presented.



Pulse Pressure Index^
^ns

Fig 5: Comparison between BDG and CG in terms of Pulse Pressure Index

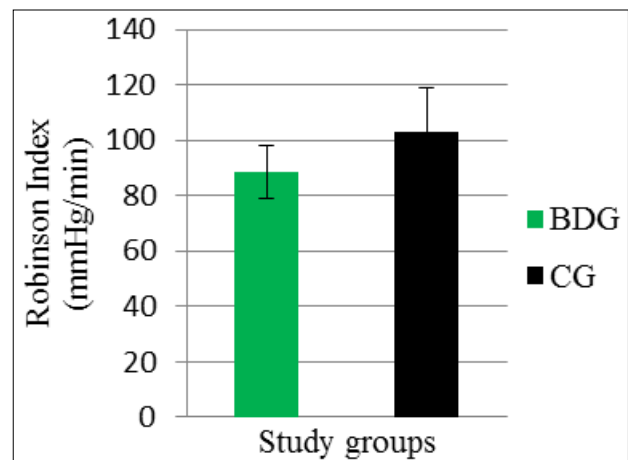
In Figure 6, comparison between BDG and CG individuals in terms of MAP has been graphically presented.



Mean Arterial Pressure
^ns

Fig 6: Comparison between BDG and CG in terms of Mean Arterial Pressure

In Figure 7, comparison between BDG and CG individuals in terms of Robinson Index has been graphically presented.



Robinson Index*
*P<0.05

Fig 7: Comparison between BDG and CG in terms of Robinson Index

India as undergoing a rapid health transition [22] resulting from significant lifestyle changes, is witnessing substantial increases in chronic non-communicable diseases like CVD; elevated blood pressure and hypertension, resulting from various factors which *inter alia* include body adiposity, are well-established risk factors for it. On the other hand, daily structured physical exercise has been shown to be beneficial for reducing blood pressure; in this regard dancing may be a preferred choice for female individuals and Indian classical dancing has potential to favorably influence obesity status [23]. Previous studies have found that practicing Bharatnatyam dancing has favorable impact on various obesity indices [24, 25, 26], that are established indirect indicators of CV health status [22]. In the present study, an attempt, in this regard, has been made to study the impact, if any, of practicing Bharatnatyam dancing on blood pressure and blood pressure indices in adult Bengalee females. In the present study also a significantly lower mean value of BMI has been found in BDG individuals compared to their CG counterparts. A substantial number of

studies have already reported a strong positive association between elevated heart rate and cardiovascular risk [27]. In the present study, it has been found that BDG individuals have significantly lower value of resting heart rate compared to CG individuals indicating a better status of cardiovascular fitness; previous study has affirmed the present trend that Bharatnatyam dancing has favorable impact on physical fitness status adjudged by assessing Physical Fitness Index (PFI) and Maximal Aerobic Capacity (VO_{2max}) [28]. Resting blood pressure is most commonly used indicator of cardiovascular health status; it has been found that sedentary behavior is associated with BP, independent of age, physical activity, and other demographic and health factors [4]. In the present study, it has been found that CG individuals leading a sedentary lifestyle and not performing any type of physical exercise have a significantly higher resting systolic blood pressure compared to their BDG counterparts, receiving the training and practicing regularly Bharatnatyam dancing although no significant difference has been found in respect of DBP. In addition with these, in recent years, there is heightened interest in PP because of its association with CV risks. PP has been found to be an independent predictor of coronary artery disease, heart failure, cerebrovascular disease, and Chronic Kidney Disease [29] with high PP represents a sign of established cardiovascular damage in the setting of arterial hypertension. In the present study, CG individuals have been found to have significantly higher PP compared to BDG individuals. It has been suggested that cardiovascular risk attributable to hemodynamic factors may be assessed more accurately considering physiological components like MAP, which is an indicator of peripheral resistance and cardiac output. Adiposity indicators like BMI and percentage body fat have been found to be positively associated with BP components including MAP in children [19], in the present investigation conducted on adult females, it has been found that CG individuals, not performing any physical activity, with a higher BMI, has higher MAP compared to BDG individuals. PPI, a prognostic/screening indicator, is a relatively novel estimate of arterial stiffness with value ranging between 0 and 1. It has been found that PPI correlates negatively with vascular compliance and can be considered an independent measure of cardiovascular mortality [20]. It has also been demonstrated that hypertensive patients with higher PPI had a more reduced renal function [30]. In the present study, although no significant difference has been found between BDG and CG individuals in terms of PPI, slightly lower mean value has been found in BDG individuals compared to CG individuals. Robinson Index or RPP, another indicator of CV risk status, has been found to be correlated well with myocardial oxygen demand with increased RPP has been documented a CV risk [17]; in the present study, it has been found that BDG individuals have significantly lower value of RPP compared to CG individuals indicating better CV health status.

4. Conclusion

From the present study, conducted in adult Bengalee females, it may be concluded that Bharatnatyam dancing has significant beneficial impact on traditional and relatively new physiological blood pressure indices and hence may be helpful to achieve and maintain better cardio-vascular fitness status and also thereby helpful in preventing progression into CVD in later life. Favorable BP indices following Bharatnatyam dancing unravel the promising non-pharmacological way of improving CV health of the

population. Further study should be conducted to assess the details of other markers of CV risks and elaborate mechanisms of decrease in CV risks.

5. Acknowledgment

The cooperation of all volunteers during the study is gratefully acknowledged.

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