

A Study on Impact of Receiving Training on Football and Sprinting on Body Composition and Physical Fitness Status of Adolescent Males

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Abstract: Physical characteristics and body composition have been known to be fundamental to excellence in athletic performance. Specific athletic events require different body types and weights for maximal performance. Therefore determination of body constitution and fitness status of an athlete is very important for producing maximal performance. With growth of children and adolescents there is a change in body composition parameters and the gender difference becomes more pronounced. Soccer playing and sprinting are the popular playing events. Both of them require fast body movements and therefore receiving training on these games may have some impact on body constitution and eventually on fitness status. A study was undertaken, in this backdrop, on randomly selected male adolescents of age range 12-18 years, receiving training in football (n1 = 36) and in sprinting (n2 = 32), the inclusion criterion being that the volunteers for the study should be receiving training for at least a period of 3 years with no chronic disease history. It has been observed that male adolescent individuals receiving similar pattern of training in football and sprinting did not vary significantly in terms of body composition but those being trained in football having better fitness status, compared to their sprinter counterparts.

Keywords: Body Composition, Heart Rate, Blood Pressure, PFI

1. Introduction

Exercise is a term that has a variety of possible meanings, each dictated by circumstances. Structured form of exercise may also be directed to improvement of a person's general health including body composition [1, 2], physical fitness [3], or as physical therapy, to augment an existing treatment to remedy or to ameliorate the effects of a disease or illness upon the body.

It is these aspects of human function that tend to have the greatest impact upon the ability of an athlete to maintain or improve their level of performance in sports. Soccer is a world's most popular sport, being played in every nation without exception [4]. The first soccer like game was played 2,500 years ago. The primary responsibility of FIFA was to develop international rules and regulations and to organize

international matches [5]. Today association football or soccer as it is known is the most popular game in the world and is played by at least 200 million people worldwide [6]. The average football matches lasts for approximately 90 minutes; but this excludes any injury and extra time played during cup games if the match ends in a draw. Physiologically football has been characterized as a discontinuous, high intensity, intermittent exercise bout. Functionally each game is made up of distinct phases incorporating sprinting (accelerating and decelerating), dribbling, and walking, jogging, change in direction, tackling, pushing, heading and kicking [7, 8]. The distances covered by players during a match vary depending on positions. The football player's exercise intensity during a match is above 70% of maximum oxygen consumption, however, they are involved in low intensity activity for about 50% of game time that is, standing, walking jogging, moving off the ball. The total distances that could be covered in a

match may be between 8 and 11km [9]. The anaerobic power output during a game could last for about seven minutes. On the other hand, sprinting is the act of running over a short distance at (or near) top speed. It is used in many sports that incorporate running, typically as a way of quickly reaching a target or goal, or avoiding or catching an opponent. Human physiology dictates that a runner's near-top speed cannot be maintained for more than 30–35 seconds. At the professional level, sprinters begin the race by assuming a crouching position in the starting blocks before leaning forward and gradually moving into an upright position as the race progresses and momentum is gained. The set position differs depending on the start. Body alignment is of key importance in producing the optimal amount of force. Ideally the athlete should begin in a 4-point stance and push off using both legs for maximum force production. Athletes remain in the same lane on the running track throughout all sprinting events, with the sole exception of the 400 m indoor. It is also important that there are some differences in body structure and composition of sports persons involved in individual and team sports. This process whereby the physical demands of a sport lead to selection of body type best suited to that sport is known as “morphological optimization”. Both the games, i.e. football and sprinting, are very much popular especially among boys and therefore receiving training on these games right from adolescence may have some impact on body constitution and eventually on fitness status. A study was undertaken in this backdrop, to study the effect of receiving training on football and sprinting on body composition and physical fitness status in Bengalee adolescent boys

2. Materials and Methods

Initially different centers imparting training on football and sprint running to adolescent males of age range 12-18 years were approached for getting access to the subjects. After

initial discussion, few centers were shortlisted. Then the experimental requirements were explained briefly. On obtaining necessary permission from authority and consent from the individual volunteers receiving training for at least 3 years period, study requirements were elaborately explained and dates of measurement were arranged on mutual convenience. Randomly selected 36 trainee male adolescents receiving training in football (F) and 32 adolescents receiving training in sprinting (S) volunteered for the study. Initially age in years, duration of training period, daily practicing time were recorded in the pre-designed schedule. Individuals trained for less than 3 years and with any major chronic disease history (self reported) were excluded from the study. On the scheduled date measurements were taken in the morning hours. Body height (cm) was measured (to the nearest 0.1cm) using anthropometric rods and body weight (kg) was measured (to the nearest 0.1 kg) using an electronic weighing scale without shoes and in light clothing. BSA and BMI were calculated. Body fat percentage was calculated from skin-fold measurement. Fat and fat free mass were calculated. Waist and hip circumferences were measured using a measuring tape and waist to hip ratio was calculated. Resting heart rate and blood pressure of the subjects were measured in sitting posture after 15 minutes rest using a digital blood pressure monitor. Physical fitness index (PFI) was calculated following the Harvard step test.

3. Results

In the present study Bengalee adolescent boys receiving training in football and sprinting participated. The mean age of the adolescent footballers and sprinters are 17.2 and 17.1 years respectively. Participating individuals have an experience of at least three years and they were from similar middle socio-economic status.

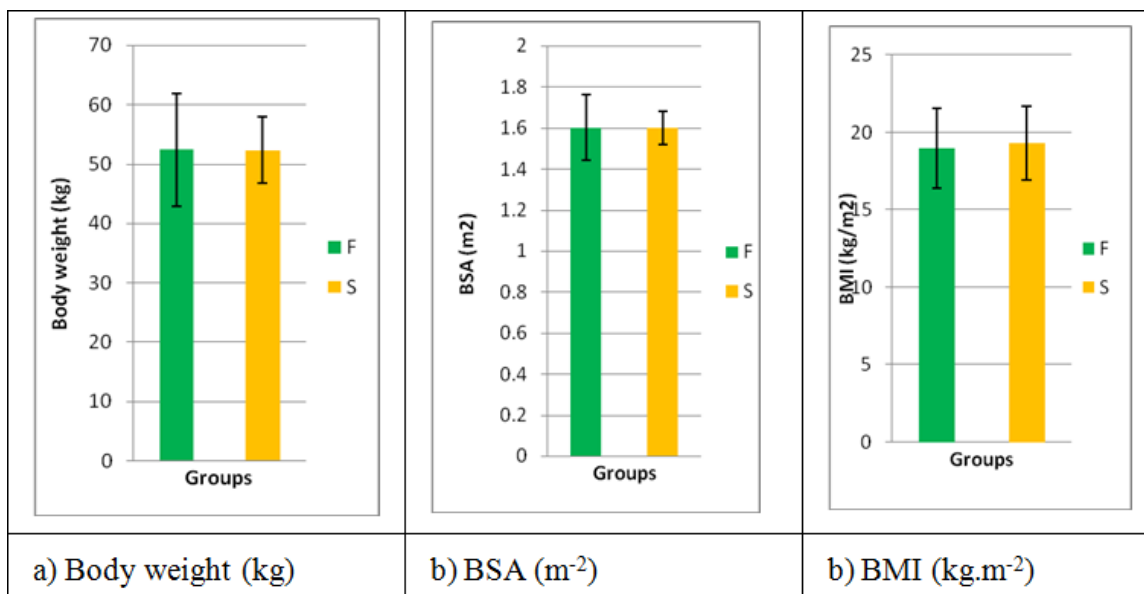


Figure 1. Comparison between the adolescent males receiving training in football and receiving training in sprinting in terms of Body Weight (kg), BSA(m²) and BMI (kg.m⁻²)

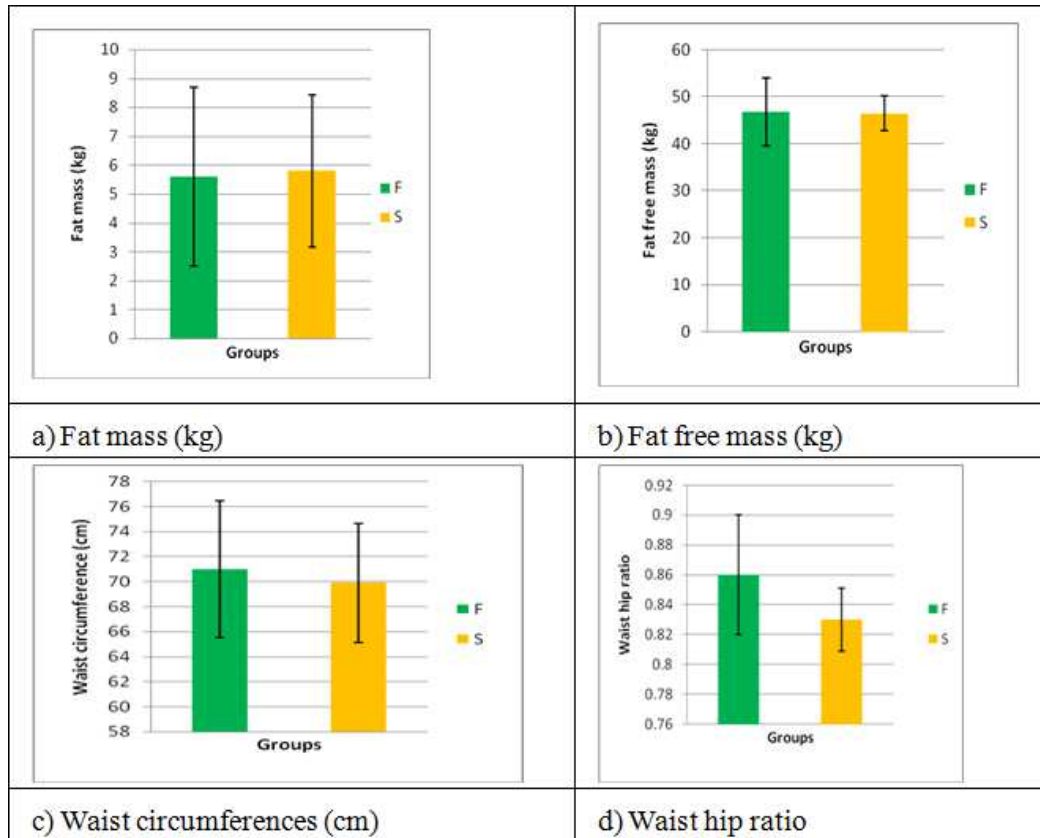


Figure 2. Comparison between the adolescent males receiving training in football and receiving training in sprinting in terms of different body composition parameters

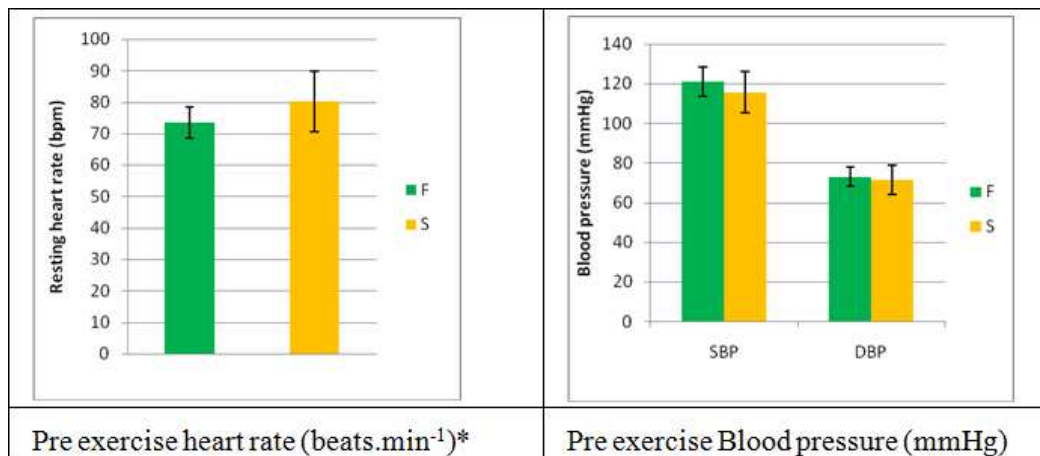


Figure 3. Comparison between the adolescent males receiving training in football and receiving training in sprinting in terms of heart rate and blood pressure.

In figure 1.a 1.b and 1.c comparison has been made in adolescent males receiving training in football and sprinting in respect of the body weight (kg), BSA (m²) and BMI (kg.m⁻²). It has been found that no significant difference exists between footballers and sprinters in terms of body weight (kg), BSA (m²) and BMI (kg.m⁻²).

In figure 2.a – 2.d, the body composition parameters in terms of fat mass (kg), fat free mass (kg) and abdominal obesity indicators in terms of waist circumferences (cm) and waist hip ratio of the adolescent males receiving training in football and receiving training in sprinting have been presented.

In figure 3.a – 3.b, the data on pre exercise heart rate (beats.min⁻¹) and pre exercise blood pressure (mmHg) of the adolescent males receiving training in football and receiving training in sprinting have been presented.

Although no significant difference has been found between footballers and sprinters in terms of pre exercise blood pressure, average value of pre exercise heart rate is significantly lower in footballers compared to the sprinters.

Fitness status in terms of PFI of the two groups of the subjects has been measured 99.5 ± 8.9 in football training group, and 91.3 ± 8.7 if sprint training group.

4. Discussion

There is an increasing prevalence of overweight and obesity among children and adolescents in recent days [10, 11] and the major contributory causes are physical inactivity (PI) [12] along with over-consumption of high-calorie diets [13]. On the other hand, physical fitness and quality of life are the integral part of human life which is correlated to each other; receiving training and regular practicing of exercise have been proven to improve fitness status [14] and thereby improving the quality of life [15]. In fitness, body composition is important parameter which has key role in health related fitness [16, 17]. Different kinds of physical activities are popular among adolescent boys and football, an aerobic endurance sport, [18] and sprinting are such popular games. The present work was conducted to study the body composition and fitness status of the adolescent individuals receiving training in football and sprinting, and to make a comparison. To study the body composition, body weight, BMI, body fat, fat free mass, waist circumference, waist hip ratio were selected. From the findings, it has been found that footballers and sprinters did not vary significantly in terms of the mentioned body composition parameters. Marginally higher mean values have been found in case of BMI and fat mass in sprinters compared to the footballers. The findings of higher BMI of the trainee sprinters are in agreement with the findings of previous studies on young Indian sports persons [19]. On the other hand, marginally higher mean values have been found in case of body weight, WC and WHR in footballers compared to their age and sex matched counterparts. It has also been found that trainee adolescent footballers have higher fat free mass compared to the sprinters; this is in agreement with the findings from a study conducted on sports persons of Brazil [20]. Majority of the previous studies found more prominent difference which may be due to performing the study on adult professional athletes with higher experience. For assessing fitness status resting heart rate, blood pressure and PFI were selected. Interestingly it has been found that there is a significant difference between the footballers and sprinters in terms of resting heart rate, a simple but important parameter to assess the cardio vascular fitness status. Mean value of resting heart rate has been found to be significantly higher ($P < 0.01$) in sprinters compared to the footballers. The average resting heart rate considered as normal in healthy individuals is approximately 75-80 beats per minute. In the present study although mean value of resting heart rate of the sprinters is almost within the normal range, the increasing trend of the result has been found. Contrary to the present study, Mohiuddin *et al.*, (2013) [21] reported that resting heart rate ($\text{beats} \cdot \text{min}^{-1}$) was higher in footballers compared to the athletes.; it was found that systolic blood pressure was lower and diastolic blood pressure (mmHg) was marginally higher of the footballers than that of the athletes. In the present study, mean value of systolic and diastolic blood pressure is marginally higher in footballers compared to the sprinters. PFI, another important and reliable parameter to assess physical fitness, especially aerobic fitness, uses the post

exercise recovery heart beat counts within the intervals of 1–1.5 minutes, 2–2.5 minutes and 3–3.5 minutes after stepping exercise. Usually the PFI of the sedentary persons are lower compared to the individuals receiving training in physical exercise of any form. The reason may be due to physical inactivity compared to the trainee individual and the way of leading life [12]. In the present study both group of individuals are in a favorable position in terms of fitness status although it has been found that individuals receiving training in football have significantly higher ($P < 0.05$) mean value of PFI compared to their sprinter counterparts. Overall it has been found that footballers and sprinters did not vary significantly in terms of different body composition parameters probably due to the fact that they are from similar background, similar pattern of training and they are not highly trained professionals, as improvement in body composition takes a long period of time to demonstrate pronounced effect.

5. Conclusion

From the findings of the present study, it may be mentioned that male adolescent individuals receiving training in football and sprinting did not significantly differ in terms of body composition. Considering the fitness status, footballers are in a better position compared to sprinters in terms of resting heart rate and physical fitness index.

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References

- [1] Chatterjee S, Banerjee N, Santra T, Chatterjee A, Chatterjee S, Manna I, Banerjee U, Mukherjee S, Impact of Dancing on Obesity Indices on Bengalee Female Adolescents of Kolkata, *AJSSM*, 2(5A), 40-44, 2014, doi: 10.12691/ajssm-2-5A-9.
- [2] Banerjee N, Chatterjee S, Kundu S, Bhattacharjee S, Mukherjee S, Effect of Regular Practicing Bharatnatyam Dancing Exercise on Body Fat of Urban Female Teenagers, *IJCAP*, 1 (1), 29 – 33, 2014.
- [3] Mukherjee S, Banerjee N, Chatterjee S, Effect of Bharatnatyam Dancing on Body Composition and Physical Fitness Status of Adult Bengalee Females, *IJBS*, 18, 9-15, 2012.
- [4] Sporis G, Jukic I, Ostojic S M & Milanovic D, Fitness Profiling in Soccer : Physical and Physiologic characteristics of Elite players, *Journal of Strength and Conditioning Research*, 23, 1947-1953, 2009.
- [5] Dogan C, Raschka C, Anthropometrical & Sport Constitutional Comparison of German Male Soccer Players and Male Students of Sports Science, *Papers on Anthropology*, XX, 78-92, 2011.

- [6] Witvrouw E, Dannee L, Asselman P, D'Have T, Cambier D, Muscle Flexibility as a Risk Factor for Developing Muscle Injuries in Male Professional Soccer Players – A Prospective Study, *The American Journal of Sports Medicine*, 31(1), 41-46, 2003.
- [7] Inklaar H, Soccer injuries II, Aetiology and prevention, *Sports Medicine*, 18, 81-93, 1994.
- [8] Lees A, and Nolan L, The biomechanics of soccer: A review, *Journal of Sports Science*, 16, 211-234, 1998.
- [9] Bangsbo J, Energy demands in competitive soccer, *Journal of Sport Sciences*, 12(1), 36-37, 1994.
- [10] Mukherjee S, Banerjee N, Chatterjee S, Chatterjee S, Chatterjee A, Santra T, and Saha B, Effect of Bharatnatyam Dancing on Body Composition of Bengalee Female Children, *AJSSM*, 2(1), 56-59, (2014), doi: 10.12691/ajssm-2-1-10.
- [11] Mukherjee S, Banerjee N, Chatterjee S, Chatterjee S, Effect of Practicing Select Indian Classical Dance Forms on Body Composition Status of Bengalee Females: An Anthropometric Study, *IJBS*, 20, 40 - 48, 2014.
- [12] Kundu S, Banerjee N, Santra T, Chatterjee S, Mukherjee S, Impact of Bharatnatyam Dancing Exercise on Lung Function of Adult Bengalee Females, *In: User Centred Design and Occupational Wellbeing*, McGraw Hill Education, 328 – 331, 2014.
- [13] Andreasi V, Michelin E, Rinaldi AEM, Burini RC, Physical fitness and associations with anthropometric measurements in 7-15 year-old school children, *Journal de Pediatria*, 86(6), 497-502, 2010.
- [14] Banerjee N, Santra T, Chaterjee S, Chatterjee A, Chatterjee S, Banerjee U, Mukherjee S, Manna I, A Study on Pulmonary Function of Adolescent Bengalee Trainee Bharatnatyam Dancers, *AJSSM*, 2(5A), 45-47, 2014, doi: 10.12691/ajssm-2-5A-10.
- [15] Banerjee N, Chatterjee S, Chatterjee S, Mukherjee S, Effect of Bharatnatyam Dancing on Psychological Health Status of Occupationally Engaged Females, *In: User Centred Design and Occupational Wellbeing*, McGraw Hill Education, 300 – 304, 2014.
- [16] Mukherjee S, Banerjee N, Chatterjee S, Chatterjee S, Effect of Kathak Dancing on Obesity Indices in Women of Sedentary Avocations, *S & C*, 80 (9–10), 279 - 282, 2014.
- [17] Bhattacharjee S, Chatterjee S, Banerjee N, Santra T, Mondal P, Mukherjee S, Impact of Bharatnatyam Dancing on Motor Ability of Adult Bengalee Occupationally Engaged Women of Kolkata, *In: User Centred Design and Occupational Wellbeing*, McGraw Hill Education, 311 – 315, 2014.
- [18] Pinasco A, Carson J, Preseason conditioning for college soccer, *Strength and Conditioning Journal*, 27, 56-62, 2005.
- [19] Abraham G, Analysis of anthropometry, body composition and performance variables of young Indian athletes in southern region, *Indian Journal of Science and Technology*, 3(12), 1210-1213, 2010.
- [20] Canhadas IL, Silva RLP, Chaves CR, Portes LA, Anthropometric and physical of young male soccer players fitness characteristics, *Rev Bras Cineantropom Desempenho Hum*, 12 (4), 239-245, 2010.
- [21] Mohiuddin M, Jaleeli K and Misbahuddin, Evaluation of the Relationship between lung function and Anthropometric parameters in normal healthy volunteers and sport persons, *International Journal of Biology, Pharmacy and Allied Sciences*, 2(12), 2257- 2266, 2013.