RESEARCH ARTICLE

INTERNATIONAL JOURNAL OF KINANTHROPOMETRY

DOI: 10.34256/ijk24310

Anthropometric and Body Composition Profile in Indian Kabaddi Players

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DOI: https://doi.org/10.34256/ijk24310
Received: 13-09-2024; Revised: 07-12-2024; Accepted: 16-12-2024; Published: 29-12-2024

Abstract

Introduction: Kabaddi is a sport in which a player performs diverse skills according to their playing positions. The present cross-sectional study was carried out to understand the anthropometric characteristics and body composition parameters with respect to playing positions in male Kabaddi players. **Methods:** The study was carried out among 42 male Kabaddi players (10 of which are Pro League Players); raiders (n=25, 18.7 ± 2.44 years) and defenders (n=17, 19.6 ± 1.58 years). Anthropometric parameters viz. Height weight, sitting height, arm span, biacromial breadth, waist & hip circumference were measured according to standard protocols followed by ISAK manual. Body composition of players was assessed using body composition analyser (mBCA). Other variables studied were body mass index (BMI), waist to hip ratio (WHR), and arm span to height ratio. **Results:** Significant differences were found between raiders and defenders in terms of their anthropometric characteristics and body composition parameters. Raiders exhibit significant higher values in terms of their height (*p=0.0009*), arm span (*p=0.023)* and arm span to height ratio (*p=0.0018)* while defenders exhibit significantly lower values in terms of their body mass index, BMI (*p= 0.0015)*, waist to hip ratio, WHR (*p=0.0001)* and fat mass (*p=0.015)*. **Conclusion:** It had been found that raiders were better over defenders in terms of their anthropometric characteristics and body composition parameters. The findings of the study provide valuable insights into the anthropometric characteristics and body composition profile related with playing position of Kabaddi players.

Keywords: Anthropometry, Body composition, Kabaddi, Playing positions

Resumen

Introducción: Kabaddi es un deporte en el que un jugador realiza diversas habilidades de acuerdo con sus posiciones de juego. El presente estudio transversal se llevó a cabo para comprender las características antropométricas y los parámetros de composición corporal con respecto a las posiciones de juego en jugadores masculinos de Kabaddi. **Métodos:** El estudio se llevó a cabo entre 42 jugadores masculinos de Kabaddi (10 de los cuales son jugadores de la Pro League); raiders (n = 25, 18,7 ± 2,44 años) y defensores (n = 17, 19,6 ± 1,58 años). Los parámetros antropométricos, a saber, altura, peso, altura sentada, extensión de brazos, ancho biacromial, circunferencia de cintura y cadera se midieron de acuerdo con protocolos estándar seguidos por el manual ISAK. La composición corporal de los jugadores se evaluó utilizando un analizador de composición corporal (mBCA). Otras variables estudiadas fueron el índice de masa corporal (IMC), la relación cintura-cadera (WHR) y la relación extensión de brazos a altura. **Resultados:** Se encontraron diferencias significativas entre raiders y defensores en términos de sus características antropométricas y parámetros de composición corporal. Los Raiders exhiben valores significativamente más altos en términos de altura (p = 0,0009), envergadura de brazos (p = 0,023) y relación envergadura de brazos a altura (p = 0,0018), mientras que los defensores exhiben valores significativamente más bajos en términos de índice de masa corporal, IMC (p = 0,0015), relación cintura-cadera, WHR (p = 0,0001) y masa grasa (p = 0,015). **Conclusión:** Se ha encontrado que los Raiders eran mejores que los defensores en términos de sus características antropométricas y parámetros de composición corporal. Los hallazgos del estudio brindan información valiosa sobre las características antropométricas y el perfil de composición corporal relacionado con la posición de juego de los jugadores de Kabaddi.

Palabras Clave: Antropometría, Composición corporal, Kabaddi, Posiciones de juego

Introduction

The sports of Kabaddi originated in India and had been very popular through ages over the entire subcontinent. The accounts of this game appear in the history of the country and the game propagated as a competitive sport in the twentieth century. It is a traditional contact sport that has gained popularity on the international stage (Deepak & Yadav, 2022). Played between two teams, the game comprises seven players which can be divided into three major groups on the basis of their role and position in the game, namely *raiders, defenders and all-rounders*. The raiders are attackers; defenders are divided into two sub-categories- corners and coverers, while all-rounders execute the duties of both attacking and defending.

Kabaddi players exhibit diverse body compositions that vary by their playing position (Shelke et al., 2024). Major moves in the game of play in Kabaddi involve jump, grab, hold, lock, twist, etc. Dey et al. (1993) states that such movements involve an exemplary physiological and anthropometric characteristic among players. Various researchers suggested that different body size, shape and proportions are beneficial in different physical activities (Malhotra et al., 1972; Kansal et al., 1986; Sindhu et al., 1996). Moreover, differences in performance of players exist across varying levels of their skill and ability (Roy et al., 2022). In order to understand the morphological features of human body, anthropometry quantitatively assists to characterize the same as accurately as possible (Mamidi et al., 2011; Shome et al., 2014).

As far as anthropometric measurements are concerned, they facilitate to predict performance by identifying physical traits of a player. Anthropometric traits may play a crucial role in Kabaddi as the sport involves physical contact. Assessing fat-mass and fat-free mass in terms of body composition has its own importance in sports. Additionally, understanding relationship between body composition and Kabaddi performance is essential for athletes, coaches, and sports scientists seeking to enhance player development and overall success (Parveen, et al., 2018). Higher amount of fat lowers the sports performance while lower the fat, higher is the performance (Busta et al., 2018). When muscle mass is concerned, trunk muscle mass is one of the significant factors affecting sports results which is evident by the studies carried out by Tesch (1983), Fry & Morton (1991), Ackland et al., (2003), Rynkiewicz & Rynkiewicz (2010) and Busta et al (2018). Therefore, the possession of essential anthropometric characteristics provides an edge to players, and to outperform their opponents.

Material and Methods

Participants

Forty two elite male Kabaddi players who were national level players and were selected for the present cross-sectional study. Ten out of these forty two players were a part of different Pro Kabaddi League teams viz. Haryana Steelers, Bangalore Bulls, Telugu Titans, Jaipur Pink Panthers, Bengal Warriors, Tamil Thalaivas and Gujarat Titans. Of the total 42 players selected for the study, 25 were raiders while 17 were defenders on the basis of their playing positions. The data for present study was collected after the completion of competition period. Prior to the testing, all the players were informed of the measurements and assessments to be taken on them. In addition, all were explained with the procedure and purpose of the tests and assessments. Age of the participants was calculated from their date of birth on the basis of their birth certificates provided prior to assessment.

Procedures

Anthropometric variables viz. height, body weight, sitting height, arm span, biacromial breadth, waist and hip circumference were taken into consideration for this study following the protocols established by International Society for the Advancement of Kinanthropometry (ISAK, 2019). Height was measured using stadiometer, body weight was measured using electronic weighing scale to the nearest 0.1 kg, sitting height was measured with sitting height table, arm span was measured with segmometer (Cescorf), biacromial breadth using anthropometer and circumferences were measured using anthropometric tape. Body mass index (BMI) was calculated from height and weight, waist to hip ratio from waist and hip circumference, arm span to height ratio from arm span and height. The anthropometric variables viz. body weight, body height and arm span were measured initially. Measurements were conducted in bare foot and minimal clothing among the players. Body composition profile was assessed using body composition analyser (Seca mBCA 514, Hamburg, Germany).

Statistical Analysis

All the data of the present study are expressed in mean ± standard deviation (SD). To assess the differences between players on the basis of their playing positions, independent sample student t- test was used. The Statistical Program for the Social Sciences (SPSS) version 25.0 for Windows (SPSS Inc., Chicago, II, USA) was used for data analysis. The value of $p< 0.05$ was considered to be statistically significant.

Results

Table 1 represents means and standard deviations of anthropometric measurements, viz. Height, weight, BMI, sitting height, arm span, and biacromial breadth (shoulder breadth); ratios viz. Waist to hip ratio (WHR) and arm span to height ratio; and body composition parameters viz. Fat mass, lean body mass and muscle mass of male Kabaddi players according to their playing positions, i.e. raiders and defenders.

Table 2 exhibits the comparison of means (average) of raiders and defenders with respect to their anthropometric characteristics and body composition profile. T-test (independent sample) was conducted to compare the mean scores of the two groups of players.

Table 1. Anthropometric characteristics and body composition profile of Kabaddi players (raiders & defenders)

Parameters	Raiders (n=25)	Defenders (n=17)
Anthropometric variables		
Age (in years)	18.7± 2.44	19.6 ± 1.58
Height (cm)	176.54± 5.7	170.68 ± 3.85
Weight (kg)	71.43± 5.2	72.51 ± 5.36
Body Mass Index (BMI)	23.0 ± 1.7	24.8 ± 1.64
Sitting height (cm)	89.2 ± 2.6	87.6 ± 3.05
Arm Span (cm)	181.9 ± 7.9	176.6 ± 5.87
Shoulder width	40.9 ± 2.4	41.2 ± 1.81
Waist to Hip Ratio	0.81 ± 0.0	0.84 ± 0.03
Arm span to height ratio	1.02 ± 0.00.00	1.0 ± 0.03
Body composition parameters		
Fat mass (kg)	9.71 ± 2.8	12.15 ± 3.39
Lean body mass (kg)	61.32 ± 4.6	60.36 ± 3.81
Muscle mass (kg)	30.78 ± 2.3	30.40 ± 2.02

Table 2. t-test of anthropometric characteristics and body composition profile

Parameters	t-value	df	Significance	Difference in mean	Standard error difference
Age	1.13	40	0.19	-0.90	0.67
Anthropometric measurements					
Height (cm)	3.57	40	**0.0009***	5.72	1.60

Weight (kg)	0.65	40	0.51	-1.08	1.66
BMI	3.41	40	**0.0015***	-1.80	0.53
Sitting height (cm)	1.70	40	0.09	1.60	0.94
Arm Span (cm)	2.36	40	**0.023***	5.30	2.25
Biacromial breadth (cm)	0.44	40	0.664	-0.30	0.69
Ratios					
Waist to Hip Ratio (WHR)	5.03	40	**0.0001***	-0.03	0.006
Arm span to Height Ratio	3.35	40	**0.0018***	0.020	0.006
Body composition parameters					
Fat mass (kg)	2.55	40	**0.015***	-2.44	0.96
Lean body mass (kg)	0.71	40	0.48	0.96	1.35
Muscle mass (kg)	0.55	40	0.58	0.38	0.69
Note: t-value: student t-test; df: degree of freedom;					

***** The mean difference is significant at the p ≤ 0.05 level.

When results of raiders and defenders are compared, significant differences were found between raiders and defenders in terms of their anthropometric characteristics and body composition parameters. When raiders are concerned, they exhibit significant higher values in terms of their height (*p=0.0009*), arm span (*p=0.023)* and arm span to height ratio (*p=0.0018)*. Contrary to this, defenders exhibit significantly lower values in terms of their body mass index, BMI (*p= 0.0015)*, waist to hip ratio, WHR (*p=0.0001)* and fat mass (*p=0.015)*.

Discussions

Numerous essential anthropometric, physical and physiological factors may contribute to an elite athlete's performance. Specific anthropometric characteristics are needed to be successful in certain sporting events. It is also important to note that there are some differences in body structure and composition of sports persons involved in individual and team sports (Abraham, 2010). The major findings of the study reveal that there are significant differences found between raiders and defenders in terms of their anthropometric and body composition profile. A significant difference was found between height of raiders and defenders (*p=0.009*). Moreover, raiders are advanced over the defenders in terms of weight, body mass index (BMI) (*p=0.0015*), sitting height, arm span (*p=0.023*), fat mass (*p=0.015*), lean body mass and muscle mass content (though all the differences found are not statistically significant). Significantly taller height, higher sitting height and higher lean body mass (though not statistically significant) observed among raiders than defenders are in line with the study by Kumar (2016); Aggarwala et al. (2019) and Shelke et al. (2024). Raiders are found to have lesser body weight than defenders (*p=0.51, not significant*) but raiders had significantly lesser body mass index (BMI) (*p=0.0015*) than defenders. The arm span of raiders is significantly greater over the defenders (*p*=0.023). The longer arm length helps the all-rounder and raiders touch the opponent from a safer distance without being caught (Kumar, 2016). Longer arm span may help the raider touch the opponent from a safer distance without being caught and allowing them to successfully score more points. In addition, significantly lesser waist to hip ratio (WHR) was found among raiders than defenders. It was also found in the study that fat mass is significantly lesser among raiders (*p=0.015*) over defenders which may be due to the reason that both playing positions have different moves; while raiders have to maneuver with a skill to touch the opponent to touch and score point while defender has to grabble and pull the opponent towards them for better catch and hold technique.

Conclusion

The findings of the study provide valuable insights into the anthropometric characteristics and body composition profile related with playing position of Kabaddi players. The account of such studies is meagre when it comes to the studies conducted to understand position wise physical attributes of Kabaddi players. It would not be incorrect to state here that anthropometric characteristics are crucial in optimizing player performance by identifying physical attributes especially on the basis of playing positions. Understanding correlation of anthropometric and body composition profile with playing positions of Kabaddi players would enable to make individual based effective training plans and fulfilment of individual player's nutritional demands. Furthermore, such studies on a larger sample may give a deep understanding of how certain anthropometric characteristics are advantageous over the others.

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Funding

There is no external funding to declare

Conflicts of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Informed Consent Statement

All the athletes included in the study provided written informed consent.

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