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Body Composition and Anaerobic Power Assessment in U19 Male Football and Cricket Players: Implications for Performance and Health

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Abstract

This study aimed to compare body composition and anaerobic power among U19 male football and cricket players, providing insights into their performance and health implications. The study involved 60 participants, with 30 from each sport, and assessed variables such as body fat percentage, lean body mass, BMI, fat weight, and anaerobic power. The data collection methods were meticulous, including precise anthropometric measurements and the vertical jump test to estimate anaerobic power. The results indicated no significant differences in BMI, body fat percentage, lean body mass or fat weight between U19 male football and cricket players. Both groups demonstrated normal body composition values, likely influenced by their training regimens and genetic factors. However, a significant difference was observed in anaerobic power, with cricket players displaying higher levels. This difference could be attributed to the intermittent nature of football, which demands greater anaerobic power, whereas cricket places less reliance on this capacity, especially for spinners. In conclusion, this study provides valuable insights into the physical attributes of young male athletes in football and cricket. While their body composition was similar, the disparity in anaerobic power highlights the importance of tailored training strategies for optimizing performance in these sports. These findings can benefit coaches and sports scientists in developing training programs for U19 male athletes in football and cricket.

KEYWORDS: Anaerobic power, Body composition, Cricket, Football

Introduction

Physical activity encompasses any movement involving skeletal muscles that expends energy, with various categories including occupational, sports, conditioning, household, and other activities. Exercise is a planned, structured subset of physical activity aimed at improving or maintaining physical fitness, a crucial component of overall health. Physical inactivity, overweight, and obesity are linked to increased health risks and mortality. Engaging in physical activities and exercise can help combat diseases like diabetes, hypertension, cardiovascular diseases, and respiratory diseases[1].Regular engagement in physical activity and one's overall physical fitness status serve as critical indicators of health outcomes. Extensive research has consistently shown that consistent physical activity plays a pivotal role in sustaining a healthy body weight, lowering the likelihood of developing conditions such as diabetes, hypertension, and cardiovascular diseases, and enhancing emotional well-being and stress management. Similarly, enhancing health-related physical fitness components such as cardiovascular endurance, muscular strength and endurance, flexibility, and body composition contributes significantly to overall health improvement[2][3].

The COVID-19 pandemic has exacerbated physical inactivity, posing a significant public health threat. Exercise supports various bodily systems, including respiratory, circulatory, muscular, nervous, skeletal, endocrine, digestive, immune, and renal systems, which collectively defend against threats. Regular physical activity is deemed effective in mitigating the health effects of the pandemic[4].

Body composition, especially body fat, plays a vital role in health. Various methods, such as skinfold thickness measurements, body mass index (BMI), and waist circumference, are used to assess body composition[5]. Sports and physical activity can influence body composition, but optimal levels vary depending on the sport. Body composition analysis is valuable for health care, research, and precision medicine, assisting in identifying health risks, guiding treatments, and evaluating interventions.An individual's anaerobic capacity is defined by their capability to replenish ATP using alternative energy pathways distinct from oxidative processes. This attribute holds significant importance as it enables the individual to engage in, endure, and repeatedly execute high-intensity, brief-duration exercises, primarily of an alactic nature[6].

Anthropometric measurements, including BMI, serve as simple indicators of obesity and body fat distribution. Skinfold thickness measurements estimate body fat percentage, but results may vary depending on measurement techniques. These measurements are widely used despite their limitations[7].

In the context of football (soccer), body composition is linked to performance and varies between positions. Players in the first league tend to have different body composition profiles than those in lower leagues. A lower body fat percentage is associated with better performance, emphasizing the importance of muscle mass maintenance during injuries[8].One of the key indicators of excellent training status in many competitive sports is the simultaneous increase in muscle mass and decrease in body fat. Soccer, or football, which is one of the most popular sports globally, demands players to exhibit rapid and explosive movements, including running and jumping, in order to gain control of the ball[9].

Cricket, despite being an old sport, lacks comprehensive scientific research on its physiological demands and players' attributes. Modern international cricketers face increased physical and psychological demands, with more matches and tours, impacting their well-being. Eccentric muscle contraction in cricket may require special attention for muscle strengthening, particularly in fast bowlers[10].

The study aims to discern potential differences in these parameters between football and cricket players. While delimitated to this specific age group and gender, the study recognizes limitations related to uncontrolled lifestyle factors. The hypotheses anticipate significant variations in these parameters, contributing valuable insights to sports science and performance optimization.

Material and Methods

Design

This was a cross-sectional comparative study aimed at assessing the Body composition and anaerobic power among the cricket and football players.In this study, we focused on several key variables, including body composition metrics like body fat percentage, lean body mass, BMI, fat weight, and anaerobic power. To measure these variables accurately, we employed specific criteria and reliable instruments.

To assess body fat percentage, we used skinfold caliper at four anatomical sites. The reliability of our instruments was ensured by calibrating them before each use, and the person conducting the measurements underwent rigorous training to guarantee accuracy.Data collection involved various procedures. We measured body weight using a calibrated weighing machine while subjects stood with minimal clothing. Height was measured with a measuring tape, ensuring proper alignment. Skinfold thickness measurements were meticulous, following precise anatomical landmarks and using a 90-degree angle for caliper placement. To minimize bias, we recorded measurements 2 seconds after applying caliper pressure.

Specific sites, including triceps, suprailiac, abdominal, and thigh skinfolds, were measured. We calculated body fat percentage using the Jackson-Pollock 4-spot method formula. BMI was determined by dividing body weight in kilograms by the square of height in meters.

Fat mass was calculated by multiplying body weight by the decimal fraction of the percentage of body fat, while lean body mass was obtained by subtracting fat weight from body weight.

To assess anaerobic power, we conducted the vertical jump test after an 8-10 minute dynamic warm-up. Subjects jumped vertically, marking the highest point on a wall. We recorded the best performance out of three attempts.The Sayers Equation was employed to estimate peak anaerobic power output from the vertical jump.This comprehensive methodology ensured the accuracy and reliability of our data collection for this study.

Subjects

For the purpose of the study, a total 60 subjects (30 from U19 football and 30 from U19 cricket players) were selected. The age of the subject ranged from 12 to 19 Years. Individuals with chronic illnesses or any injury were excluded from the study. The groups were heterogeneous in terms of anthropometric characteristics, such as body weight, height and age (Table 1). All participants consented to participate in the study and were informed about its voluntary nature, objectives, benefits and course.

Table 1 . Participants' anthropometric characteristics

	Age	Weight	BMI	Body Fat %	Lean Body Mass	Fat Mass
Cricket (n=30)	16.20 ± 2.72	73.20 ± 22.11	23.1	13	56.9	8.63
Football (n=30)	15.11±3.11	74.81 ± 12.28	22.7	12.8	55.2	8.21

Procedure

In this study, various variables were chosen for examination, including body composition (specifically body fat percentage and lean body mass), BMI (Body Mass Index), fat weight, and anaerobic power. To guarantee the reliability of the data, meticulous measures were taken.

The instruments used for data collection were meticulously calibrated before use, ensuring their accuracy and reliability. Additionally, the researcher responsible for data collection underwent comprehensive training and practice under the guidance of experts to ensure competence in gathering data for all selected variables.Data collection procedures were precise and well-defined. Body weight was measured using a weighing machine with subjects standing in minimal clothing. Height measurements were taken using a measuring tape with subjects following specific positioning instructions.

For skinfold thickness measurements, four specific body sites (Triceps, Suprailiac, Abdominal, and Thigh) were targeted using calipers. Stringent techniques were followed to minimize measurement errors, such as proper site identification, consistent skinfold grasping, and maintaining a 90-degree angle with the caliper.

The calculation of body fat percentage was based on the Jackson-Pollock 4-spot method, incorporating measurements from the four skinfold sites, the subject's age, and a specific formula. Fat mass was calculated by multiplying the percentage of body fat by the subject's body weight. Lean body mass was determined by subtracting the fat mass from the total body weight.

Anaerobic power was assessed through the vertical jump test, following an appropriate warm-up routine. Subjects' performance was evaluated based on the height they reached during the jump, with the best of three attempts recorded.The Sayers Equation was used to estimate Peak Anaerobic Power output, incorporating jump height and body mass into the calculation. Overall, these meticulous methods and practices were employed to ensure the accuracy and reliability of the data collected in this study.

Statistical analysis

For the purpose of the study detailed descriptive statistics (Mean and Standard deviation) were calculated. To find the significance difference between the selected parameters between U19 male football and cricket players, t-test was employed. The level of significance was set at 0.05 levels.

Results

The means score and standard deviation vale of BMI of U19 male football and cricket players were M= 22.7. SD= 2.1; M= 23.1, SD= 2.8 respectively.

Independent t-test was calculated to assess the significance of BMI of U19 Male Football and Cricket players. The result is presented in Table 2.

	t-test for equality of means					
	F	**Sig.**	**T**	**Sig.(2-tailed)**	**Mean difference**	**Std. error difference**
BMI	3.35	0.07	-.65	.51	-.42	.64

Table 2 reveal that there is no significant difference was obtained in BMI of U19male football and cricket players as the t-value was .51 that was not significant as the p value is more than 0.05.

The mean score and standard deviation value of Body fat % of U19male football and cricket players were M= 12.8, SD= 2.6; M=13, SD=2.4 respectively.

Independent t-test was calculated to assess the significance of body fat % between U19 male football and cricket players.

The results are presented in Table 3

	t-test for equality of means					
	F	**Sig.**	**T**	**Sig.(2-tailed)**	**Mean difference**	**Std. error difference**
Body fat %	.24	.62	-.35	.72	-.23	.66

Table 3 reveals that a significance difference was not obtained in Body fat % of U19 male football and cricket players as the t value obtained was .72 that was not significant as the p value is more than 0.05.

The mean score and standard deviation value of Lean body mass of U19male football and cricket players were M= 55.2, SD=5.4; M=56.9, SD=5.2 respectively.

Independent t-test was calculated to assess the significance of Lean body mass of U19 male football and cricket players. The results are presented in Table 4.

	t-test for equality of means					
	F	**Sig.**	**T**	**Sig.(2-tailed)**	**Mean difference**	**Std. error difference**
Lean body mass	.032	.85	-1.26	.21	-1.73	1.37

Table 4 shows that there is no significance difference was obtained in Lean body mass of U19male football and cricket players as the t value was .21 that was not significant as the p value is more than 0.05.

The mean score and standard deviation value of Fat mass of U19 male football and cricket players were M= 8.21, SD=2.51; M=8.63, SD=2.56 respectively.

Independent t-test was calculated to assess the significance of Fat mass of U19 male football and cricket players. The results are presented in Table 5.

	t-test for equality of means					
	F	**Sig.**	**T**	**Sig.(2-tailed)**	**Mean difference**	**Std. error difference**
Fat mass	.025	.87	-1.63	.52	-.41	.65

Table 5 shows that there is no significance difference was obtained in Lean body mass of U19 male football and cricket players as the t value was .52 that was not significant as the p value is more than 0.05.

The mean score and standard deviation value of Anaerobic power of U19 male football and cricket players were M= 3036, SD=699.7; M=4128.5, SD=464.9 respectively.

Independent t-test was calculated to assess the significance of anaerobic power of U19 male football and cricket players. The results are presented in Table 6.

	t-test for equality of means					
	F	**Sig.**	**T**	**Sig.(2-tailed)**	**Mean difference**	**Std. error difference**
Anaerobic power	4.305	.042	7.12	.000	1092.5	153.3

Table 6 shows that there is a significance difference was obtained in Anaerobic power of U19 male football and cricket players as the t value was .00 that was significant as the p value is less than 0.05.

Discussion

During childhood and puberty, the rapid growth and development increase the requirement for energy and nutrientand stimulate routine metabolism for lean tissue growth and tissue remodelling[11][12]

There was a significant difference obtained in anaerobic power between Male Football and Cricket players of age group of U19. The probable reason could be the duration of the game which varies a lot between these two sports. Football is an intermittent sport that requires the high amount of anaerobic power compared to cricket. Goal keeper ,attackers , defender they all requires the anaerobic capacity to perform well but in cricket, player like spinners they do not fully rely on the anaerobic capacity so this could also be the reason of significant difference.

There was no significant difference obtained in BMI, body fat %, lean body mass, fat weight between U19 male Football and Cricket players. The body composition data (BMI, body fat %, lean body mass, fat weight) of both the football and cricket players in the age group of 12 to 19 years were in the normal range. The probable reason for insignificant difference in these parameters between the selected subjects could owe to their training regimen, genetic predisposition.

This finding implies that the training plays an important role in the rate of the physical development. Nevertheless, physical environment nutrient and genetic factors contribute to the difference in development as well as the positive effect of sports on bone development[13].

Conclusion

The present study has yielded several noteworthy conclusions regarding the physical attributes of U19 male football and cricket players. Firstly, it was observed that there was no significant difference in BMI between the two groups, indicating that their body mass index values were relatively similar. Similarly, the study found no significant disparity in body fat percentage and fat weight between the U19 male football and cricket players, suggesting that both groups exhibited comparable levels of adiposity and fat distribution. Additionally, the analysis revealed no significant distinction in lean body mass between the two groups, implying that their muscle mass and overall body composition were similar. However, a noteworthy finding was the significant difference in anaerobic power between U19 male football and cricket players. This suggests that the two groups may differ in their ability to generate short bursts of intense power, which could be of interest to coaches and sports scientists seeking to optimize training regimens for these athletes. In sum, this study provides valuable insights into the physical attributes of young male athletes in these sports, highlighting both similarities and differences that may be useful for future research and training strategies.

Conflict of Interests

The authors declare no conflict of interest.

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