

Impact of Receiving Training in Football on Obesity and Physical Fitness Status: A Study in Bengali Male Adolescents

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Abstract

The prevalence of obesity and its related medical consequences are increasing in many countries. Obesity has now become a major global problem. Obesity has been found to increase the risk of morbidities and mortalities including cardiovascular disease (CVD), diabetes, gallbladder disease, respiratory disease, cancer, arthritis and gout. The growing prevalence of childhood obesity highlights two major problems for health professionals: (1) the identification and adoption of population-based prevention strategies involving healthy lifestyle beginning early in life and, (2) the need to identify high risk obese children for targeted interventions. There is some agreement, that the assessment of fat distribution (visceral fat in particular), may be a useful approach for determining risk of disease associated with obesity. On the other hand, structured form of exercise may also be directed to improvement of a person's general health including body composition, physical fitness or as physical therapy, to augment an existing treatment to remedy or to ameliorate the effects of a disease or illness upon the body. In this backdrop, a study has been undertaken on randomly selected 14 male adolescents of age range 12-16 years, receiving training in football for at least a period of 3 years and practiced regularly for at least an hour with no chronic disease history, constituted the experimental group (EG). 12 male individuals of comparable age and socio-economic background, but not receiving training in any form of exercise constituted the control group (CG). It has been observed that male adolescent individuals receiving training in football regularly have significantly ($P < 0.05$) higher physical fitness but significantly ($P < 0.05$) lower obesity indices compared to their age matched counterparts. It may be concluded that football is a beneficial way of exercising; it can serve as potential tool for fitness and optimum body composition of bengalee adolescent males.

Keyword: Body Composition; Cardiovascular Disease; Health Problems; Exercise; Fat Deposition.

Introduction

During the past century, life expectancy has substantially increased in the world. Unfortunately, with the increase in life expectancy and physical inactivity the incidence of chronic diseases such as obesity has enhanced all over the world and India is not an exception. Obesity is a product of an indulgent, comfortable lifestyle [2] and since 21st century the worldwide prevalence of obesity has reached an epidemic dimension which still continues to escalate [11, 23]. Obesity becomes one of the most common health problems, such that World Health

Organization (WHO) reported overweight and obesity to be an 'escalating epidemic' worldwide [45]. It is considered as excess deposition of body fat which has been clearly associated with numerous patho-physiologic processes [6]. It is now defined as public burden. WHO has recommended classifications of bodyweight that include degrees of underweight and gradations of excess weight or overweight that are associated with increased risk of some non-communicable diseases [46, 47] such as type 2 diabetes, limitations of respiratory function etc. On the other hand, increased weight is also associated with higher levels of triglycerides and low-density lipoprotein cholesterol (LDL-C) and lower

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levels of high-density lipoprotein cholesterol (HDL-C), and at least 75% of hypertension can be attributed to obesity in adults [27] therefore it is in turn associated with the risk of cardiovascular disorder (CVD). Current research suggests that inflammation plays an important role in the development of CVD [37, 42]. One of the most important markers of inflammation and subsequent CVD appears to be elevated levels of high-sensitivity C-reactive protein (CRP) [41]. To support this contention, it has been shown that CRP is a better predictor of CVD when compared to lipoprotein, homocysteine, interleukin 6, total cholesterol, low-density lipoprotein cholesterol, serum amyloid A, apolipoprotein B, and the ratio of total cholesterol to high-density lipoprotein cholesterol [41]. It has been found that individuals who engage in sedentary behaviors are more likely to have a greater risk of obesity [22] and therefore developing CVD. One possible approach for improving levels of CRP may be aerobic exercise, a low-cost, nonpharmacologic intervention that is available to most of the general public. A recent qualitative systematic review that examined studies dealing with physical exercise concluded that habitual physical exercise results in lower levels of CRP [26]. Physical exercise defined as skeletal muscle contraction results in increased energy expenditure and helps to promote a healthful body composition, maintain muscle mass, and thus preserve the resting metabolic rate (RMR) [22, 49]. It has been found from different studies that regular physical exercise can also lowers the risk of metabolic syndrome [16, 19] and delaying progression of a number of chronic diseases [15, 13]. Football is one of the world's popular team sports defined as a discontinuous, high intensity; intermittent exercise bout [25, 29] relies mainly on the aerobic energy system, as emphasized by the large distances covered during a match. It involves movements i.e. jumping, running, deceleration, acceleration, pivoting etc of different body parts. Many different measures of body shape have been proposed and used over the years for assessing body morphology. Body composition measures includes BMI generally thought of as an index of percentage of total body fat, waist and hip circumference, waist hip ratio, the ratio of the circumference of the waist to the height (WHtR) are globally accepted sensitive indicators of health status providing information about the body composition as well as cardiovascular risk. The present study has been planned to find out the comparison of fat deposition and the risk of cardiovascular disease between the trainee footballers and the sedentary individuals of comparative age group with no experience of regular physical exercise.

Methodology

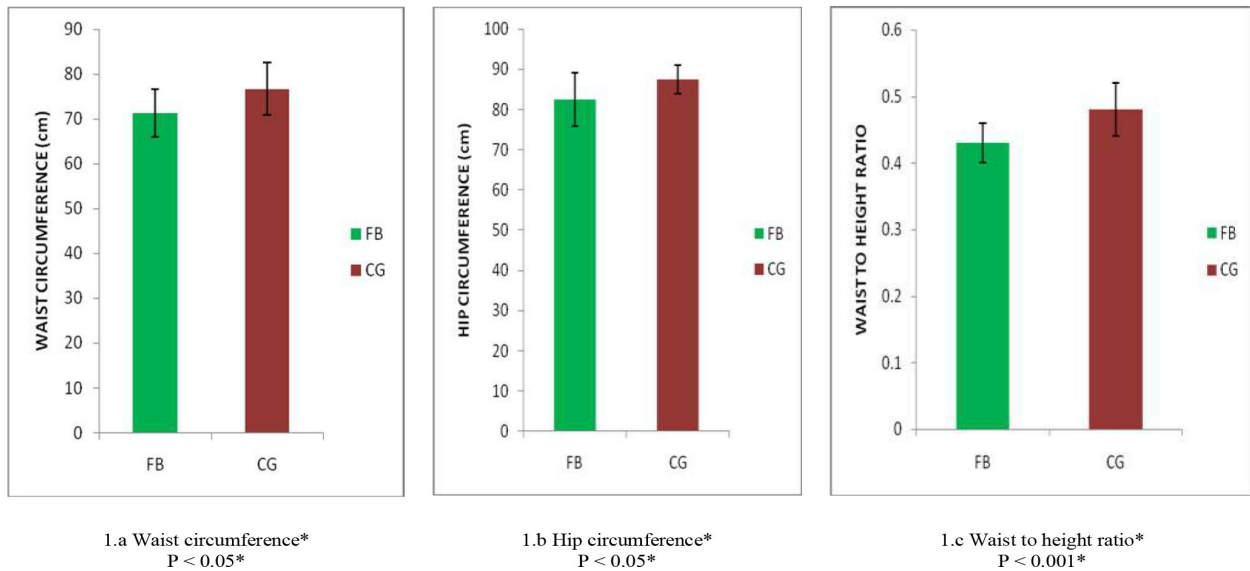
Initially different centers imparting training on football, of Hooghly district in the Indian state of West Bengal were approached for getting access to individuals for carrying out the study. After initial discussion, few centers were shortlisted. Then the experimental requirements and the aim of the study were explained briefly to the institution authorities, interested individuals and their parents/guardians. On obtaining necessary permission from authority and consent from the individual volunteers receiving training for at least 3 years period and practicing regularly for at least one hour period, study requirements were elaborately explained and dates of measurement were arranged on mutual convenience. 14 randomly selected adolescent male individuals receiving training in football volunteered for the present study and they constituted the experimental group (EG). The age of the individuals ranged between 12–16 years which falls within the WHO defined criteria for being considered as adolescents [48]. On the scheduled day, arranged on mutual convenience, measurements were obtained. Initially age in years, duration of training period, daily practicing time were recorded in the pre-designed schedule. The information about their number of family members, parental education, occupation and monthly family income were also collected for determining the socioeconomic status of the individuals [40]. Individuals trained for less than 3 years and with any major chronic disease history (self reported) were excluded from the study. 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 with individuals without shoes and in light clothing. From the measurements of height and weight BMI was calculated. Waist and hip circumferences were measured using a measuring tape and waist to hip ratio and waist to height ratio (8) were calculated. Maximum oxygen consumption of the individuals were calculated following Queen's college step test and Physical fitness index (PFI) of the individuals was calculated following the Harvard step test (31). 12 individuals of comparable age, socioeconomic and ethnic background with no football or any other athletic background were randomly selected and constituted the control group (CG). On the scheduled date measurements were taken in the morning hours.

Results

and waist to height ratio of the EG and CG individuals have been presented.

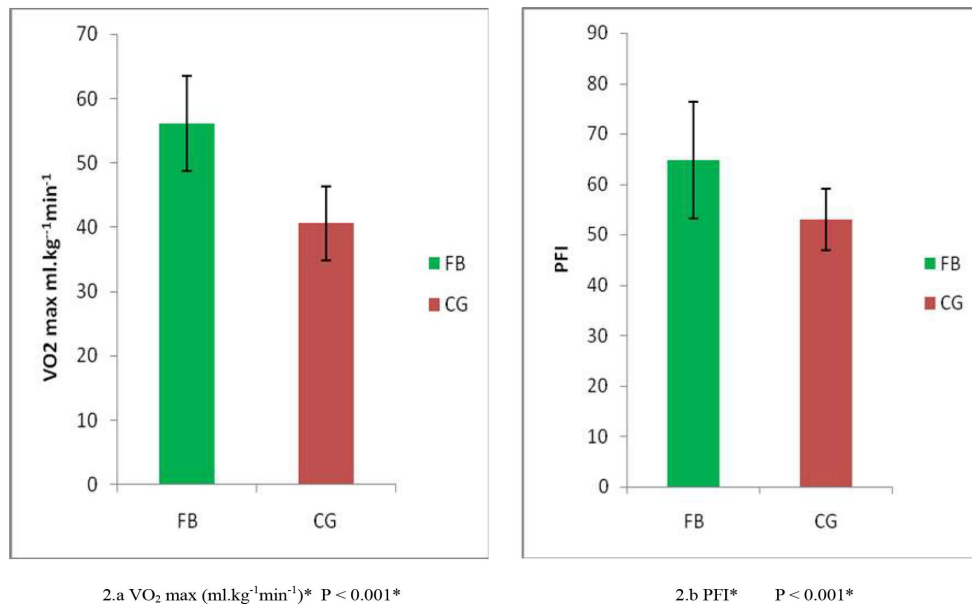
In figure 1.a, 1.b and 1.c the obesity indices in terms of waist circumference (cm), hip circumference (cm)

Fig. 1: Comparison of obesity indices between the study group and control group individuals.



In figure- 2.a, 2.b, the cardio respiratory parameters in terms of VO_{2max} ($ml.kg^{-1}min^{-1}$) and PFI of the EG and CG individuals have been presented.

Fig. 2: Comparison of cardio respiratory parameters in terms of VO_{2max} ($ml.kg^{-1}min^{-1}$) and PFI between the experimental and control group individuals.



Discussion

There is an increasing prevalence of overweight and obesity among children and adolescents in recent

days [31, 32] and the major contributory causes are physical inactivity (PI) along with over-consumption of high-calorie diets [1]. 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 [3] and thereby improving the quality of life [4]. Body composition is an important parameter which has key role in health related fitness [33, 7]. Different kinds of physical activities are popular among adolescent boys and football, an aerobic endurance sport, [38] is a popular athletic game all over the world. The present work was conducted to study the effect of regular aerobic exercise in terms of football training on reducing obesity and enhancing physical as well as cardio respiratory fitness in Bengali adolescent males, with the individuals of comparable age group and did not have experience of any exercise training on regular basis, and to make a comparison. To study the body composition, body height, body weight, BMI, waist circumference, hip circumference, waist hip ratio, waist to height ratio and to study the cardio respiratory fitness VO_{2max} and PFI were selected. From the findings it has been found that footballers vary significantly in terms of mentioned body composition parameters than the control group individuals. Significantly higher value has been found ($P < 0.01$) in case of body height in football players than the control group individuals and significantly higher score ($P < 0.01$) has been found in terms of body weight in control group individuals than their footballer counterpart. This finding is in agreement with the findings of Dogan et al, 2011[14]. On the other hand, significant differences have been found in terms of body composition parameters in footballers compared to their age and sex matched counterparts. It has been found that waist and hip circumference of the control group individuals were significantly higher ($P < 0.05$) than the experimental group individuals. Marginally higher mean value of waist to hip ratio has been found in control group individuals than the footballers. This finding is similar to the study conducted on the individuals of Canada [30]. From the findings it was also found that significant difference exists in terms of waist to height ratio among the experimental group and control group individuals. The score of the waist to height ratio to the control group individuals were significantly higher ($P < 0.001$) than their footballer counterpart. This results is in agreement with the findings reported by Savva et al, [43] conducted the study on 10–14 years adolescent males in Cyprus. The BMI of the control group individuals were also significantly higher ($P < 0.001$) than the adolescent male footballers of their comparable age. The results of this study are in agreement with the observation that simple anthropometric indices of visceral adipose tissue are helpful for predicting the presence of cardiovascular risk factors in adults and children

[39, 17, 18.20, 21]. Waist circumference, BMI and waist-to-height ratio were proven to be better predictors of obesity. BMI is usually thought of as an index of percentage of total body fat. Indeed, BMI correlates well with more direct estimates of percentage body fats [10]. In contrast, WHR is usually conceived of as an index of fat distribution, with high WHR indicating a less curvaceous body shape with high abdominal (also referred to as central) adiposity and low WHR indicating a more curvaceous body shape with low abdominal adiposity. Abdominal adiposity is assumed to reflect individual differences in physiology orthogonal to total body fat [12], and has consequently been argued to be useful in predicting a range of health and fertility outcomes [22, 27, 44]. To study the cardio-respiratory fitness of both the control group as well as experimental group individuals VO_{2max} and PFI were selected and it has been found that both the scores of the VO_{2max} and PFI were significantly vary between two groups. The VO_{2max} score of the footballers were significantly higher ($P < 0.001$) than their age and sex matched control group individuals and this result is similar to the findings of Ostojic et al, 2009[36] conducted the study on the football players in Serbia. This trend is also similar to the other fitness parameter i.e. PFI. 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. PFI score of the footballers were significantly higher ($P < 0.001$) than the control group individuals and this finding is similar to the finding of Banerjee et al., 2014 [5]. The reason may be due to physical inactivity compared to the trainee individual and the way of leading life [28]. Overall it has been found that the adolescent Bengalee males receiving training in football for at least 3 years significantly differ in terms of body composition parameters than their age and sex matched sedentary individuals and the trainee individuals are also in better position in terms of fitness status than their age and sex matched individuals probably due to the fact that physical inactivity can leads to deposition of body fat specifically the central adiposity [35] and this in turn also associated with a three to four-fold increased risk of heart disease in adolescents.

Last but not the least it may be mentioned that the sedentary adolescent males must be involved in various other types of low or no cost traditional enjoyable exercise modes like yoga, dancing of various forms to keep themselves fit without taking undue risk of injuring as incase of rock climbing and

like them especially in general fitness programs [8, 9, 34,]. On the basis of the study, it could be concluded that aerobic exercise in terms of football, if practiced regularly for at least an hour, has beneficial impact on maintaining physical fitness and on attaining favorable body composition variables, adjudged anthropometrically in adolescents; the favorable body composition thus attained could reduce the chance of onset of obesity in adulthood and related diseases and helps to lead a healthy life.

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