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A Study on Body Physique and Flexibility Status of Bengalee Male Adolescents Undergoing Training in Cricket

Abstract **: Cricket is one of the popular team games. A study has been carried out on 33 randomly selected Bengalee male adolescents, of age range 15-18 years, being trained in cricket for at least 6 years and practising about a period of two hours daily for at least six days a week to study the body physique and flexibility status. It was found that the individuals receiving training in cricket had significantly better body physique, assessed in terms of different adiposity indices and flexibility, compared to their age and sex matched counterparts constituting the control group.**

Keywords **:** Body adiposity, arthropometrics, central obesity, fitness, motor ability, obesity markers,

Cricket is one of the best and favorite games for everyone, from children to their grandparents, particularly in this part of the globe. It is played both for recreational purpose and at competitive levels by males and also females. Competitive cricket is mostly played on a pitch on an oval field; cricket just for fun is also played in backyards, parks, streets or on the beach. For millions of cricket fans, it is their world, their home. Cricket is characterized by discontinuous, intermittent, specialized form of aerobic exercise (the ability of the body to do the work in presence of oxygen) bout that requires different types of dynamic body movements involving leaping, throwing, running, turning. It is regarded as one of the most popular physical activities that have received significant importance among people particularly in this part of the world including India, where nowadays different form of physical activities have become popular due to emerging scientific knowledge about the beneficial impact of physical activities on the body. Physical activity is that kind of attribute which is defined as any bodily movement produced by skeletal muscles, resulting in energy expenditure and varies continuously from low to high intensity activities and regular practicing of it not only increases the supply of oxygen to the skeletal muscles it also makes them strong and healthy, which in turn increases the capacity of giving optimal performance and in broader aspect it increases the physical, mental and social state of wellbeing of individuals of all ages[1,2]. An individual can do physical activity on regular basis by practising a particular form of physical exercise - a planned, structured, repetitive, and purposive physical activity that results in improvement or maintenance of one or more components of physical fitness, a set of attributes that people have or achieve through regular physical exercise without undue tiredness or fatigue, having reserve of strength and energy, and with sufficient energy to enjoy leisure-time and to meet unforeseen emergencies suddenly placed upon the body[3]. It has also been found in different studies that regular physical exercise has some beneficial health outcomes including reducing of different non-communicable diseases such as coronary artery diseases, hypertension, obesity, and type 2 diabetes[4,5] and may also help in preventing different psychological disorder including depression, anxiety among population of all ages[6]. There is an increasing interest in youth in sports, a well defined form of physical exercise[7] and among all sports, cricket has taken an important place in our country. It has been the most entertaining game since long years back. In the past, it was played solely within a specific season (winter in Asian countries and summer in western countries) but due to its popularity, from the last few decades, the game is being played throughout the year in more than sixty countries as major international team sport. It has been found in earlier studies that the specific physical characteristics or anthropometric (branch of science concerned with comparative measurements of the human body, its parts, and its proportions and composition) profiles and fitness indicate whether the player would be suitable for the competition at the highest level in a specific sport and they are also regarded as the sensitive indicators of physical growth and nutritional status of the athletes for their maximal performances[8,9]. Cricket is such an aerobic endurance sports that involves different playing position along with position specific body physique and enormous flexibility for the desirous players, for optimal performance. Earlier studies conducted on the cricketers in the states of Punjab have proved that they have desirable anthropometric profiles, body composition and flexibility when compared to their age and sex matched control group individuals[10].Similar findings have also been found in cricketers given core strength training for at least a period of eight weeks. There are numerous studies available about cricket at international level, but in India especially in West Bengal lack of research have been done on physiological issues related to cricket. In this backdrop, the present study has been carried out to study the body physique and

flexibility status of Bengalee male adolescents being trained in cricket for at least 6 years and practicing about a period of two hours for at least six days a week.

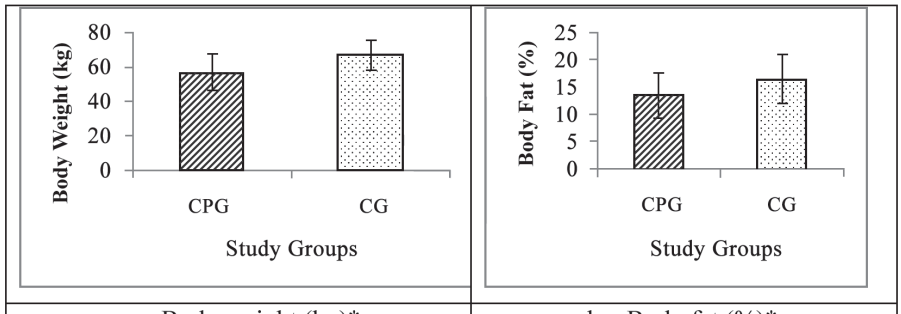
Methodology : Initially different centers of Hooghly district, West Bengal, imparting training on cricket were approached for getting access to individuals for carrying out the study. After initial discussions few centers were shortlisted. The objectives of the study and assessment requirements were explained to the coaches and the individuals. On obtaining necessary permission, the dates of measurements were arranged on mutual convenience. Individuals undergoing training in cricket for at least a period of 6 years and practicing it daily for at least 2 hours every 6 days a week and with no chronic disease history (self-reported) were included in the present study. 33 randomly selected males, of age range 15-18 years, fulfilling the inclusion criteria constituted the Cricket Practising Group (CPG). Initially age in years, duration of training period (y), daily practising time were recorded in the pre-designed schedule. The information about the parental education, occupation and monthly family income were also noted and the socioeconomic status of the individuals[11,12] was assessed. Stature (cm) was measured (to the nearest 0.1cm) using anthropometric measurement set and body weight (kg) was measured (to the nearest 0.1 kg) using an electronic weighing scale with individuals without shoes and in socially acceptable light clothing. BMI ($kg.m^{-2}$) was calculated. Body fat (%) of the subjects was calculated from the skin fold measurements taken at biceps, triceps, subscapular, suprailliac and calf[13]. Waist Circumference (WC) and Hip Circumference (HC) were measured using a non-stretchable measuring tape and Waist to Hip ratio (WHR) [14] and Waist to Body Height ratio (WHtR)[15] were calculated. In addition, obesity indices in terms of Body Mass Abdominal Index (BMAI), Body Adiposity Index and Abdominal Volume Index were also calculated. The pre-exercise heart rate and blood pressure of the subjects were recorded using a digital blood pressure monitor after the individuals rested for at least about 15 minutes. The handgrip strength (kg) [16] of the subjects was measured in vertically downwards and upwards position in both the hands. Lower-back and hamstring flexibility was estimated by means of Sit and Reach Test[17]. Similar measurements were recorded for 42 males, of comparable age, socioeconomic and ethnic background without formal training in any form of exercise including cricket, constituting the control group (CG). All the measurements were taken by the same individuals in morning hours. After taking the measurements data were subjected to statistical analyses and 0.05 was chosen as the level of significance.

Results and Discussions : The basic physical and physiological characteristics of the study participants (CPG and CG individuals) are presented in table 1.

TABLE 1. Basic Physical and Physiological Characteristics of Study Participants

Variables	Cricket Practicing Group (CPG)	Control Group (CG)
Age (years)^	16.4±2.14	16.4±1.09
Stature (cm)*	165.3±7.73	161.2±6.76
$SBP_{Pre\ exercise}$	119.2±6.74	119.4±10.66
$DBP^*_{Pre\ exercise}$	64.6±9.01	71.1±11.74

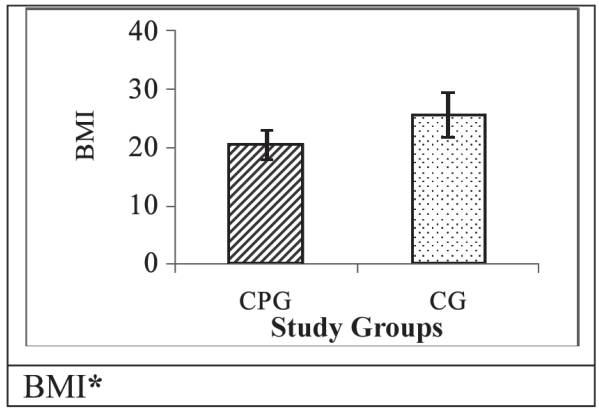
^ns, *P<0.05



a. Body weight (kg)* b. Body fat (%)*

*P<0.05

Figure 1: Comparison between CPG and CG individuals in respect of Body Weight (kg) and Body Fat (%).



BMI*

*P<0.05

Figure 2: Comparison between CPG and CG individuals in respect of BMI

In figure 1.a and 1.b the body composition parameters in terms of body weight (kg) and body fat (%) of the CPG and CG individuals have been graphically presented.

In figure 2, the BMI ($kg.m^{-2}$) of CPG and CG individuals has been graphically compared.

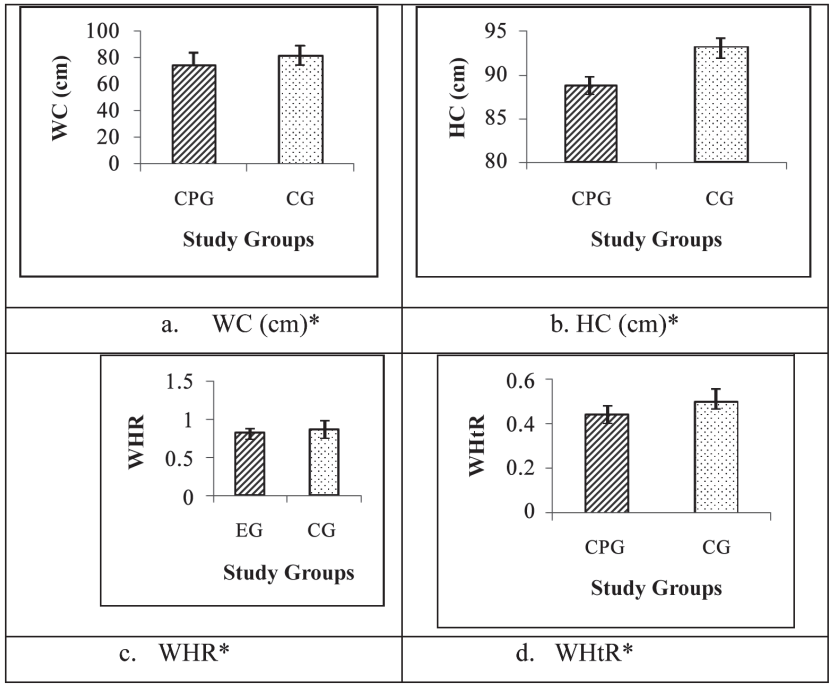
In figure 3.a., 3.b., 3. c and 3.d., the body physique parameters in terms of WC (cm), HC (cm), WHR, and WHtR of CPG and CG individuals have been graphically presented.

In figure 4.a., 4.b. and 4.c, the obesity indices in terms of Body Mass Abdominal Index (BMAI), Body Adiposity Index (BAI) and Abdominal Volume Index (AVI) of CPG and CG individuals have been compared.

In figure 5.a, 5b, 5c and 5d, the handgrip strength (kg) of CPG and CG individuals in vertically upward and downward positions of both right and left hands have been presented.

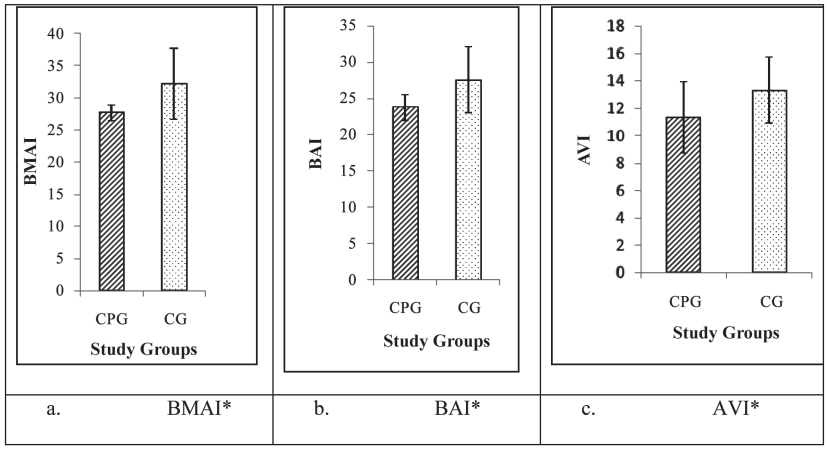
In figure 6, static flexibility in terms of Sit and Reach (cm) Test Score of CPG and CG individuals has been graphically presented.

Cricket, being an international team sports, has some rules governing the game like other international games and at the same time it demands some basic body morphologic features from individuals desirous of playing it, for optimal performance. It has been found in the present study that CPG and CG individuals were comparable in terms of age but differ significantly ($P<0.05$) in terms of stature, body weight(fig. 1.a), pre exercise diastolic blood pressure and in basic anthropometric parameters including WC, HC, WHR and WHtR (fig 3) and the finding is in agreement with the previous study conducted on individuals receiving training in different forms of Indian classical dances[18,19]. Body composition - an important correlate of physical fitness - includes lean body mass, muscle and bone and it refers to the body's chemical composition by three well defined models (chemical model, anatomical model and the two-compartmental model); the last one simplifies body composition into two components, the fat mass and the fat free mass (FFM). In recent times, the predominance of obesity is increasing throughout the world in such a way that it has been termed as an "escalating epidemic" [20] and it is not the end in itself. The obesity related co-morbidity including different non-communicable diseases are also rising, due to over accumulation of body fat ultimately leading to fall in the physical working capacity of an individual, and therefore body fat (%) is important parameter, having serious implications, to assess the body composition status. It has been reported in earlier studies that regular



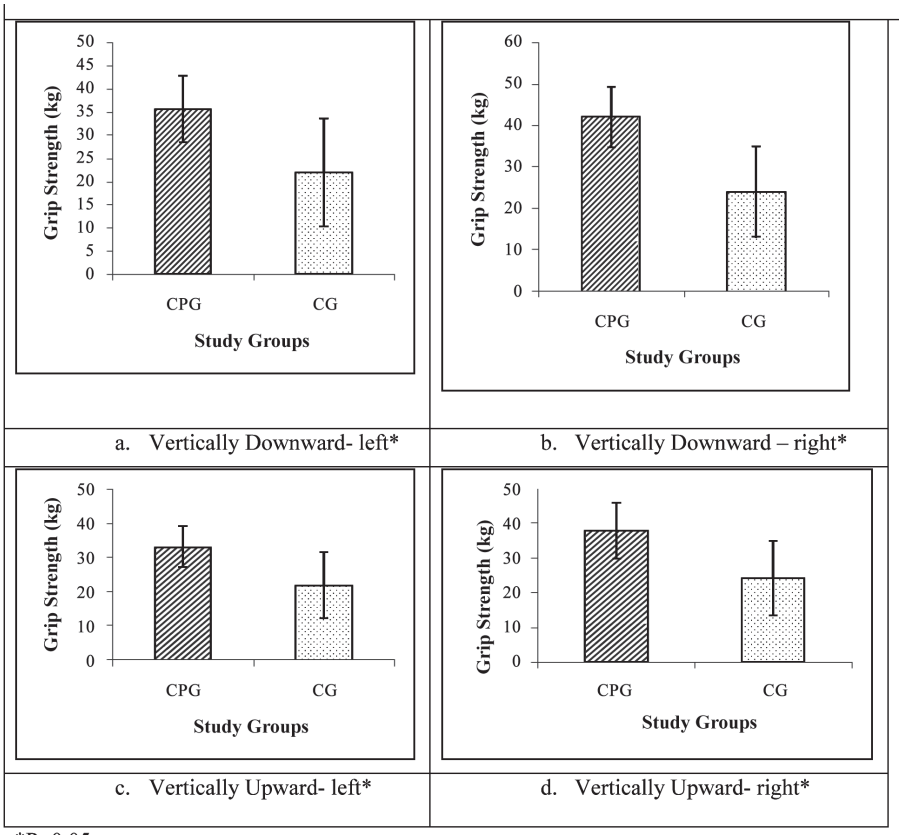
*P<0.05

Figure 3: Comparison between CPG and CG individuals in respect of WC (cm), HC (cm), WHR and WHtR.



*P<0.05

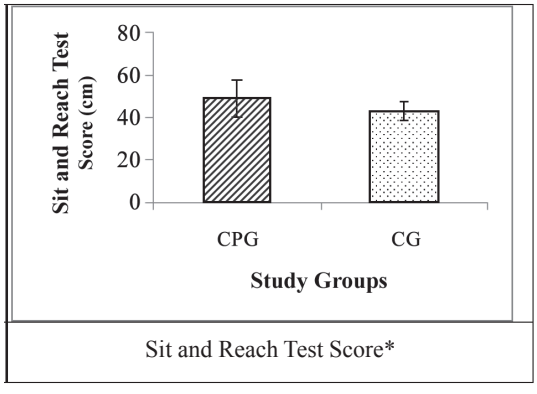
Figure 4: Comparison between CPG and CG individuals in respect of BMAI, BAI and AVI.



*P<0.05

Figure 5: Comparison between CPG and CG individuals in respect of handgrip strength in two different positions of left and right hands.

physical exercise of particular duration increases the lipid mobilization from their storage sites in response to a specific fat-mobilizing substance [21] that could result in 1% to 9% of body fat reduction. In the present study, significantly (P<0.05) lower mean value of body fat (%) has been found in CPG individuals compared to the CG individuals (fig: 1.b); the findings are in agreement with the earlier studies[22] conducted on Indian Cricketers to investigate their anthropometric profiles. Our earlier studies, carried out on individuals receiving training in football, and different forms of Indian classical dances, also reported that regular exercising of the particular forms had beneficial impact on the body fat status[23-25]. It has been found in the present study that the mean value of BMI, the most commonly used reliable indicator of obesity, in CPG individuals, is 20.5 (fig: 2.) whereas CG individuals have mean value of BMI 25.7 which is above the cut off value for being referred to as overweight category for Asians. The significantly higher (P<0.05) value of BMI in CG individuals may be due to leading a sedentary life, a and hence there is a risk for developing cardiovascular and pulmonary diseases[26], the finding is in agreement with the previous study conducted on cricketers[27]and individuals undergoing training in Indian classical dance[28]. Considering the central adiposity indices, the recommended cutoff value for WC is found to be 90 cm for Asian men[20]; in the present study it has been found that the average value of WC in CG individuals (80.6 cm) (fig: 3.a) is significantly higher than their CPG counterparts (74.2 cm) though below the threshold level. Similar trend has been found in case of HC (fig.3.b); present findings are in agreement with the previous reports[29, 30]. In the present study, body physique status has also been assessed in terms of Waist to Hip Ratio (WHR) and Waist to Height Ratio (WHtR). According to the recommendations for Asians, the thresholds value of WHR, usually conceived as an index of fat distribution, is 0.90[31] for men, and low value of WHR indicates a more curvaceous body shape with low abdominal adiposity. In the present study lower mean value has been found in case of the WHR in CPG and CG individuals but average value of WHR has been found to be higher in CG individuals compared to their CPG counterpart (fig: 3.c). The WHtR, an important parameter reflecting the body physique status, has been found to be significantly lower (P<0.05) (fig: 3.d) in CPG individuals compared to their CG counterparts; the findings are in agreement with the previous findings reported on the basis of studies carried out on adult females undertaking training in different forms of Indian classical



*P<0.05

Figure 6: Comparison between CPG and CG individuals in respect of Sit and Reach Test Score.

dancing, indicating the beneficial impact of physical exercise[32-36].

In the present study obesity indices like Body Mass Abdominal Index (BMAI), Body Adiposity Index and Abdominal Volume Index have been estimated. It has been found from the result of the present study that the mean value of BMAI is significantly (P<0.05) low in CPG individuals (27.6) than their CG counterparts (fig. 4.a) which reduce the risk factor of having health related co-morbidities in the CPG individuals[32] compared to their age and sex matched CG males. Body Adiposity Index (BAI), another important predictor of body fat[32]without assessment of body weight is an alternative index based on hip circumference and body height[37]. In the present study, the CG individuals have been found to have a higher value of BAI (fig.4.b)[38], indicating a chance of insulin resistance and metabolic disorder. The Abdominal Volume Index (AVI)[39,32] yet another central adiposity marker, is also significantly low (P < 0.05) in CPG individuals (fig.4.c).

Strength is one of the most important components in physical fitness and a necessity for many sports. Strength training is an exercise programme where free or stationary weights are used for the purpose of increasing muscular strength, muscular endurance and power, through which skills can be improved[40]. When strength losses occur, there is a much higher chance of developing muscular strain and joint instability[41]which are likely after repeated eccentric muscle actions. On the other hand, hand muscle strength is a significant predictor of health status, increasing muscle strength is expected to have some important role in enhancing physical functioning and hence increasing the level of fitness. Cricket is a game that may require substantial muscle strength for making runs by holding the bat at different position according to the ball. It has been found from the result of the present study that the mean handgrip strength of both the hands in vertically downwards and upwards position was significantly higher (P<0.05) in CPG individuals compared to CG individuals (fig: 5); similar result has been reported from a recent study conducted on cricketers of Pakistan and Iran[42].

It has been found in previous studies that structure and functions are two inseparable entities with respect to human performance in elite competitive sports. When all functional factors such as anthropometric, morphological, physiological, psychological and motor fitness variables are equal, structure to a large extent determines the degree of success of an adult elite athlete[43,44]. As cricket requires flexibility of the players right from the beginning and for desirable performance in challenging conditions, flexibility (as a physical readiness factor) has its significance and it could reduce injuries of the players. In the present study CPG individuals has been found to have significantly higher (P < 0.05) lower-back and hamstring flexibility compared to their age and sex matched CG counterparts (fig. 6); the findings are in agreement with that of an earlier study conducted on male Tamil cricketers, aged between 18 - 22 years[45], and also is in consonance with the reports from studies conducted on adult Bengalee females practicing bharatnatyam dance[46], another form of aerobic exercise that requires flexibility during different dynamic body movements.

Conclusion : From the present study, it may be concluded that the adolescent males being trained in cricket for a period of at least 6 years and practising it for a period of two hour and at least 6 days a week have significantly favorable body physique status; significant differences have also been found in respect of their handgrip strength and static flexibility, compared to their non-exercising age and sex matched counterparts.

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SATABDI BHATTACHARJEE[1], TANAYA SANTRA[1], SHARMISTHA SADHU[1], SURJANI CHATTERJEE[1], AYAN CHATTERJEE[1], SANDIPAN CHATTERJEE[1], NEEPA BANERJEE[1], KUNTAL GHOSH[2], SHANKARASHIS MUKHERJEE[1]*

[1]Human Performance Analytics and Facilitation Unit,
Department of Physiology,
University Colleges of Science and Technology,
University of Calcutta
Rashbehari Shiksha Prangan
92 Acharya Prafulla Chandra Road, Kolkata 700 009, India

*E mail: msasish@yahoo.co.in

[2]Indian Statistical Institute, Kolkata, India

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