

STUDY OF BODY COMPOSITION AMONG ATHLETES OF BALL GAMES

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Abstract:

The present investigation has been conducted on 300 athletes with an aim to find out differences in body composition among the ball games namely basketball, football, handball, hockey and volleyball. The data for the present study were collected during the various inter colleges of Himachal Pradesh University in the session 2012-2013. Each athlete was tested for various anthropometric measurements necessary for estimation of bone mass, muscle mass and body fat percentage. The muscle and bone masses of each athlete have been estimated using Matiegka's (1921) method. Body density has been estimated by using Durnin and Womersley's (1974) equation. Further body fat percentage has been estimated by using formula devised by Brozek et al (1963). Analysis of variance (ANOVA) was used to find out significant difference among the athletes of ball games. In case of any significance of mean difference, Scheffee's post hoc 't' test was applied for further analysis. From the findings, among the athletes of ball games studied for this investigation, Basketballers have maximum average bone development (10.29 kg) and handballers have the lowest with (10.02 kg). Highest muscle development has been found with volleyballers (29.07 kg) and hockey players were the least muscle developed athletes with (26.57 kg) among the athletes of ball games. Volleyballers have also shown the highest fat possession (11.09%) and the basketballers with lowest fat percentage (8.41%) among the athletes of ball games.

KEYWORDS:

Bone mass, muscle mass and fat percentage.

INTRODUCTION

Performances in sports competitions at various levels have become a sign of prosperity, development and innovations of new techniques in the field of sports. It is gaining momentum day by day and high level research in the field is going on to explore the possibilities of investigating the ingredients responsible for the enhancement of sports performance and facilitating the talent selection for competitions (Clayne & Ganth, 1975). Anthropometric characteristics of athletes determine the success in particular sports events in various ways. The knowledge of these characteristics is necessary to establish their importance for the success in competitive sport (Lohman, et al., 2010). The research on the influence of these characteristics in sporting games is of particular complexity, because the success in the game depends, among other things, on how the individual characteristics of some players fit into the whole, thus creating a coherent team (Vijaya Lakshmi, 2005).

Studies of body composition in certain sports indicated that athletes who were very lean but heavy because of a well-developed musculature were superior in performance in certain competitive sports activities, such as football, weight lifting and shot put (Bullen, 1971). Athletes competing in weight classified sports (e.g. rowing, boxing, wrestling, Judo) should theoretically be more competitive when their

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muscle weight is maximum and fatness is minimum for a given weight classification. Hence 'over fat' athletes hovering on there-fore borderline of a particular weight category, may have the opportunity of losing fat and there competing in a more appropriate weight category (Neil P.C. 1991). On the other, long-distance swimming, water polo and synchronized swimming are sports where certain 'Optimal' level of body fat is required. The low density of fat gives it buoyancy characteristics, which is advantageous in their respected sports. The data obtain from champion performers permit as to speculate that the highly trained runners may achieve greater success if his body fat is less than 5% of body weight (Costill, D.L. 1981). Frank Shorter, 1972 Olympic marathon champion and 1976 Olympic silver medalist revealed a body fat content of only 1.6% of body weight. The uses of skin fold and body composition techniques on athletes have been largely directed towards estimating the amount of fat in the body. The important of fat as a tissue in athletes lies in its paucity rather than its abundance (Carter & Yuhasz. 1984).

From these examples, it is evident that the examination of body composition, which includes the determination of muscle, bone and fat weight among athletes, is very essential. The information collected on athletes of ball game of Himachal Pradesh University can be used for monitoring the training programs as well as counseling, providing information about the choice for a particular sport.

METHODOLOGY

To achieve the purpose of this study 300 athletes of ball games i.e. basketball (n=60), football (n=60), handball (n=60), hockey (n=60) and volleyball (n=60), who participated in the various inter colleges of Himachal Pradesh University during the session 2012-2013 were randomly selected and used as subjects in this study. Age group ranged from 18-25 years. Each athlete was tested for various anthropometric measurements necessary for estimations of bone mass, muscle mass and body fat percentage. A set of anthropometric measurements, which included height, body weight, bicondylar widths of humerus, femur, wrist and ankle, the circumference of upper arm, forearm, thigh and calf and the skin folds at biceps, triceps, forearm, thigh, calf (medial), supra-iliac and subscapular sites were taken on each subject by following standard technique of Heath and Carter (1967). The muscle and bone masses of each athlete have been estimated using Matiegka's (1921) method. The body density has been estimated by using Durnin and Womersley's (1974) equation. Further body fat has been estimated by using formula devised by Brozek et al 1963). To test the significance of mean difference among the athletes of ball games namely basketball, football, handball, hockey and volleyball, analysis of variance (ANOVA) was used. In case of any significance of mean difference on the criterion measure to find out which pair of group was better among the other, the Scheffee's post-hoc't' test was applied.

RESULT & DISCUSSION

The data collected by adopting above procedure were statistically analyzed. The results were presented in the following ways.

Table I: Mean, standard deviation and F values of age, height, weight, bone mass, muscle mass and fat percentage among the athletes of ball games

Parameters	Basketball (n=60)	Football (n=60)	Handball (n=60)	Hockey (n=60)	Volleyball (n=60)	F value
	Mean-S.D	Mean-S.D	Mean-S.D	Mean-S.D	Mean-S.D	
Age	20.38.5 – 1.53	20.02 – 1.27	19.92 – 1.41	19.68 – 1.78	19.88 – 1.27	1.81
Height	170.97 – 6.38	168.87 – 6.13	170.62 – 6.89	169.78 – 6.31	173.38 – 4.88	8.57**
Weight	63.03 – 8.02	60.47 – 7.42	60.52 – 7.37	60.38 – 8.84	64.13 – 6.59	4.92**
Bone Mass	10.29 – 1.17	10.08 – 1.19	10.02 – 1.39	10.11 – 1.26	10.28 – 1.06	1.13
Muscle Mass	28.47 – 3.62	27.11 – 4.03	26.90 – 5.11	26.57 – 4.68	29.07 – 3.80	10.04**
Fat Percentage	8.41 – 3.46	10.82 – 3.97	9.36 – 3.29	8.79 – 4.01	11.09 – 2.63	9.76**

Significant at .05 level; ** Significant at .01 level

Table I represents the comparison of mean, standard deviation and level of significance of age, height, weight, bone mass, muscle mass and fat percentage among athletes of ball games. Basketballers were found to be the oldest with an average age of (20.38 yrs) and hockey players were found to be youngest among the athletes of ball games with an average age of (19.68 yrs). The difference was found to be statistically insignificant. Volleyballers were tallest among all athletes with average height (173.38 cm) and

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the hockey players were the shortest athletes with (168.87 cm). The difference was found to statistically significant, at the level of $P < .01$. Volleyballers were heaviest among all athletes with average weight (64.13 kg) and the hockey players were the lightest athletes with (60.38 kg), and difference was found to be statistically significant, at the level of $P < .01$. Volleyballers have maximum bone development (10.29 kg) and handballers have the lowest with (10.02 kg), and difference was found to be insignificant. Highest muscle development has been found with volleyballers (29.07 kg) and hockey players were the least muscle developed athletes with (26.57 kg) among the athletes of ball games. The difference was found to be statistically significant, at the level of $P < .01$. Volleyballers have shown the highest fat possession (11.09%) and the hockey players with lowest fat percentage (8.79%) among the athletes of ball games. The difference was found to be statistically significant, at the level of $P < .01$.

Table II: Post-hoc 't' values of age, weight, muscle mass and fat percentage among ball game athletes

Parameters	t value									
	BB Vs FB	BB Vs HB	BB Vs HOK	BB Vs VB	FB Vs HB	FB Vs HOK	FB Vs VB	HB Vs HOK	HB Vs VB	HOK Vs VB
Height	2.51*	.39	2.41*	2.65**	1.92	.10	4.96**	2.02*	3.04**	5.06**
Weight	2.51*	2.24*	2.36*	.99	.03	.08	3.27**	.12	3.23**	3.35**
Muscle Mass	2.81**	3.24**	3.93**	1.22	.43	1.12	4.04**	.68	4.47**	5.16**
Fat Percentage	4.42**	1.74	.71	4.92**	2.68**	3.71**	.50	1.03	3.18**	4.22**

BB - Basketball, FB- Football, HB-Handball, HOK- Hockey, VB- Volleyball
 *Significant at .05 level; ** Significant at .01 level

From table II, it was observed that there was a significant mean difference between the volleyballers and hockey players ($t=5.06$; $p < .01$), having the maximum value followed by footballers and volleyballers ($t=4.96$; $p < .01$), handballers and volleyballers ($t=3.04$; $p < .01$), basketballers and volleyballers ($t=2.65$; $p < .01$), basketballers and footballers ($t=2.51$; $p < .05$), basketballers and hockey players ($t=2.41$; $p < .05$) and then the handballers and hockey players ($t=2.02$; $p < .05$), in height, but insignificant mean difference was observed between footballers and handballers, followed by basketballers and handballers, and then footballers and handballers. In body weight, it was clearly noticed that there was significant mean difference between volleyballers and hockey players ($t=3.35$; $p < .01$), having the maximum value followed by volleyballers and footballers ($t=3.27$; $p < .01$), volleyballers and handballers ($t=3.23$; $p < .01$), basketballers and hockey players ($t=2.36$; $p < .05$), basketballers and footballers ($t=2.51$; $p < .05$) and then the basketballers and handballers ($t=2.24$; $p < .05$), but insignificant mean difference was observed between volleyballers and basketballers, followed by handballers and hockey players, footballers and hockey players, and then footballers and handballers. In muscle mass, there was significant mean difference between the volleyballers and hockey players ($t=5.16$; $p < .01$), having the maximum value followed by handballers and hockey players ($t=4.47$; $p < .01$), volleyballers and footballers ($t=4.04$; $p < .01$) basketballers and hockey players ($t=3.93$; $p < .01$), basketballers and handballers ($t=3.24$; $p < .01$), and then basketballers and footballers ($t=2.81$; $p < .01$), but insignificant mean difference was observed between volleyballers and basketballers, followed by footballers and hockey players, handballers and hockey players, and then handballers and footballers. In fat percentage, there was significant mean difference between the basketballers and volleyballers ($t=4.92$; $p < .01$), having the maximum value followed by basketballers and footballers ($t=4.42$; $p < .01$), volleyballers and hockey players ($t=4.22$; $p < .01$), footballers and hockey players ($t=3.71$; $p < .05$), handballers and volleyballers ($t=3.18$; $p < .05$), and then the footballers and handballers ($t=2.68$; $p < .01$), but insignificant mean difference was observed between basketballers and handballers, followed by handballers and hockey players, basketballers and hockey players and then footballers and volleyballers.

DISCUSSION

It has been found that basketballers were the oldest and hockey players were the youngest among the athletes of ball games. However there was no significant difference among the athletes of ball games in age. This shows that athletes of ball games were of almost same age.

The volleyballers were tallest and footballers were shortest among the athletes of ball games. The results of the present study were coincided with the results of Hirata (1966). He found that volleyballers and

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basketballers were taller than rest of group. There was significant difference among the athletes of ball games in height. Further, on applying post hoc t test, it was found that volleyballers were significantly taller than basketballers, footballers, handballers and hockey players, respectively. Basketballers and handballers were found significantly taller than hockey players. Similarly basketballers were also found significantly taller than footballers.

The volleyballers were heaviest and hockey players were lightest among the athletes of ball games. However there was significant difference among the athletes of ball games in weight. The results of Kaur (2000) do not correspond with the result of the present study. Kaur was of the view that basketballers were heavier than other groups. Further, on applying post hoc t test, it was found that volleyballers were significantly heavier than hockey players, footballers and handballers, respectively. Similarly, basketballers were found significantly heavier than footballers, handballers and hockey players.

Basketballers have maximum bone development and handballers have the lowest. Highest muscle development has been also found in volleyballers and hockey players were the least muscle developed athletes among the ball games. Volleyballers have shown the highest fat possession and the basketballers show lowest fat percentage among the athletes of ball games. There was significant difference among the ball games athletes in muscle mass and body fat percentage. Finding of the researcher were in agreement with Musaiger et al. (1994). They reported that there were significant differences in body composition among athletes of team sports. Further, on applying post hoc t test for muscle mass, it was found that volleyballers were possessed significantly greater muscle mass than footballers, handballers and hockey players. Similarly, Basketballers possessed significantly greater muscle mass than footballers, handballers and hockey players. For fat percentage, it was found that volleyballers possessed significantly greater fat percentage than basketballers, handballers and hockey players. Similarly footballers also possess significantly greater fat percentage than basketballers, handballers and hockey players.

CONCLUSIONS

Among athletes of ball games studied for this investigation, basketballers were found to be oldest (20.38 yrs) and hockey players were youngest (19.68 yrs) among the athletes of ball games. In case of height and weight, the volleyballers were tallest (173.38 cm) and heaviest (64.13 kg), and footballers were shortest (168.87 cm) and hockey players were lightest (60.38 kg), respectively among the athletes of ball games. Basketballers have maximum average bone development (10.29 kg) and handballers have the lowest with (10.02 kg). Highest muscle development has been found with volleyballers (29.07 kg) and hockey players were the least muscle developed athletes with (26.57 kg) among the athletes of ball games. Volleyballers have also shown the highest fat possession (11.09%) and the basketballers with lowest fat percentage (8.41%) among the athletes of ball game. Statistically, it has been observed that athletes of ball games differ significantly from each other in height, weight, muscle mass and body fat percentage.

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