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Body Composition differences in Offensive and Defensive Roles among Male Kabaddi Players

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Abstract

Introduction: This study explores the correlation between Kabaddi players' playing positions and body composition characteristics. **Methods:** Anthropometric parameters, Body composition, performance were measured with standard recognized methods **Results:** Offensive players exhibited significantly higher weight, BMI, and body fat % compared to defensive players. Body composition influences playing style but is not the sole determinant of position selection in Kabaddi. Position-specific training programs can enhance performance by focusing on agility for offensive players and strength for defensive players. Offensive players may get the benefit from fat loss and agility training to improve rapid movements, whereas, defensive players should prioritize strength and endurance training to enhance tackling power. Identifying the muscle-to-fat ratio rather than simply relaying on BMI, is necessary to individualize the training programs effectively among Kabaddi players. Talent identification process should incorporate agility, endurance, and strength along with body composition for a more comprehensive assessment. **Conclusion:** The study address the limitations, such as a small sample size, lack of muscle mass data, and absence of in game performance metrics like sprint speed and reaction time. Despite of these constraints, the findings emphasize that body composition plays an important role in performance but should not be the sole criterion for position assignment. Future research in this directions should integrate other additional physical and physiological fitness components to optimize talent identification and performance enhancement in Kabaddi.

Keywords: Kabaddi, BMI, Fat %, Body Composition, Talent Identification, Athletic Performance.

Resumen

Introducción: Este estudio explora la correlación entre las posiciones de juego de los jugadores de Kabaddi y las características de la composición corporal. **Métodos:** Los parámetros antropométricos, la composición corporal y el rendimiento se midieron con métodos estándar reconocidos. **Resultados**: Los jugadores ofensivos exhibieron un peso, IMC y porcentaje de grasa corporal significativamente mayores en comparación con los jugadores defensivos. La composición corporal influye en el estilo de juego, pero no es el único determinante de la selección de la posición en Kabaddi. Los programas de entrenamiento específicos para cada posición pueden mejorar el rendimiento al centrarse en la agilidad para los jugadores ofensivos y la fuerza para los jugadores defensivos. Los jugadores ofensivos pueden beneficiarse de la pérdida de grasa y el entrenamiento de agilidad para mejorar los movimientos rápidos, mientras que los jugadores defensivos deben priorizar el entrenamiento de fuerza y resistencia para mejorar la potencia de tackle. Es necesario identificar la relación músculo-grasa en lugar del IMC únicamente para personalizar eficazmente los programas de entrenamiento entre los jugadores de Kabaddi. La identificación de talentos debe incorporar agilidad, resistencia y fuerza junto con la composición corporal para una evaluación más completa. **Conclusión:** El estudio destaca limitaciones como un tamaño de muestra pequeño, la falta de datos de masa muscular y la ausencia de métricas de rendimiento en el juego como la velocidad de sprint y el tiempo de reacción. A pesar de estas limitaciones, los hallazgos enfatizan que la composición corporal influye en el rendimiento, pero no debería ser el único criterio para la asignación de puestos. Las investigaciones futuras deberían integrar componentes adicionales de la aptitud física para optimizar la identificación de talentos y la mejora del rendimiento en Kabaddi.

Palabras Clave: Kabaddi, IMC, % de grasa, Entrenamiento de fuerza, Identificación de talentos, Rendimiento atlético.

Introduction

Kabaddi is a contact-based, high-intensity team sport that demands a combination of various physical and physiological attributes such as power, endurance and strength. Kabaddi is primarily divided into two categories of roles. One is offensive (raiders) and another one is defensive (defenders) positions. Each of the role demands a specific physical and physiological attributes (Aggarwala *et al.,* 2019). The performance for the Kabaddi players are significantly influenced by various physical and physiological indices namely, the body composition and muscular strength of the players. These abilities are the crucial determinants in executing skills and maintaining performance throughout the game. Many studies on the physical and physiological requirements have been carried out, however, comparative studies related to body composition and muscular strength between offensive and defensive players is not as such explored. Hence, the present study could add some valuable insights into the position-specific requirements for the players. Furthermore, it would be helpful in the talent identification process, in the modulations of the training program, and also in the strategies of injury prevention.

Body composition is composed of the various factors and elements, such as muscle mass, fat percentage, and bone density (Martín-Rodríguez, 2024). These all plays an important role in the athletic performance. The playing positions, raiders and defenders shows a distinctive body composition characteristics due to their specific roles within the sport. The position raiders, who prioritize speed and agility mainly to evade defenders and score points, also require an optimal balance between lean muscle mass and low fat percentage. These enables quicker movements and rapid acceleration (Ali, Sk & Adhikari, Samirranjan. 2011). Conversely, for the defenders, it rely on the combination of the superior muscular strength and stability to tackle and hold raiders. Which ultimately, renders higher muscle mass and greater upper-body strength for peak performance (Kumar, 2016). Following, these various physical and physiological differences of the characteristics not only instrumental in designing training programs for position-specific demands in Kabaddi, also to generate the baseline data on the sports kabaddi.

The superiority of the muscular strength (both upper body and lower body) plays a pivotal role (Fukuda *et al.,* 2018), and it is paramount for the peak performance of Kabaddi players. Raiders require a good amount of explosive leg strength and core stability to execute swift movements, whereas defenders necessitate substantial upper and lower body strength to effectively counter raiding attempts and also to employ control over opponents (Bagha, Saeid. 2015). Studies have found that defenders generally exhibit higher absolute muscular strength compared to raiders, this is mainly due to the nature of their role in the game (Beattie *et al.,* 2014). These further involves forceful engagement and grappling techniques (Pramanick, 2022). However, relative muscular strength, which considers strength in relation to body weight, enables raiders to maintain agility and speed respectively.

The existing literatures have highlighted the importance of the physical attributes in Kabaddi, yet limited research has carried out a direct comparative analysis between offensive and defensive players. A more profound, in-depth understanding of body composition and muscular strength variations can assist coaches, sport scientists, practitioner and trainers in refining training regimens to enhance players' performance and allay injury risk (Kellmann, 2018). Furthermore, the findings can contribute to sports science literature by providing empirical evidence on the physical and physiological demands of different playing positions in Kabaddi (Desai & Naik, 2022).

The present study aimed: (a) to compare the body composition of offensive (raiders) and defensive (defenders) male Kabaddi players, to evaluate the correlation between body composition among various playing positions in Kabaddi, (b) to offer recommendations for training and conditioning programs based on position-specific physiological demands, (c) to contribute to talent identification strategies by established the ideal body composition parameters for offensive and defensive Kabaddi players, and (d) to augment the scientific basis of physiological demands in Kabaddi and assisted future research in optimizing the performance outcomes.

Material and Methods

The present research uses a comparative cross-sectional design, allowing the comparison of differences in body composition among offensive and defensive Kabaddi players. The cross-sectional design is appropriate as it makes it possible to collect data from players at a single point in time and hence allow a direct comparison of physiological characteristics on the basis of positional roles. The study included male Kabaddi players from Gujarat state those competing at the state, national, or professional level. The sample is selected using the purposive sampling technique, ensuring that participants meet the following inclusion criteria:

- Male players actively participating in competitive Kabaddi tournaments.

- Players categorized as offensive (raiders) and defensive (defenders) based on their designated playing position.
- Players with a minimum of 2 years of competitive experience in Kabaddi.
- Medically fit athletes without any pre-existing injuries that may affect their performance.

A total of 16 male Kabaddi players will be selected, comprising:

- 8 offensive players (Raiders)
- 8 defensive players (Defenders) the sample size is determined based on previous research studies in similar areas, ensuring statistical validity.

Anthropometric and Body Composition measurements

Height and Body Mass: Height (cm) and weight (kg) were measured according to anthropometric method standardized by International Society for Advancement of Kinanthropometry (Esparza-Ros *et al.,* 2019). For the measurement of standing height, an Anthropometric Rod (CESCOEF, Brazil) was used. Whereas, an Electronic Weighing scale (Seca 769, India) was used for body mass measurement.

Body Fat Percentage and Lean Body Mass: Body composition was analyzed with a Bioelectrical Impedance Analyzer. (InBody 570, InBody Co. Ltd, Korea)

Body Mass Index (BMI): BMI was calculated using the following equation,

BMI (Kg/m^2)= Weight (kg) / Height (m^2)

Statistical Analysis: The data was expressed as mean and standard deviation. Statistical Analyses were done using the program SPSS (Statistical Package for the Social Sciences) Version 26.0

Results

Offensive players are slightly heavier (73.9 kg vs. 69.6 kg) and taller (171.6 cm vs. 170.5 cm) compared to defensive players. Offensive players also have higher BMI (25.0 vs. 23.85) and body fat percentage (20.7% vs. 18.96%). These differences suggest that offensive players may require more mass for the generation of power and endurance, while defensive players may prioritize agility and leaner body composition.

a) The results reviled that there were a substantial differences in body composition traits between defensive and offensive players. Offensive players tend to have higher BMI and body fat percentage, while defensive players maintain a leaner profile, and likely found to be a correlation between body composition and playing position. Further statistical analysis (e.g., correlation tests) would be needed for precise validation.

b) The results found a relationship, but a detailed correlation analysis is required.

c) Due to the variation in body composition, individualized training programs can be created. Strength training and conditioning for endurance could be beneficial for offensive players, whereas agility training and speed training could be conducive for defensive players.

d) The data provides insights into training modifications for position-specific improvements among players. Findings of the study can assist in scouting and training methodologies by determining optimal body composition characteristics for targeted positions. Trainers can utilize these measures to optimize training and selection processes for players.

e) The research presents practical implications for maximizing training and talent identification in Kabaddi.

Table 1. Average values with standard deviation of the Indian kabaddi players

Metric	Defensive (Mean ± SD	Offensive (Mean ± SD)
Height (cm)	170.50 ± 7.52	171.63 ± 5.24
Weight (kg)	69.56 ± 12.10	73.88 ± 8.56
BMI(kg/m2)	23.85 ± 3.43	25.00 ± 1.75

Body Fat %	18.96 ± 6.43	20.70 ± 4.80

Table 1 represented the physical characteristics of the defensive and offensive players of the present study where offensive players had slightly higher height, weight, BMI, and body fat % compared to defensive players.

Table 2. Statistical analysis with t-test values.

Independent Sample t-Test Results			
Metric	t-Statistic	p-Value	Interpretation
Height (cm)	0.347	0.734	No significant difference
Weight (kg)	0.823	0.426	No significant difference
BMI	0.844	0.417	No significant difference
Body Fat %	0.612	0.551	No significant difference

Table 2 represented the p values which are greater than 0.05, ($p \leq .05$)

Table 3. Correlation coefficient (r) values in between different variables

Pearson Correlation Analysis (r)				
Metric	Height (cm)	Weight (kg)	BMI	Body Fat %
Height (cm)	1.000	0.672	0.268	0.050
Weight (kg))	0.672	1.000	0.891	0.625
BMI (kg. m^2)	0.268	0.891	1.000	0.798
Body Fat %	0.050	0.625	0.798	1.000

The analysis (as listed in table 3) showed a strong positive correlation (0.891) between different variables, this confirms that weight is a major determinant of BMI in Kabaddi players. Similarly, BMI and body fat % exhibit a strong positive correlation (0.798), revealing that a higher BMI is closely associated with a higher body fat percentage. However, BMI alone does not differentiate between fat and muscle mass, which is crucial for Kabaddi players. The correlation between weight and body fat percentage is moderate (0.625), suggesting that heavier players tend to have higher body fat percentages, although muscle mass variations can also influence weight. Additionally, height and weight share a moderate positive correlation (0.672), meaning taller players generally weigh more, though height alone does not determine playing effectiveness. Lastly, the correlation between height and body fat percentage is very weak (0.050), indicating no meaningful relationship, as taller players do not necessarily have higher or lower fat percentages.

Discussion

The present study examined to explore the correlation between Kabaddi players' playing positions and body composition characteristics. The analysis was made in accordance with the following hypotheses: Offensive and Defensive players will differ significantly in their body composition characteristics. The mean and standard deviation analysis revealed that the offensive players tended to be slightly higher in weight, BMI, and body fat percentage than the defensive players. But independent t-tests found no statistically significant difference ($p > 0.05$) between body composition traits in offensive and defensive players. This implies that though trends would be

evident, body composition will not be the only factor determining play position (Dhanjal, 2024). A positive correlation would exist between body composition measures and playing positions for Kabaddi players. Pearson correlation analysis also revealed a very strong positive correlation between Weight and BMI (0.89) and BMI and Body Fat % (0.79). This verifies that heavier players do have a higher BMI and body fat percentage. The correlation between Height and Body Fat % was, however, extremely weak (0.05), so height does not have a significant effect on fat distribution. This confirms the hypothesis that body composition contributes to determining playing positions but has a complex relationship. Position-oriented body composition training programs will result in enhanced athletic performance. Since BMI and body fat percentage differ in players, individualized training programs can be created. Offensive athletes with greater body fat % might need speed and agility training, whereas defensive players with reduced fat % can engage in strength training (Ghosh, 2014). Even though no difference was found in body composition across positions, position training should still be prioritized to achieve best performance and prevent injury.

The findings of the study would be of great utility for the best talent identification and training techniques in Kabaddi (Nabilpour, 2013). However, the study has some limitations, such as due to the less number of positioned sample size, also being the cross-sectional design. Further, more physiological, biomechanical, and nutritional parameters may be included with longitudinal study design and more sample size. Which could provide more information, including the incorporation of the training cycle and phases of the sport. The research proposes that though individual body composition by itself is not a determining criteria for the selection of Kabaddi positions, it affects style of play.

Conclusion

Offensive and defensive Kabaddi players do not differ significantly in body composition. Body composition parameters (BMI, weight, and fat %) are positively correlated. Position-specific training according to body composition can optimize athletic performance. Future talent identification should incorporate agility, endurance, and strength, in addition to body composition for the performance optimization in kabaddi.

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Informed Consent Statement

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

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