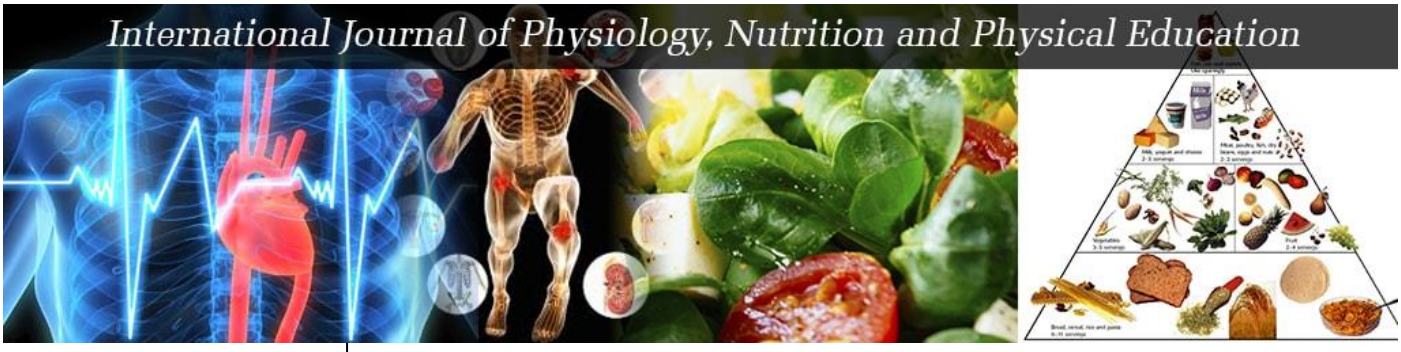

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A study of anthropometrical parameters among different playing positions of baseball players

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Abstract
Background: Anthropometry play an important role in deciding the particular build of the body with various measurements of the segments of the body it has also its importance in the field of various sports. The aim of the current study was to evaluate anthropometric characteristics
Methods: The present study were consisted of 64 male inter-university baseball players from all India age ranging from 18 to 28 years belonging to Punjab, Delhi, AP and Chandigarh states of all India inter university. The purposively sampling technique was utilized to collect the required data of the subject after the match.
Results: Results of the study indicated that there were significant differences in the various anthropometrical characteristics among various playing positions in Baseball.
Conclusion: It is reveled from the results that inter-university baseball players significantly differed in the various measurements such as Upper Arm Circumference, Forearm Circumference and other measurements with respect to different paying positions.

Keywords: Anthropometrical characteristics

Introduction
One of the fundamentals of this approach is the study of human measurements or anthropometry. Anthropometry plays an important role in deciding the particular built of the body with various measurements of the body segments, suitable for a particular game and sports and essentially helpful to excel in that game. Anthropometry is a branch of ergonomics that deals specifically with the measurement of people, particularly with measurements of body size, shape, strength and working capacity.
Anthropometry means the measurement of a man, whether living or dead. In simple terms it is the dimensions of the body. Anthropometry represents the typical and traditional tool of human biology, physical anthropology and axiology. Recently it has taken a strong bonded relationship with physical and sports sciences (Sodhi, 1991).
This measurement data is used to describe or paint a picture of the user population for a particular measure of the body. By applying anthropometry, we attempt to design the working environment around the person, rather than placing constraints on them because they have to adapt to what is provided. If anthropometric factors are taken into consideration when products are designed, the outcome is likely to be increased acceptability, improved ease and efficiency of use, and therefore greater operational safety and cost effectiveness. When considering the design and use of equipment, the term 'average person' is often referred to and used. However, very few people would actually fit such a pattern.
The height of an individual is an important anthropometric measurement which sums up the linearity of the body. Height of a person is composed of legs, pelvis, trunk (Supine), head and face. The components of the height are important in pertaining to the assessment of growth in different body proportions and for other general and specific purposes (Sushil Gosain, 1993).
Height is often used as a design criterion, but a 'tall' person can either have a long or short body and long or short legs. Anthropometry is used to assess and predict performance, health and survival of individuals and reflect the economic and social well-being of populations. Anthropometry is a widely used, inexpensive and non- invasive measure of the general nutritional status of an individual or a population group.

Recent studies have demonstrated the applications of anthropometry to include the prediction of who will benefit from interventions, identifying social and economic inequity and evaluating responses to interventions.

Anthropometric measurements are widely used to assess and predict performance in various sports. Anthropometric measurements and morphological characteristics play an important role in determining the success of a sportsperson (Wilmore & Costill, 1999; Keogh, 1999) [1]. An athlete's anthropometric and physical characteristics may represent important prerequisites for successful participation in any given sport (Gualdi-Russo & Zaccagni, 2001) [2]. Indeed, it can be assumed that an athlete's anthropometric characteristics can in some way influence his/her level of performance, at the same time helping to determine a suitable physique for a certain sport (Carter & Heath, 1990). It has been well established that specific physical characteristics or anthropometric profiles indicate whether the player would be suitable for the competition at the highest level in a specific sport (Claessens *et al*., 1999; Reilly *et al*., 2000; Gabbett, 2000; Slater *et al*., 2005) [3, 4].

Somatotypes of athletes in different sports

Plenty of evidence supports that the ideal somatotype for athletes varies as a function of the sport or event (Carter and Heath, 1990, Duquet and Carter, 1996) [5]. Although ideal body size and shape are not the only elements necessary for an athlete to excel, they may represent important prerequisites for successful performance in a sport.

Indeed, it can be assumed that a player's anthropometric characteristics in some way influence his/her level of performance and at the same time can help to determine a suitable physique for a certain sport. Therefore, somatotype analysis can provide a descriptive picture of the anthropometric characteristics of the high-level players. In this sense, the somatotyping method is believed to yield better results than simple linear anthropometric measurement (Rienzi *et al*., 1999), since it combines adiposity, musculo-skeletal robustness and linearity into a somatotype rating (Gualdi-Russo and Zaccagni, 2001b) [2].

Neni *et al*. (2007) [6] reported the somatotypes of adult Indonesian, in particular of male athletes in a number of sports. The athletes were from badminton, baseball and volleyball, aged in their 20's. Non-athlete undergraduate students were also studied as a control group. The following findings were obtained: the mean somatotype of the badminton players was 'central' (3.3-3.7-3.7), that of the baseball players was 'mesomorph-endomorph' (1.7 -4.50-5.80), that of the volleyball players was 'mesomorph-ectomorph' (2.4-3.5-3.7), and that of the students were 'ectomorphic mesomorph' (2.7-5.2-3.8). Compared with international data, the Indonesian players were shorter and heavier in each of the sports. The mean somatotype of the Indonesian badminton players was 'central', contrasting with the more mesomorphic South Australian players. The somatotypes of the international baseball groups were divided into 'mesomorphiendoomorph' and 'endomorphic mesomorph'. The indonesian baseball players belong to the latter group (Neni *et al*., 2007) [6].

Athletes of a specific sport event may be characterized by a particular somatotype. The literature has shown that high-level female volleyball players have a common somatotype, mesomorphy.

Materials and Methods

This study used a cross-sectional design and was descriptive in nature and purposive sampling technique was used to collection of data. It is not possible to collect the data for each and every university baseball players of India so, the subject for the present study were consisted of 64 male inter-university baseball players from all India age ranging from 18 to 28 years belonging to Punjab, Delhi, AP and Chandigarh states of all India inter university. Minimum level of participation was Inter-university. The purposively sampling technique was utilized to collect the required data of the subject after the match.

Selected anthropometry description data were collected from the current top four men's baseball teams. Anthropometry measurements and statistical analyses were performed to determine the physical characteristics of the baseball players, and comparisons were made between the players of different baseball positions.The participants were keenly examined and tested. The data were collected during All India intervarsity championship of Baseball (Men Section) held at Panjab University Chandigarh.

Selection of Variables

Selected anthropometric measurements and physiological description were taken from each subject were as follows:

Anthropometric Measurements

Anthropometric measurements taken from each subject were as follows:

Gross Body Measurements

1. Height (cm)
2. Weight (kg)

Circumferences of Body Parts (cm)

1. Upper Arm Circumference
2. Forearm Circumference
3. Chest Circumference
4. Thigh Circumference
5. Calf Circumference

Skinfold Thickness (mm)

1. Biceps
2. Triceps
3. forearm
4. Subscapular
5. Suprailiac
6. Thigh
7. Calf

Diameters of Body Parts (cm)

1. Bicondylar Humerus Diameter
2. Bicondylar Femur Diameter

Results and Discussion

Table 1: The means, standard deviation, range and standard error for the age, weight, height and BMI are presented of baseball players

Descriptive Statistics BMI						
Groups	**N**	**Min**	**Max**	**Mean**	**SE**	**SD**
Age In Month	64	211.00	322.00	261.42	3.28	26.27
Height	64	159.00	184.00	170.82	0.74	5.91
Weight	64	50.00	93.00	69.16	1.08	8.66
BMI	64	18.37	30.44	23.67	0.31	2.48

Table 1 revealed that mean age of the baseball players was 261.42 month (SD=26.54). Mean height of the baseball players was 170.82 (SD=5.91) and mean BMI of the baseball players was 23.67 (SD=2.48). For weight the mean score was 69.15kg. (SD=8.66). Bmi of the baseball players was 23.67 (SD=2.48)

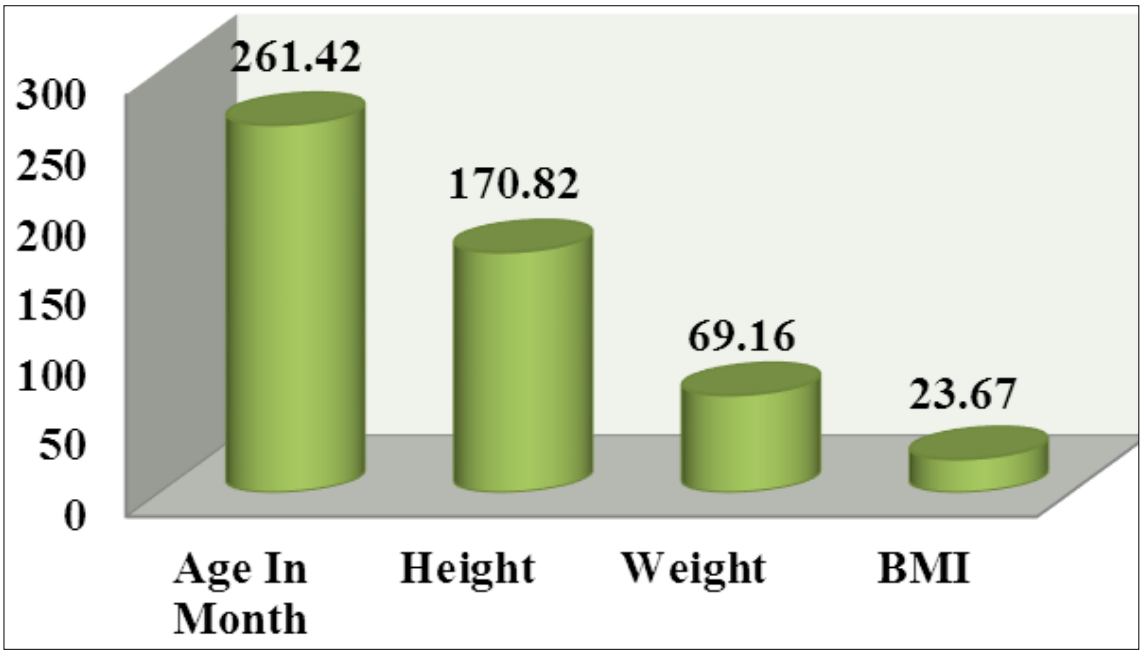

Fig 1: The graphical representation of means, standard deviation, range and standard error for the age, weight, height and BMI of baseball players

The descriptive statistics for anthropometric variable are given in table 2

Table 2: The means, standard deviation, range and standard error for the body circumference statistics are presented of baseball players

Body Circumference Statistics						
Groups	N	Min	Max	Mean	SE	SD
Chest Circumference	64	80.00	106.00	91.92	.91	7.24
Upper Arm Circumference	64	26.00	41.00	31.33	.41	3.24
Forearm Circumference	64	25.00	40.00	29.27	.35	2.77
Thigh Circumference	64	44.00	60.00	52.36	.46	3.66
Calf Circumference	64	32.00	44.00	36.45	.35	2.82

The table 2 revealed the mean, range, standard error mean and standard deviation of the body circumferences of baseball player. Chest circumference the mean score was 91.92cm (SD=7.24) and mean standard error was 0.90. Upper Arm circumference the mean score was 41.00cm (SD=4.24) and mean standard error was 0.40. Forearm circumference the mean score was 29.26cm (SD=2.77) and mean standard error was 0.34. Thigh circumference the mean score was 52.35cm (SD=3.65) and mean standard error was 0.45. Calf circumference the mean score was 36.45cm (SD=2.81) and mean standard error was 0.35

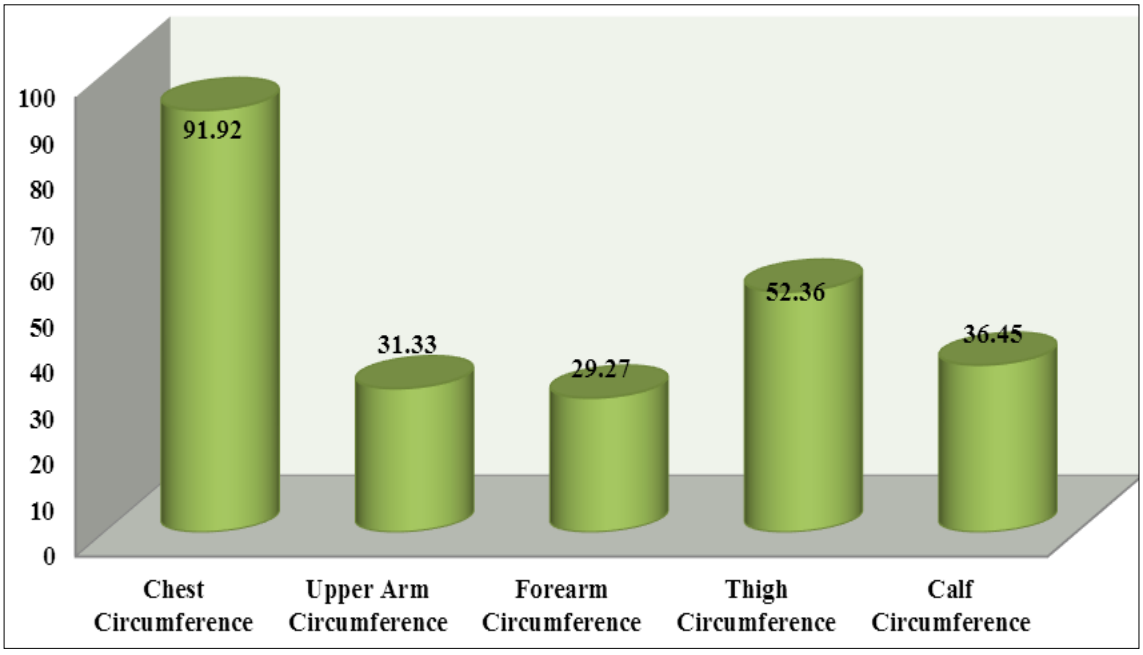

Fig 2: The graphical representation means for the body circumference statistics are presented of baseball players

Table 3: The means, standard deviation, range and standard error for the age, weight, height and BMI are presented in

Body Skinfold Statistics						
	N	**Min**	**Max**	**Mean**	**SE**	**SD**
Biceps Skinfold	64	3.60	10.20	5.71	.19	1.49
Triceps Skinfold	64	4.60	11.80	7.58	.22	1.74
Forearm Skinfold	64	3.00	9.50	5.66	.20	1.61
Subscapular Skinfold	64	5.60	13.40	9.20	.22	1.79
Suprailliac Skinfold	64	5.80	18.00	9.12	.25	1.99
Thigh Skinfold	64	7.80	20.60	12.31	.32	2.59
Calf Skinfold	64	5.20	18.80	9.52	.32	2.55

The table 3 explains that the means, standard deviation, range and standard error for the age, weight, height and BMI of Baseball players. Biceps skinfold mean score was 5.71mm (SD=1.49) and mean standard error was 0.19.Triceps skinfold mean score was 7.58mm (SD=1.74) and mean standard error was 0.22. Forearm skinfold mean score was 5.66mm (SD=1.61) and mean standard error was 0.20. Subscapular skinfold mean score was 9.20mm (SD=1.79) and mean standard error was 0.22. Superilliac skinfold mean score was 9.12mm (SD=1.99) and mean standard error was 0.25. Thigh skinfold mean score was 12.31mm (SD=2.59) and mean standard error was 0.32. Calf skinfold mean scour was 9.52 mm (SD=2.55) and mean standard error was 0.32.

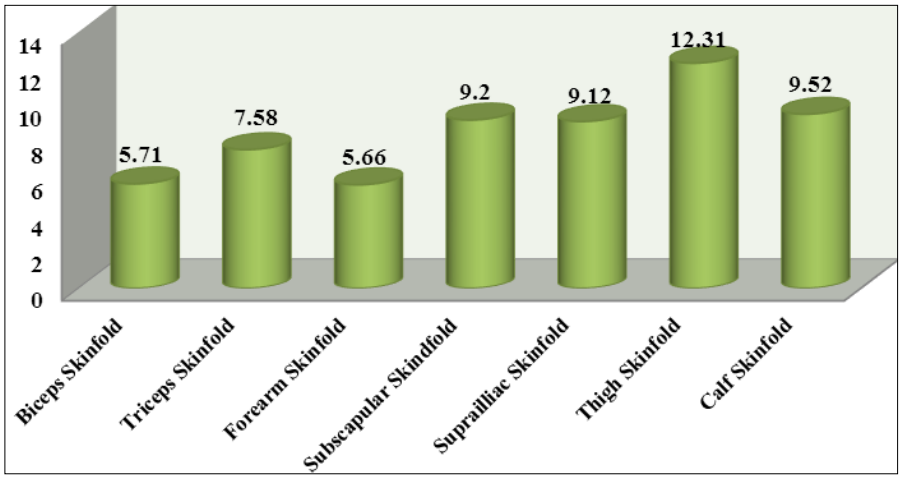

Fig 3: The graphical representation of means, standard deviation, range and standard error for the age, weight, height and BMI

Conclusion

It is established that body build plays an important role in achievements in many sport since it provides a basis for the formation and improvement of movement techniques, specific physical performance. Furthermore, the combination of somatometry and physiological factors of a baseball player partly determines successful competition in baseball. These two features are basic factors, which can limit the technical and tactical level of an opponent team during the game (Papadopoulou *et al*., 2002)

Performance and body type varied by playing position, and statistically significant differences were found in physiological parameters, body composition and somatotype variables among four playing positions namely, the catcher, the pitcher, the infield and outfield.. No significant differences in proportionality were found. Outfielders (center, left, and right fielders) were the best offensive players with the highest mean body weight and age mass values. Fielders (first base, second base, shortstops, and third base) had the lowest mean body weight. Catchers had similar mean weight, height values as infielders. Carvajal *et al*. (2009) [8].

Pitchers were morphologically similar to players in all positions, but significant morphological differences were found among pitchers with different performance levels as they were taller and lower in weight. Carvajal *et al*. (2009) [8].

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