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Anthropometric Characteristics, Somatotyping and Body Composition of Volleyball and Basketball Players

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Introduction

Volleyball 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 Such physical abilities are important for both volleyball 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 indicate that the morphological characteristics of athletes successful in a specific sport differ in somatic characteristics from the general population. Basketball and volleyball players are typically taller than the players of other games. Basketball and volleyball require handling the ball above the head; therefore, having a greater height is an advantage in these sports. Higher body mass however, is a hurdle for volleyball players in achieving good jumping height Various researchers suggested that different body size, shape and proportions are beneficial in different physical activities

Objectives of the study

1. To study the anthropometric characteristics and body composition of basketball and volleyball players.
2. To study the body types of the basketball and volleyball players.

Material and methods

The present study was conducted on 63 young male subjects (volleyball =36 and basketball = 27) of age group 18-25 years. The subjects were randomly selected from the different colleges affiliated to Gujarat University, Ahmadabad, and Gujarat, 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 anthropometrics 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 0.5kg. Body surface area (BSA) and body mass index (BMI) we recalculated by the following formulae:

Where

X = sum of supra-spinal, sub scapular and triceps skin fold and corrected for stature by multiplying the sum of skin folds by170.18/Body Height in cm (ii) Mesomorphy = (0.858 X Hummers width) + (0.601 ´ Femur width) + (0.188 X Corrected arm girth) + (0.161 Corrected Calf Girth) - (Body Height X 0.131) + 4.5

For 17 to 19 years age group:
Body Density (gm/cc) = 1.1620-0.0630 (X) (Durnin and Womersley, 1974)

For 20 to 29 years age group:
Body Density (gm/cc) = 1.1631-0.0632 (X) (Durnin and Womersley, 1974)

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 In,).

Table 1
Physical parameters of the volleyballers and basketballers

Variables	Basketballers (N=27) Mean	SD	Volleyballers (N=36) Mean	SD	t- Value
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	0.94	3.95**

** indicates p<0.01.

Table 2
Different skin folds measurements of the volleyballers and basketballers.

Variables	Basketballers (N=27) Mean	SD	Volleyballers (N=36) Mean	SD	t- Value
Biceps (mm)	4.88	1.25	4.00	1.17	2.89**
Triceps (mm)	7.48	1.31	8.69	3.43	1.37
Subscapular (mm)	12.55	3.04	11.38	3.66	1.34
Suprailliac (mm)	14.77	2.96	9.03	5.45	4.49
Calf (mm)	13.07	3.57	11.19	3.97	1.94

** indicates p< 0.01.

Table 3
Diameters and circumferences of the volleyballers and basketballers

Variables	Basketballers (N=27) Mean	SD	Volleyballers (N=36) Mean	SD	t- Value
Bi-hummers 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	2.56

* indicates p< 0.05.

Table 4
Different components of body composition of the volleyballers and basketballers

Variables	Basketballers (N=27) Mean	SD	Volleyballers (N=36) Mean	SD	t- Value
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.

Results:

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

In Table 2 descriptive statistics for skin fold measurement values are depicted. Both biceps ($p<0.01$) and suprailliac skin folds ($p<0.01$) measurements were observed to be significantly higher for basketball players than volleyball players. The differences observed between the two groups for triceps, sub scapular and calfskin 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 volleyball players in bihumerusand 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 volleyball players.

Table 5
Somatotyping of the volleyballers and basketballers

Variables	Basketballers (N=27) Mean	SD	Volleyballers (N=36) Mean	SD	t- Value
Endomorph	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 $p < 0.05$.

Discuss:
In the present study the anthropometric characteristics of the athletes have not been evaluated in relation to their performance, but were instead compared with each other. This study indicates the existence of differences among the players of different games. The overall results Show that basketball players were taller and heavier as

Compared to the volleyball players Similar findings were found in the studies on Malaysian male athletes (Nadir et.al., 1996) and Turkish male athletes (Pelin et al., 2007) which reported that the height of basketball players was greater when compared to other sports groups. The basketball players were also reported to have greater body fat percentage, skin fold measurements, FFM and endomorphic component as compared to volley ballplayers. These results show that basketball player's were taller, heavier and fatter as compared to their counterparts. On average, the basketball players of the present study are considerably taller and heavier than the State level players studied by Sodhi (1976) and top-ranking Indian basketball players (Sodhi, 1980). On the other hand, they are considerably shorter and lighter when compared to their international counterparts (Salletet al., 2005; Apostolicism et al., 2003). Because the basketball and volleyball require handling the ball above the head, having a greater height is an advantage in basketball and volleyball games (Kansal et al., 1986).Lower height of Indian basketball players might be the one of the reason for their dismal performances at the international level.

The volleyball players in the present study have greater height and weight than the volleyball players from West Bengal studied by Bandyopadhyay (2007) whereas they are shorter and lighter than their international counterparts (Guild and Mascagni, 2001;Morques and Merino, 2009; Gobbet, 2008).The present data regarding the % fat of the players is approximately accords with the proposal that percentage fat value among basketball and volleyball players should be within the range of 6-15% (Wilmore and Costill,1999).The basketball players in the present study have higher percentage body fat than the elite level Greek basketball players (Sallet et al., 2005) and French professional basketball players (Apostolicism et al., 2003). The volleyball players have higher body fat percentage than the volleyball players from West Bengal studied by Bandyopadhyay (2007). An increased fat weight will be detrimental in volleyball and basketball because in these sports, the body is moved against the gravity (e.g. volleyball spiking, blocking) or propelled horizontally (assign basketball) as the additional body fat adds to the eight of the body without contributing to its force production or energy producing capabilities. Higher fat free mass was reported among the overseas players than the Indian volleyball and basketball players who will therefore achieve better performance. Greater fat content and lower FFM among Indian volleyball and basket ballplayers act as a hindrance in their performance. This might be due to lower training levels and thus low level of physical fitness. Constituents of diet may also be one of the reasons for greater fat content and lower FFM among the Indian players.