

Relationship between Two Body Adiposity Estimating Methods: A Study in Bengalee Female Adolescents being Trained in Bharatnatyam Dance

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Abstract

India, the second most populous country in the world, is now considered as an emerging economy. It is undergoing a major nutrition and lifestyle transition in recent days. Consequently, obesity has often been found paradoxically coexisting with under nutrition in different parts of the country. Adolescents are important future human resources and their health must be ensured. Because any negative health impact in childhood and adolescence eventually leads to an adult onset of chronic disease that in turn reduces life expectancy and quality of the life. As unhealthy body composition is an established risk factor for many non communicable diseases, identifying accurate ways to assess body composition, in particular body fat, is very important. Anthropometry, widely used traditional technique and impedance, a relatively new one are such examples of body composition measurement techniques. Present study has focused to find out the association, if any, between the values of body fat obtained from anthropometric and impedance techniques in Bengalee adolescent females receiving Bharatnatyam type of Indian classical dance training. It has been found that the trainee adolescent dancers have favorable body composition values. It has also been found that no significant difference ($P > 0.05$) exists between body fat values obtained from anthropometry and impedance method. Moreover a significant ($P < 0.05$) positive correlation ($r=0.98$) has been found between the body fat values obtained from the two techniques. Based on the relationship a new regression equation was developed and test retest validity was carried out.

Keywords: Body composition; Traditional method; Under nutrition; Overweight; Physical activity.

Introduction

Maintaining a healthy body weight and level of body fatness is an essential prerequisite for a healthier and longer life. Overweight and underweight individuals with body fat levels falling at or near the extremes of the body fat continuum are likely to have serious health problems; that can reduce life expectancy and threaten the quality of life. Overweight individuals with a high fat mass have a higher risk of a range of adverse health outcomes, including type

2 diabetes, hypertension, stroke, impaired physical functioning and higher rates of mortality[13] on the other hand, underweight individuals with very low body fat levels tend to be malnourished and have a relatively high risk of fluid-electrolyte imbalances, renal and reproductive disorders, osteoporosis and muscle wasting.[23] For predisposition of overweight or underweight, generally body fat plays the crucial role; therefore not only the body weight, but also the body fat measurement technique plays an important

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role in determining the health status of any individual including children and adolescents. The measurement of change in adiposity in children is challenging because of the effects of maturation and growth on lean muscle mass, fat mass, and hydration status.[22] Adolescence, characterized by an exceptionally rapid rate of growth resulting in the transition from childhood to adulthood occupies a crucial period of life[31] and maintenance of good health in adolescence is of great importance. But unfortunately it that has been neglected for many years has attracted global attraction in the last decade only.[10] Generally from adolescence the level of physical activity decreases especially in females and they start to lead a more or less sedentary life. As obesity and under nutrition both have deleterious effect on the normal health, close and frequent monitoring by different practical methods to assess body composition in particular to estimate body fat and taking timely preventive measures will be an effective approach in dealing with the problem.[19] Body composition can be estimated by numerous techniques including hydrodensitometry, Air Displacement Plethysmography, dual-energy X-ray absorptiometry (DEXA)[2] etc; most of these methods are sophisticated, time consuming and are not easily accessible; therefore performing these techniques in large scale studies are difficult whereas anthropometric technique is a traditional and widely used method. On the other hand, impedance, a newer technique, is relatively rapid and suitable for field studies. Limited data describe the ability of the technique to accurately assess body fat, there is scarcity of information regarding pediatric cohort. Therefore, present study has been planned with objectives to find out the association between the values of body fat estimated by anthropometric and impedance techniques, the trend of relationship between body fat values and other body composition indices, develop new equation for body fat estimation and the study has

been conducted in Bengalee adolescent females engaged in physical activity, specifically receiving training in Bharatnatyam dance, which is an enjoyable form of in physical activity in females.

Methods

Initially educational institutions of Hooghly district in the Indian state of West Bengal were approached for getting access to individuals for carrying out the study. Prior to the study, the head of the institutions, the individuals and their parents/guardians were informed about the aim of the study and the procedural requirement of the investigation before requesting them to permit the children to take part in the study. The present cross sectional study involved 54 Bengalee female adolescents constituting the Study Group (SG), selected by simple random sampling with the criteria for inclusion as residing in Hooghly District for at least 10 years with mother tongue being Bengali, presence of regular menstrual cycle since menarche (self reported) for at least 1 year, receiving Bharatnatyam dancing training for at least a period of three years with an average half an hour practicing time, and absence of any chronic illness (self - reported). The age of the individuals ranged between 14 to 16 years which falls within the WHO defined criteria for being considered as adolescents.[32] Adolescents were excluded if they had any physical impairment that precluded anthropometric evaluations or used any medication that might impact the body growth. On the scheduled day, arranged on mutual convenience, measurements were obtained. Initially the basic information like age in complete years, age at menarche, duration of daily activities (e.g. school hours, study time, TV viewing time, dance practicing time, sleeping time etc) and eating habits were recorded in the predesigned schedule. The information about number of family

members, parental education, occupation and monthly family income were also collected for determining socioeconomic status of the individuals.[30] Basic anthropometric measurements like body height, body weight, waist circumference, and hip circumference were taken. BSA, BMI[16] and waist to hip ratio were calculated. For defining overweight and obese WHO BMI classification for children was followed. Body fat percentage was estimated from anthropometric measurements using age and sex specific equation for children[11] and also following impedance technique.[7] Subjects removed socks, shoes, and any metal jewelry before measurement and were advised to refrain from exercise and food consumption one hour prior to testing. Procedure followed in the present study was in accordance with the ethical standards. From percentage values, fat mass was calculated; fat-free mass was also calculated. All measurements were taken in the morning hours with ambient temperature around 25°C- 27°C. Standard descriptive statistics (arithmetic mean and standard deviation) were found out for directly measured and derived variables. One way ANOVA was performed to find out whether there is any significant difference exists between the fat mass values obtained from two methods of body fat estimation. Pearson's Correlation

Table 1: Physical and Physiological characteristics of the Study group

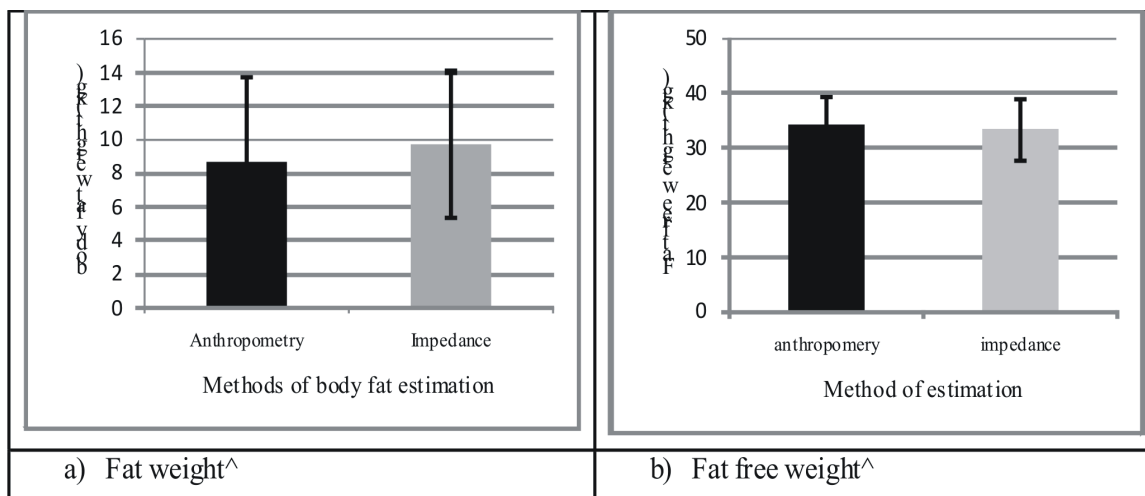
Variables	Study Group
Body height (cm)	151.9 ± 5.87
Body weight (kg)	43.0 ± 9.65
BSA (m ²)	1.3 ± 0.14
BMI (kg.m ⁻²)	18.5 ± 3.95
WC (cm)	64.2 ± 9.12
WHR	0.77 ± 0.056

coefficient (r) was found out to measure the strength of association between the fat mass values obtained from two methods of body fat estimation. Prediction equation for body fat values from anthropometric scores was developed. 51 Bengalee female school students of comparable age, socioeconomic and ethnic background were similarly randomly selected to constitute the Validation group (VG). Body fat mass values of VG individuals were predicted using the prediction equation developed. Suitability of the prediction equation was studied using Test-retest correlation. Data were analyzed with significance set at P <0.05.

Results

Present study was conducted on 54 Bengalee adolescent females constituting Study Group (SG); the physical and

Figure 1: Comparison between two methods of body fat estimation in adolescent females



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