

Original Article

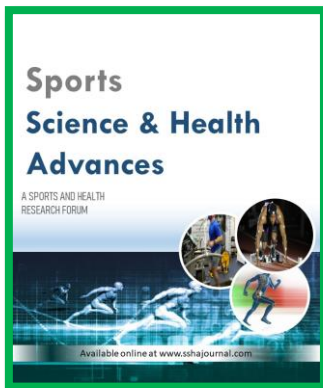
Body composition Feature among different ball game players: A comparative study

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Abstract

Nowadays, human body is the most popular research topic all over the world. The purpose of this study is to compare the body composition characteristics among athletes from various ball games, including soccer, basketball and handball to identify sport-specific physiological adaptations and potential performance advantages.

A total of 30 male athletes (10 from each sport) aged 20-25 years participated in the study. During the body composition measurement, we used a stadiometer scale for measuring height, a digital weighing machine for measuring body weight, and a skinfold caliper for measuring fat and fat percentage. The data were analyzed using one-way ANOVA to determine significant differences between the groups. Body fat percentages are not significantly different for all three ball game players. Basketball players total body fat is significantly heavier than that of football players, but there is no significant difference between basketball and handball players. The body mass of football players is significantly lower than that of basketball players; the body mass of handball and basketball players is not significantly different. Compared to football players, the basketball group's lean body mass was noticeably higher. The differences between basketball and handball players were negligible.

Keywords

Body Composition, Ball Games, Football, Basketball, Handball

Introduction

Numerous games are being developed frequently all around the world; some of them involve balls, while others do not. A game without a ball is called a non-ball games such as athletics, gymnastics, kabbadi, and having a ball is called a ball game, such as soccer, cricket, baseball, and basketball (Mukta, F.T.J et al 2024). The ball size, shape, weight material, as well as size of the court and size of the court are different (Mukta, F.T.J et al 2024). All game are called team sports and team sports are the ideal utility for satisfying the basic human need of motions, collaboration and competing (Pireva, A. 2019). It is also known that certain morphologic profile variances exist among players who maintain separate team positions in a variety of sports ball games (football, basketball, handball, volleyball, rugby, etc) (Hoare, 2000). The present study deign on football, handball and basketball players and those ball games are Olympic sports. Body composition has direct

impact on the players' sports related performance. Physical fitness, technique, tactic and training plane depends on athlete's body composition or structure.

Nowadays, human body is the most popular research topic all over the world (Arafat, M. Y. et al 2023). A prior study found that sports scientists all over the world are paying more attention to identifying an athlete's skill, limitations, and potential, as well as developing the most effective training regimens for them (Hadzicet al.,2012). The previous research attempted to determine if body type, body composition, and performance level were related (Bhatnagar et al., 1984; Bayios, 2006; Artioli et al., 2009; Hagberg et al., 2010; Kim et al., 2011). Athlete success has been linked to particular anthropometric features, body types, and composition (Heath & Carter 1990; Duquet & Carter 2001).

Anthropology is the method most frequently employed to assess body composition in general and among athletes (Pavlovic et al., 2021). Body weight, height, skin fold measurements, body circumference, and various body diameters are all considered anthropometric characteristics (AC), which define the dimensions of the human body and skeleton and enable individual or combined predictions of body composition, energy content, regional fat, body fat, and fat mass (Molla, 2017 & Rickta, J. F. et al 2024). The science of measuring the size, form, and proportions of the human body in a systematic manner is known as anthropometry. Certain anthropometric traits and body composition have been linked to improved running performance in elite athletes, according to several researches (Knechtle et al., 2008; Arrese et al., 2006).

Research on the physical features of the human body to date suggests that the morphological traits of athletes who excel in a particular activity differ from the general population in terms of somatic characteristics (Pireva, A 2019). Tanner makes the argument that an athlete's ability to compete at the highest level is objectively hampered by an improper body composition. Carter, who once examined the body composition of top athletes across a range of competitive ranks, highlights the parallels in body size and composition, noting that these similarities increase in direct proportion to an athlete's rising standing in the sport. This suggests that identifying a "sports type" is easiest when a group of elite players from the same sport are homogeneous (International Committee for the Standardization of Physical Fitness Tests & Larson, 1974).

To be effective, training process must consider both the current and targeted anthropometric status of players, on the one hand, and the game specific demands and desirable results, on the other (Barr et al., 1994).

There aren't many comparison studies looking at the anthropometric traits of athletes in Bangladesh, despite the fact that there are many such studies conducted globally. For this reason, the current study was designed to describe athletes' body composition from three popular sports—handball, basketball, and football—and look into any potential variations based on the degree of competition.

Methods

A total of thirty (30) male university students volunteered as participants for the present study. Out of them, 10 were football players (mean age: 24 ± 2 years, height: 169 ± 1 cm, and weight: 58 ± 9 kg.), 10 were basketball players (mean age: 21 ± 5 years, height: 176 ± 2 cm, and weight: 72 ± 2 kg), and the rest were handball players (mean age: 23 ± 6 years, height: 173 ± 7 cm, and weight: 65 ± 7 kg.), respectively. All the subjects used to stay in university students' hostels and had the experience of seven to ten years of practice age in their respective sports. During the body composition measurement, we used a stadiometer scale for measuring height, a digital weighing machine for measuring body weight, and a skinfold caliper for measuring fat and fat percentage.

Procedure of measuring Body Composition

The body composition of the subjects was assessed by measuring height, weight, and two skinfolds (triceps and subscapular). Every participant's height is measured by a stadiometer from head to foot. A digital weighing machine was used for body weight measurements in kg. The participant stands in a relaxed arm-hanging position, and the

triceps skinfold is measured at the upper arm mid-point mark on the posterior surface of the right upper arm.

Data analysis procedure

The obtained data, in the form of numerical scores, was analyzed using statistical procedures to get results and draw conclusions. The mean and SD were calculated as the descriptive statistics. An analysis of variance was used to find out the significance of the inter-group difference. The LSD test was used as a post hoc test to find out the exact location of differences wherever needed. The statistical calculation was done using the statistical software SPSS (version 25).

Results

Table 1 Mean and standard deviation (Sd) values of different elements of body composition for different ball game players

Group	Mean and Standard deviation values			
	Percentage of body fat	Body Weight (kg)	Total body fat (kg)	Lean body mass (kg)
Football	10.91 ± 3.22	58.90±6.20	6.51 ± 2.24	52.37 ± 4.87
Handball	12.87 ± 5.59	65.70±11.10	8.83 ± 5.31	56.86 ± 7.77
Basketball	15.74 ± 5.11	72.18±8.03	11.42 ± 8.83	60.76 ± 7.04

It is seen from Table 1 that the mean values of percentage of body fat for the football, handball, and basketball groups of subjects were 10.91 ± 3.22%, 12.87 ± 5.59%, and 15.74 ± 5.11%, respectively. Table 4 also indicated that the mean values of total body fat for the football, handball, and basketball groups of subjects were 6.51 ± 2.24kg, 8.83 ± 5.31 kg, and 11.42 ± 8.83kg, respectively. Table 4 also revealed that the mean values of lean body mass for the football, handball, and basketball groups of subjects were 52.37 ± 4.87kg, 56.86 ± 7.77 kg, and 60.76 ± 7.04kg, respectively.

Table 2 Multiple comparisons by LSD in total body fat

Group	Between Group	Mean difference	Std. Error	Significant
Football	Basketball	-4.914	1.825	.01
	Handball	-2.320	1.825	.21
Basketball	Football	4.914	1.825	.01
	Handball	2.594	1.825	.17
Handball	Football	2.320	1.825	.21
	Basketball	-2.594	1.825	.17

* The significant level at 0.05

Table 3 Multiple comparisons by LSD in lean body mass

Group	Between Group	Mean difference	Std. Error	Significant
Football	Basketball	-8.427	2.987	.00
	Handball	-4.526	2.987	.14
Basketball	Football	8.427	2.987	.00
	Handball	3.901	2.987	.20
Handball	Football	4.526	2.987	.14
	Basketball	-3.901	2.987	.20

* The significant level set at 0.05

It is seen from Table 2 that the basketball group of subjects was significantly heavier in total body fat than the football group of subjects. But there was no significant difference between the handball and basketball groups in total body fat.

It is seen from Table 3 that the basketball group of subjects was significantly heavier in lean body mass than the football group of subjects. But there was no significant difference between the handball and basketball groups in lean body mass.

Table 4 ANOVA test for testing significance of difference among mean values of all parameters

		Sum of squares	DF	Mean square	F	Significant	Remarks
Among Groups	Percentage of body fat	117.96	27	58.98	2.61	.09	Not significant
	Total body fat	120.86	27	60.43	3.63	.04	Significant
	Lean body mass	355.72	27	117.86	3.99	.03	Significant

* The significant level set at 0.05

It is seen from Table 4, that the different ball game players were homogenous in this parameter and statistically not significant. It also clear that there was significant difference in total body fat and lean body mass among different group of ball game players.

Discussion

Football, Basketball and Handball all the three ball games are Olympic listed sports. All the three ball game players need high level of physical condition and fitness for better performance. A trainer or a coach must be knowledge about the athlete's physical condition. The aim of present study to investigate the body composition in football, basketball and handball players.

In the body composition part, body fat percentages are not significantly different for all three ball game players. Basketball players total body fat is significantly heavier than that of football players, but there is no significant difference between basketball and handball players. The body mass of football players is significantly lower than that of basketball players; the body mass of handball and basketball players is not significantly different.

From a physiological perspective, body fat % is significant; a higher percentage is associated with an athlete's physical characteristics, particularly when it comes to maneuvering the body or specific body parts in space (Gil et al., 2007). In comparison to basketball and handball players, football players are smaller and lighter (Pireva, A. et al. 2019). Conversely, because they handle the ball above their heads, basketball players typically have taller statures. (Gaurav, V. et al., 2010). Based on NBA.com's accessible data, the average height of professional basketball players in 2018 and 2019 was 200.6 cm. Because they are taller than football players, basketball players are also probably heavier than the latter group.

In comparison to basketball and football players, handball players had a higher BMI index and a lower body height (Pireva, A. et al. 2019). The physical attributes of basketball, handball, and football players are notably different in terms of arm length, forearm length, hand length, tibia length, foot length, and thigh length (Kathayat L.B. et al. 2021). In comparison to basketball and handball players, football players are smaller and lighter (Pireva, A, 2019). In addition, compared to basketball players, handball players have a higher proportion of fat tissue (Pireva, A. 2019). A previous research study concluded that basketball players have superior body mass, body height than football and handball players (Lenjani N. et al. 2020). In the same study, it was also indicated that

handball players have heavier body mass and body height than football players (Lenjani N. et al. 2020). The present research study evaluated the mean values of lean body mass for football 52.37 (± 4.87 kg), handball 56.86 (± 7.77 kg), and basketball 60.76 (± 7.04 kg). Mean body fat percentage: football players 10.91 ($\pm 3.22\%$), handball players 12.87 ($\pm 5.59\%$), and basketball players 15.74 ($\pm 5.11\%$). Our study supports the previous research on body composition.

Conclusions

There was no discernible difference in the body fat percentage between the basketball, handball, and football groups. Compared to the football players, the basketball group of participants had a much higher total body fat percentage. However, there was no discernible change in total body fat between basketball and handball players. Compared to football players, the basketball group's lean body mass was noticeably higher. The differences between basketball and handball players were negligible.

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Data Availability Statement: The article contains every one of the unique contributions that are featured in this manuscript.

Ethical Statement: The study complied with every essential guideline for doing ethically sound research.

Authors Contributions: TS conceived the design research, collected the data and critically review the article. FTJM and JFR critically review. MYA write the article.

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