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Anthropometric characteristics, somatotyping and body composition of Foot Ball and basketball players

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Abstract:

The purpose of the study was to compare the anthropometric characteristics and somatotype of the Allahabad University's male basketball players and Foot Ball players. Sixty three sportspersons (Foot Ball=36 and basketball=27) of age group 18-25 years were selected from different colleges affiliated to Allahabad University, U.P., India. All the participants were assessed for height, weight, breadths, girths and skin fold thickness. An independent samples t-test revealed that basketball players had significantly higher height ($p<0.01$), weight ($p<0.01$) and body surface area ($p<0.01$) as compared to Foot Ball players. The basketball players were also found to have significantly greater biceps ($p<0.01$) and suprailliac ($p<0.01$) skin fold thicknesses, calf circumference ($p<0.05$), percent body fat ($p<0.01$), total body fat ($p<0.01$), fat

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free mass ($p<0.05$) and endomorphic component ($p<0.05$) as compared to Foot Ball players. Foot Ball players had significantly greater body density ($p<0.01$) as compared to basketball players. The basketball and Foot Ball players of this study were found to have higher percentage body fat with lower body height and body weight than their international counterparts. Further investigations are needed on the above studied variables along with fitness and physiological variables to assess relationships among them and with performances in Foot Ball and basketball.

Key words: Anthropometric characteristics, basketball, body composition, somatotyping, Foot Ball.

INTRODUCTION

Foot Ball and basketball are among the world's popular sports, played practically in every nation at varying levels of competence**.** Successful participation in these sports requires from each player a high level of technical and tactical skills and suitable anthropometric characteristics.All ball games require comprehensive abilities including physical, technical, mental, and tactical abilities. Among them, physical abilities of the players are more important as these have marked effects on the skill of players and the tactics of the teams because ball games require repeated maximum exertion such as dashing and jumping (Tsunawake, 2003). Such physical abilities are important for both Foot Ball and basketball players to achieve higher levels of performance.

To evaluate these physical abilities, the anthropometric measurements, parameters of the body composition such as the percent body fat (% FAT), fat-free mass (FFM) and somatotype components are often used. Studies on the physical characteristics of the human body to-date

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indicate that the morphological characteristics of athletes successful in a specific sport differ in somatic characteristics from the general population. Basketball and Foot Ball players are typically taller than the players of other games (Rahmawati et al., 2007). Basketball and Foot Ball require handling the ball above the head; therefore, having a greater height is an advantage in these sports (Kansal et al., 1986). Higher body mass however, is a hurdle for Foot Ball players in achieving good jumping height (Bandyopadhyay, 2007). Various researchers

suggested that different body size, shape and proportions are beneficial in different physical activities (Malhotra et al., 1972; Kansal et al., 1986; Sidhu et al., 1996). Several studies on the anthropometric characteristics and somatotype of basketball and Foot Ball players have been reported in literature (Fleck et al., 1985; Hakkinen, 1993; Hosler et al., 1978; Spence et al., 1980; Sallet et al., 2005; Apostolidis et al., 2003; Gualdi and Zaccagni, 2001; Pelin et al., 2009; Morques and Marinho, 2009; Gabbett, 2008); however, similar studies in the context of India are limited. The present study has been conducted on Indian university Foot Ball and basketball players to

evaluate their selected physical characteristics along with somatotype thus fills up already existing void of literature in Indian concern.

Table 1. Physical parameters of the Foot Ballers and basketballers.

Variables	**Basketballers (N=27)**		**Foot Ballers (N=36)**		**t-Value**
	Mean	**SD**	**Mean**	**SD**	

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Height (cm)	187.44	5.19	183.25	6.15	2.85**
Weight (kg)	79.40	7.70	73.02	7.58	3.28**
BMI	22.63	2.33	21.78	2.35	1.41
BSA	2.04	0.09	1.94	0.10	3.95**

** indicates $p<0.01$.

Objectives of the study

(1) To study the anthropometric characteristics and body composition of basketball and Foot Ball players.

(2) To study the body types of the basketball and Foot Ball players.

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MATERIALS AND METHODS

The present study was conducted on 63 young male subjects (Foot Ball =36 and basketball = 27) of age group 18-25 years. The subjects were randomly selected from the different colleges affiliated to Allahabad University, U.P., India irrespective of their caste, religion, dietary habits and socioeconomic status. The age of each subject was calculated from the date of birth as recorded in his institute. The height of the subjects was measured with anthropometic rod to the nearest 0.5 cm (HG- 72, Nexgen ergonomics, Canada). The weight of subjects was measured by using portable weighing machine to the nearest 0.5 kg. Body surface area (BSA) and body mass index (BMI) were calculated by the following formulae:

BSA (m2) = (Body mass in kg) 0.425 ´ (Body Height in cm) 0.725 ´ 0.007184 (DuBois and DuBois, 1916) BMI (Kg/m2) = (Body mass in kg)/ (Stature in m2) (Meltzer et al., 1988)

Skin fold thickness measurements of the subjects were measured by slim guide skin fold calliper. Girths were taken with the steel tape to the nearest 0.5 cm. Widths of body parts were measured by using sliding calliper with digital readout. Somatotype was determined from the following equations (Heath and Carter, 1990):

(i) Endomorphy = - 0.7182 + 0.1451(X) - 0.00068 (X)2 + 0.0000014 (X)3

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Where

X = sum of supra-spinale, subscapular and triceps skin fold and corrected for stature by multiplying the sum of skin folds by 170.18/Body Height in cm

(ii) Mesomorphy = (0.858 ´ Humerus width) + (0.601 ´ Femur width) + (0.188 ´ Corrected arm girth) + (0.161 ´ Corrected Calf Girth) - (Body Height ´ 0.131) + 4.5

Where

Corrected Arm Girth = Arm girth-Biceps skin fold, Corrected Calf Girth = Calf Girth-Calf Skin fold.

(iii) Ectomorphy = (HWR ´ 0.732)-28.58

[Where HWR = (Body Height in cm)/ (weight in kg) 0.33]

Percentage body fat as estimated from the sum of skin folds was calculated using equations of Siri (1956) and Durnin and Womersley (1974). The regression equations for the prediction of body density from the log of the sum of skin fold thickness at four sites in mm are as follows:

For 17 to 19 years age group:

Body Density (gm/cc) = 1.1620-0.0630 (X) (Durnin and Womersley, 1974)

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Where

X = log (Biceps + Triceps + Subscapular + Suprailliac).

% Body Fat = [4.95/ Body density-4.5] ´ 100 (Siri, 1956)

Total Body Fat (kg) = (% Body fat/100) ´ Body mass (kg)

Lean Body Mass (kg) = Body mass (kg) – Total body fat (kg)

Statistical analyses

Values are presented as mean values and SD. Independent samples t tests were used to test if population means estimated by two independent samples differed significantly. Data was analyzed using SPSS Version 16.0 (Statistical Package for the Social Sciences, version 16.0, SSPS Inc, Chicago, IL, USA).

RESULTS

Table 1 shows the descriptive statistics for physical parameters of Foot Ball and basketball players. Mean body height of basketball players was significantly higher than those of Foot Ball players ($p<0.01$). Basketball players also had significantly greater weight ($p<0.01$) as compared to Foot Ball players. No statistically significant difference was observed between the basketball players and the Foot Ball players in relation to BMI. BSA was significantly higher in basketball players than those of Foot Ball players ($p<0.01$).

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In Table 2 descriptive statistics for skin fold measurement values are depicted. Both biceps ($p<0.01$)

Table 2. Different skin fold measurements of the Foot Ballers and basketballers.

Variables	Basketballers (N=27)		Foot Ballers (N=36)		t-value
	Mean	SD	Mean	SD	
Biceps (mm)	4.88	1.25	4.00	1.17	2.89**
Triceps (mm)	7.48	1.31	8.69	3.43	1.73
Subscapular (mm)	12.55	3.04	11.38	3.66	1.34
Suprailliac (mm)	14.77	2.96	9.03	5.45	4.94**
Calf (mm)	13.07	3.57	11.19	3.97	1.94

** indicates $p< 0.01$.

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Table 3. Diameters and circumferences of the Foot Ballers and basketballers.

Variables	Basketballers (N=27)		Foot Ballers (N=36)		t-value
	Mean	SD	Mean	SD	
Bi-humerus diameter	69.77	3.45	70.45	6.49	0.49
Bi-femur diameter	102.66	5.89	100.03	6.99	1.58
Upper arm circumference	27.00	1.33	26.33	1.88	1.56
Calf circumference	36.66	2.28	35.50	2.10	2.09*

* indicates $p < 0.05$.

Table 4. Different components of body composition of the Foot Ballers and basketballers.

Variables	Basketballers (N=27)		Foot Ballers (N=36)		t-value
	Mean	SD	Mean	SD	

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Body density	1.062	0.004	1.068	0.009	3.13**
% BF (kg)	15.95	2.12	13.30	4.01	3.10**
TF (kg)	12.67	2.11	9.88	3.75	3.46**
FFM (kg)	66.72	6.59	63.13	5.39	2.37*

* indicates $p < 0.05$. ** indicates $p < 0.01$.

and suprailliac skin folds ($p<0.01$) measurements were observed to be significantly higher for basketball players than Foot Ball players. The differences observed between the two groups for triceps, subscapular and calf skin fold measurement were not statistically significant.

Descriptive statistics of diameters and circumferences are shown in Table 3. There was no significant difference between basketball players and Foot Ball players in bihumerus and bi-femur diameters. Since arm and calf circumference measurements reflect the bone, muscle

and fat mass of the limbs, these two variables have also been evaluating. No significant difference was observed in upper arm circumference between the two groups, but calf circumference ($p<0.05$) was significantly higher for basketball players when compared to Foot Ball players.

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Descriptive statistics for different components of body composition are presented in Table 4. Foot Ball players were found to have significantly greater body density ($p<0.01$) when compared to basketball players. The basketball players were observed to have significantly

higher percent body fat ($p<0.01$) and total body fat ($p<0.01$) when compared to Foot Ball players. Fat free mass (FFM) was also significantly greater in basketball players ($p<0.01$) than those of Foot Ball players. Table 5 summarizes the descriptive statistics of the somatotyping components. Endomorphy values of basketball players were significantly higher ($p<0.01$) than those of Foot Ball players. In relation to mesomorphy and ectomorphy, no significant differences were observed between the two groups.

Table 5. Somatotyping of the Foot Ballers and basketballers.

Variables	Basketballers (N=27)		Foot Ballers (N=36)		t-value
	Mean	SD	Mean	SD	
Endomorphy	3.21	0.56	2.68	1.05	2.37*
Mesomorphy	2.91	1.14	3.06	1.11	0.51
Ectomorphy	3.40	1.30	3.57	1.41	0.50

* indicates $p < 0.05$.

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Conclusion

There were significant differences in most of the anthropometric characteristics between the basketball players and Foot Ball players. On average, the basketball players were taller and heavier than the Foot Ball players. The basketball players also had higher body surface area, calf circumference and FFM than the Foot Ball players. But the biceps and suprailliac skin folds, percentage body fat, total body fat and endomorphy were also higher in basketball players when

compared to Foot Ball players whereas the body density was greater among the Foot Ball players. More data would be helpful on the above studied variables along with fitness and physiological variables to assess relationship among them and with performance in Foot Ball and basketball.

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