



STUDY OF BODY COMPOSITION AMONG MALE AND FEMALE SOFTBALL PLAYERS

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Abstract:

The purpose of this study was to examine body composition components among softball players and to compare body composition components among male and female softball players. Total 150 male and 150 female softball players from the various states and universities of India were selected to participate in the study. Height of the players was measured with the anthropometric rod. Portable weighing machine was used to measure the weight of the players. Harpenden skinfold caliper was used to assess the skinfold thicknesses. The results revealed that the female softball players had significantly higher percent body fat ($p < 0.05$) total body fat ($p < 0.05$) as compared to male softball players whereas the male softball players had significantly greater lean body mass ($p < 0.05$) than the female softball players. In conclusion, female softball players possess higher amount of body fat as compared to their male counterparts.

Keywords: body composition, performance, percent body fat, lean body mass, softball

1. Introduction

Softball is a baseball descendant game that requires speed, strength, and endurance. To develop in these areas, many factors play a significant role like skill, practice, level of physical activity, techniques, psychological traits, nutrition and other environmental factors. However, a particular body size and shape and certain genetically conditioned abilities and features are required in order to achieve top level performance in softball.

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Players require the basic physical structural composition of the players which suits best to the demands of the sport and a particular playing position for higher performance.

Body composition refers to the distribution of muscle mass and fat mass in the body. Assessment of anthropometric parameters and body composition, therefore, has an important role in sports and health. Excess body fat besides leading to obesity and disease causation, may also hinder performance (Vipene and Victor, 2013). The association of body composition with physical performance changes is also of great interest to strength and conditioning specialists (Silvestre et al., 2006). Body composition, a component of health related fitness is the relative amount of fat and tissues that is devoid of fat or fat free mass (muscle, bone and water). Human body comprises body fat mass and fat free mass (Siahkouhian et al., 2006; Baumgartner et al., 2003; Wang et al., 2001). These two parameters are primarily used in the study of the relationship between body composition and physical performance (Houtkooper and Going, 1994; Wang et al., 1995; Kim et al., 2005). Body composition is an important aspect of fitness (Reilly et al., 1990) and can be predicted from anthropometric measures (Maud and Foster, 1995). Body composition of athletes is an essential tool to evaluate the health of the athletes, observe the effects of a training program, and to find out most favorable competitive body weight and body composition (Prior et al., 2001). It is generally accepted that a lower relative body fat is required to succeed in competition in most of the sports. This is due to the fact that excess body fat acts as a dead weight in activities where the body mass must be repeatedly raised against gravity during locomotion (Reilly, 1996). It hinders the performance and increases the energy requirements of the activity. On the other hand, lean body mass contributes to power generation during high-intensity activity and provides a greater absolute size and strength for resistance with high dynamic and static loads. Studies of body composition in certain sports such as football, weight lifting and shot put indicated that athletes who were lean but heavy because of a well-developed musculature were superior in performance in competitive sports activities (Bullen, 1971).

Body composition components are an essential part of the evaluation and selection of players for different sports, standard data on such factors are still scant in the Indian context on softball players. The present study, therefore, aimed at evaluating the body composition among softball players from India.

2. Methodology

The subjects of the present study were purposively selected from the university level and national level male softball players. 150 male softball players (mean age: 21.35 ± 2.57 years) of different universities and states of India were selected to participate in the study. The data for the study was collected during the 33rd Senior National Softball Championship held at Anantpur District of Andhra Pradesh in January, 2012 and All India Inter University Softball Championship held at Panjab University, Chandigarh in February 2012.

2.1 Anthropometry

The mean age of male and female softball players was 21.35±2.57 years and 20.50±2.10 years respectively. The height of male and female softball players was observed to be 173.49±6.12 cm and 159.41±5.65 cm respectively. The weight of male and female softball players was observed to be 65.62±8.35 kg and 52.24±6.93 kg respectively. The height of the players was measured with anthropometric rod to the nearest 0.5 cm (HG- 72, Nexgen ergonomics, Canada). Portable weighing machine was used to measure the weight of the softball players to the nearest 0.5 kg. Harpenden skinfold caliper was used to assess the skinfold thicknesses of the players.

2.2 Body Composition

Percentage body fat as estimated from the sum of skinfolds was calculated using equations of Siri (1956) and Durnin and Womersley (1974). The regression equations for the prediction of body density from the log of the sum of skinfold thickness at four sites in mm are as follows

For Males	For Females
17 to 19 years age group Body Density (gm/cc) = 1.1620-0.0630 (X)	17 to 19 years age group Body Density (gm/cc) = 1.1549-0.0678 (X)
20 to 29 years age group: Body Density (gm/cc) = 1.1631-0.0632 (X)	20 to 29 years age group: Body Density (gm/cc) = 1.1599-0.0717 (X)

Where:

$X = \log(\text{biceps} + \text{triceps} + \text{subscapular} + \text{suprailliac})$.

Percent Body Fat = $[4.95 / \text{body density} - 4.5] \times 100$ (Siri, 1956)

Total Body Fat (kg) = $(\% \text{body fat} / 100) \times \text{body mass (kg)}$

Lean Body Mass (kg) = $\text{body mass (kg)} - \text{total body fat (kg)}$

2.3 Statistical Analyses

Statistical analyses were performed using SPSS version 16.0 for windows (SPSS Inc, Chicago, IL, USA). The data was presented as descriptive statistics such as mean, standard deviation, standard error of mean, minimum value and maximum value. Independent samples t-test was used to compare the male and female softball players on body composition components. Significance levels were set at $p < 0.05$.

3. Results

Table 1: Descriptive statistics of components of the body composition of the male and female softball players

Variables	Gender	N	Mean	SD	SEM	Min. Value	Max. Value	t-Value
Percent Body Fat (%)	Male	150	16.56	4.66	0.38	4.21	28.77	18.586*
	Female	150	24.77	2.74	0.22	17.13	30.4	
Total Body Fat (kg)	Male	150	11.09	4.04	0.33	2.07	23.88	4.889*
	Female	150	12.97	2.44	0.19	7.48	20.71	
Lean Body Mass (kg)	Male	150	54.53	5.64	0.46	40.27	68.52	24.538*
	Female	150	39.26	5.12	0.42	29.62	57.29	

* Indicates $p < 0.05$, SD: standard deviation, SEM: standard error of mean

The descriptive statistics of different components of the body composition of the softball players are presented in Table 1 and Figure 1. The average percent body fat of the male softball players was 16.55 % with a standard deviation of 4.66. The female softball players had 24.77 % average percent body fat with standard deviation 2.74. The average total body fat of the male softball players was observed to be 11.09 kg with a standard deviation of 4.03. Whereas, the female softball players had 12.97 kg average total body fat with standard deviation 2.44. The mean lean body mass of the male softball players was observed to be 54.52 kg with a standard deviation of 5.63. However, the female softball players had 39.26 kg average lean body mass with standard deviation 5.12. The independent samples t-test revealed that the female softball players were found to have significantly greater percent body fat ($t = 18.586$, $p = 0.000$) total body fat ($t = 4.899$, $p = 0.000$) as compared to male softball players. On the other hand, male softball players had significantly greater lean body mass ($t = 24.538$, $p = 0.000$) than the female softball players.

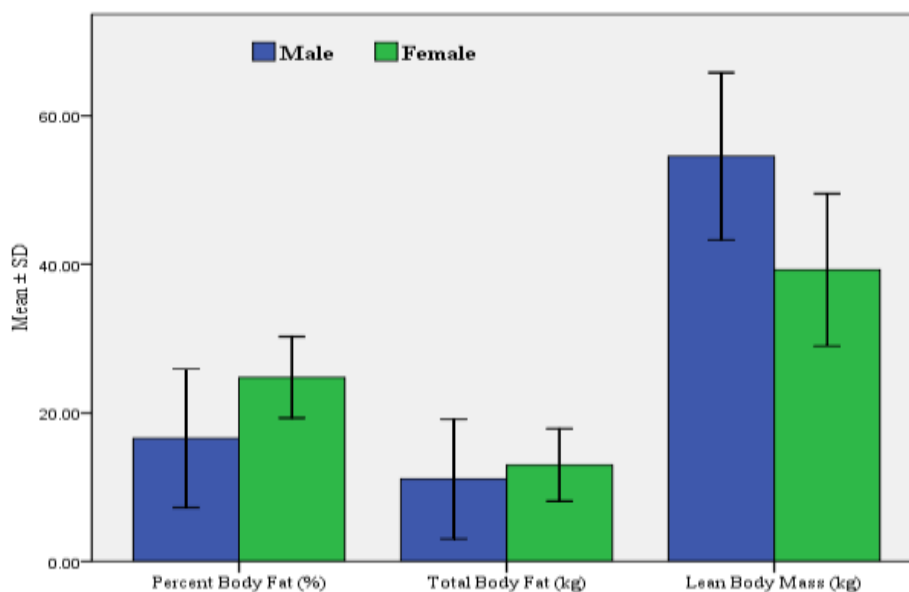


Figure 1: Different components of the body composition of the male and female softball players

4. Discussion

The primary objective of the study was to assess the body composition components among the male and female softball players. 150 male (mean age: 21.35 ± 2.57 years) and 150 female (mean age: 20.50 ± 2.10 years) softball players from various universities and states of India were assessed for various components of body composition. The descriptive data on various components of body composition of the male and female softball players are presented in the table 1. The male and female softball players were also compared on these parameters. The percent body fat of male and female softball players in the present study was 16.56 ± 4.66 % and 24.77 ± 2.74 % respectively. The percent body fat of the male softball players was within the normal limits and was

higher than the under-15 Indian softball players studied by Rao and Kumar (2015), minor and major baseball league players reported by Hoffman et al. (2009), high school and professional baseball players from USA (Szymanski et al., 2010; Mangine et al., 2013), NCAA Division II baseball players (Myers, 2012), Japanese high school baseball players (Tajika et al., 2015) and elite Korean baseball players (Ko and Kim, 2005). On the other hand, the male softball players in the present study had lesser fat percentage than the Cuban baseball players (Carvajal et al., 2009) and collegiate softball players from Thailand (Sintara and Sonchan, 2015).

The female softball players in the present study were found to have much higher fat percentage which is comparable to the Indian elite softball players reported by Singh et al. (2013). However, the female softball players had higher fat percentage than their international counterparts such as Czech Republic's national softball team players (Mala et al., 2015) and NCAA Division II and III softball players studied by Dickson et al. (2009). The female softball players in the present study were observed to have lower fat percentage than the Indian non-elite female softball players (Singh et al., 2013), NCAA Division I and II softball players (Thompson and Barkley, 2013; Szymanski et al., 2012), collegiate softball players from Thailand (Sintara and Sonchan, 2015) and South Australian softball players (Withers and Roberts, 1981). In case of lean body mass, the male and female softball players were observed to have mean values 54.53 ± 5.64 kg and 39.26 ± 5.12 kg respectively. The male softball players had lesser lean body mass in comparison to the minor and major baseball league players (Hoffman et al., 2009), Cuban baseball players (Carvajal et al., 2009), high school and professional baseball players from USA (Szymanski et al., 2010; Mangine et al., 2013), NCAA Division II baseball players (Myers, 2012) and Japanese high school baseball players (Tajika et al., 2015). The lean body mass of the female softball players in the present study was comparable to that of Indian elite and non-elite female softball players reported by Singh et al. (2013). However, the female softball players had lower lean body mass than the Czech Republic's national softball team players (Mala et al., 2015) and NCAA Division I, II and III softball players (Dickson et al., 2009; Thompson and Barkley, 2013; Szymanski et al., 2012). It is revealed from the above discussion that the findings regarding body composition of female softball players were consistent with those previously reported on Indian female softball players. However the female softball players had lower body fat percentage than the female softball players of some other countries but they also had lower muscle mass which has major role in energy production and force generation during play.

5. Conclusion

It is concluded from the findings of the present study that male softball players had superior body composition components. Male players possessed higher levels of muscle mass whereas the female softball players had higher amount of body fat as compared to their male counterparts.

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