Assessment of selected anthropometric variables of basketball, football and cricket Indian university players

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Abstract

Aims: The purpose of this study was Assessment of Selected Anthropometric Variables of Male Basketball, Football and Cricket Indian University Participation Players.

Materials and Methods: There was seventy five (N=75) trained male basketball, football and cricket players participated in the study from each game i.e. basketball, football and cricket. Little is done to observe the effects of the training of each game on anthropometric profile or body size of male basketball, football and cricket players.

Results: The mean age, height and weight of male basketball, football and cricket players was 22.12±1.61 year, 183.32±12.82cm and 78.08±12.18 Kg, 22.12±1.61 year, 183.32±12.82cm and 78.08±12.18 Kg and 21.12±1.66 year, 174.40±6.66cm and 63.28±3.92 Kg respectively. The study shows the relationship among body girths (circumferences). A statistical significant positive correlation was found between arm girth relaxed and arm girth flexed & tensed (r = .913 P<.01), forearm girth (r = .781 P<.01), chest girth(r = .562 P<.01), waist girth(r = .545 P<.01), gluteal girth (r = .748 P<.01), thigh girth1 (r = .525P<.01), thigh girth2 (r = .743 P<.01). Similarly, a statistical significant positive correlation was found between chest girth and waist girth (r = .422 P<.05). A statistical significant positive correlation was also found between ankle girth and wrist girth (r = .564 P<.01), thigh girth1(r = .483 P<.05), thigh girth2 (r = .495 P<.05), and calf girth (r = .618 P<.01).

Conclusion: The physique characteristics mainly age, height, body weight, Arm girth relaxed, Arm girth flexed tensed, Forearm girth, Wrist girth, Chest girth, Waist girth, Gluteal girth, Thigh girth1, Thigh girth2, Calf girth, Ankle girth, bone diameter is significantly distinct on basketball, cricket and football players’ performance. This reference data will be helpful for researchers and practitioners interested in cricket, basketball and football.

Keywords: Girth, circumferences, body size, waist girth, chest girth, diameter

1. Introduction

Anthropometry has a rich tradition in sports sciences, physical education and sports medicine. despite the fact that, in different times, different terms were used like dynamic anthropometry, sports anthropometry, biometry, physiological anthropometry, anthropometric measurements, kin-anthropometry etc. by scientists to establish some relationships between the body structure of different sports person and the specialized functions required for various tasks (Koley, 2006) [14].

In fact, it is well established that each individual of players physic is unique. The human changeability is so enormous that no two individuals can ever be exactly the same. There are two main causes for this deviation. One is the genes inherited from parents and the other is the infinity of environment which acts upon individuals from structure to very important. Therefore, researchers have always been fascinated by the phenomenon of human variation. In the sports, the law of chance operates as a whole and sports person in general tend to fall along a curve of normal distribution on all traits (Koley & Sandhu, 2005) [13].

The period of competitions and practice sessions, players are involved in heavy schedules which require careful short-term and long-term planning of their training programs. Anthropometric dimensions and morphological characteristics play an important role in determining the success of sports person (Rico-Sanz, 1998; Wilmore and Costill, 1999; Keogh, 2006).
Quite naturally, the interest in anthropometric characteristics and body composition of sportsperson from different competitive sports has increased extremely over the last ten years. 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 like basketball, football, cricket etc (Claessens et al., 1999; Bourgois et al., 2000; Reilly et al., 2000; Gabbert, 2000; Ackland et al., 2003; Slater et al., 2005) [9, 7, 22, 31, 2, 24]. These anthropometric parameters are the sensitive indicators of physical growth of the sportspersons for their maximal performances (Wilmore and Costill, 1999; Chatterjee et al., 2006) [25, 8].

Numerous studies have examined the relationships between anthropometric and physiological characteristics of basketball, football and cricket players (Lamonte et al., 1999; Ackland et al., 1997; Bale, 1991; Bayios et al., 2006; Latin et al., 1994; Ostojc et al., 2006) [16, 3, 4, 5, 17, 21]. But in Indian context the literature is scant in this regard. To fill the gap in the literature, the present study was planned. Mainly, in our research work there are three games basketball, football and cricket. Therefore, the aim of the present study was to observe assessment of selected anthropometric variables of male basketball, football and cricket Indian university participation players.

2. Materials and Methods
There was seventy five (N=75) trained male basketball, football and cricket players between the ages of 17 and 25 years volunteered for this study. In other words, twenty five players participated in the study from each game i.e. basketball, football and cricket. Little is done to observe the effects of the training of each game on anthropometric profile or body size of male basketball, football and cricket players.

3. Results
The mean age, height and weight of male basketball, football and cricket players was 22.12±1.61 year, 183.32±12.82cm and 78.08±12.18 Kg, 22.12±1.61 year, 183.32±12.82cm and 78.08±12.18 Kg and 21.12±1.66 year, 174.40±6.66cm and 63.28±3.92 Kg respectively (Table 1).

### Table 1: Mean ±SD of Age, height and weight of male Basketball, Football and Cricket Indian university level participation players.

| Player’s Playing Experience | N   | Age, (year) | Height (cm) | Body weight (kg) |
|-----------------------------|-----|-------------|-------------|------------------|
| Basketball Players          | 25  | 22.12±1.61  | 183.32±12.82| 78.08±12.18      |
| Football Players            | 25  | 20.96±1.90  | 169.76±20.63| 64.80±5.07       |
| Cricket Players             | 25  | 21.12±1.66  | 174.40±6.66 | 64.80±5.07       |
| Total                       | 75  | 21.40±1.78  | 177.16±10.07| 68.72±10.30      |

#### 3.1 Comparison of Body Girths of Basketball, Cricket and Football Players

#### 3.2 Arm girth relaxed
It was observed that the mean arm girth relaxed of basketball players was 29.74±7.77cm, cricket players was 24.72±2.17cm and football players was 26.84±2.76cm (Table 2).

The variance in the mean values of arm girth relaxed among different sports disciplines was statistical analyzed with the help of ANOVA. The results of ANOVA showed (Table 3) that the variance in the mean values of arm girth relaxed between different groups (basketball, cricket and football players) was statistical significant.

Further, results of scheffe posthoc (Table 4) showed that basketball players showed the significant difference in arm girth relaxed at \( P<0.05 \) when compared with the cricket and football players. The cricket players also showed the significant difference in arm girth relaxed at \( P<0.05 \) when compared with the football players.

#### 3.3 Arm girth flexed tensed
It was observed that the mean arm girth flexed tensed of basketball players was 32.28±2.03cm, cricket players was 28.10±2.32cm and football players was 30.74±2.96cm (Table 2).

The variance in the mean values of arm girth flexed tensed among different sports disciplines was statistical analyzed with the help of ANOVA. The results of ANOVA showed (Table 3) that the variance in the mean values of arm girth flexed tensed between different groups (basketball, cricket and football players) was statistical significant.

Further, results of scheffe posthoc (Table 4) showed that basketball players showed the significant difference in arm girth flexed tensed at \( P<0.05 \) when compared with the cricket players. The cricket players also showed the significant difference in arm girth flexed tensed at \( P<0.05 \) when compared with the football players.

#### 3.4 Forearm girth
It was observed that the mean forearm girth of basketball players was 26.92±1.44cm, cricket players was 23.10±1.44cm and football players was 25.38±1.33cm (Table 2).

The variance in the mean values of forearm girth among different sports disciplines was statistical analyzed with the help of ANOVA. The results of ANOVA showed (Table 3) that the variance in the mean values of forearm girth between different groups (basketball, cricket and football players) was statistical significant.

Further, results of scheffe posthoc (Table 4) showed that basketball players showed the significant difference in forearm girth at \( P<0.05 \) when compared with the cricket and football players. The cricket players also showed the significant difference in forearm girth at \( P<0.05 \) when compared with the football players.

#### 3.5 Wrist girth
It was observed that the mean wrist girth of basketball players was 17.74±2.05cm, cricket players were 15.08±1.11cm and football players was 16.52±0.65cm (Table 2).

The variance in the mean values of wrist girth among different sports disciplines was statistical analyzed with the help of ANOVA. The results of ANOVA showed (Table 3) that the variance in the mean values of wrist girth between different groups (basketball, cricket and football players) was statistical significant.

Further, results of scheffe posthoc (Table 4) showed that basketball players showed the significant difference in wrist girth at \( P<0.05 \) when compared with the cricket and football players. The cricket players also showed the significant difference in wrist girth at \( P<0.05 \) when compared with the football players.

#### 3.6 Chest girth
It was observed that the mean chest girth of basketball players
was 92.36±17.12cm, cricket players was 84.36±12.96cm and football players was 86.28±14.72cm (Table 2). The variance in the mean values of chest girth among different sports disciplines was statistical analyzed with the help of ANOVA. The results of ANOVA showed (Table 3) that the variance in the mean values of chest girth between different groups (basketball, cricket and football players) was not statistical significant.

3.7 Waist girth
It was observed that the waist girth of basketball players was 84.24±7.77cm, cricket players was 73.28±12.74cm and football players was 74.84±13.78cm (Table 2). The variance in the mean values of waist girth among different sports disciplines was statistical analyzed with the help of ANOVA. The results of ANOVA showed (Table 3) that the variance in the mean values of waist girth between different groups (basketball, cricket and football players) was statistical significant. Further, results of scheffe posthoc (Table 4) showed that basketball players showed the significant difference in waist girth at $P<0.05$ when compared with the cricket and football players.

3.8 Gluteal girth
It was observed that the mean gluteal girth of basketball players was 96.60±7.40cm, cricket players were 88.08±4.10cm and football players was 92.40±6.09cm (Table 2). The variance in the mean values of gluteal girth among different sports disciplines was statistical analyzed with the help of ANOVA. The results of ANOVA showed (Table 3) that the variance in the mean values of gluteal girth between different groups (basketball, cricket and football players) was statistical significant. Further, results of scheffe posthoc (Table 4) showed that basketball players showed the significant difference in gluteal girth at $P<0.05$ when compared with the cricket players. The cricket players also showed the significant difference in gluteal girth at $P<0.05$ when compared with the football players.

3.9 Thigh girth1
It was observed that the mean thigh girth1 of basketball players was 58.90±7.72cm, cricket players was 54.28±8.52cm and football players was 57.84±8.88cm (Table 2). The variance in the mean values of thigh girth1 among different sports disciplines was statistical analyzed with the help of ANOVA. The results of ANOVA showed (Table 3) that the variance in the mean values of thigh girth1 between different groups (basketball, cricket and football players) was statistical significant. Further, results of scheffe posthoc (Table 4) showed that basketball players showed the significant difference in thigh girth at $P<0.05$ when compared with the cricket and football players.

3.10 Thigh girth2
It was observed that the mean thigh girth2 of basketball players was 54.04±2.89cm, cricket players were 49.52±3.66cm and football players was 52.40±3.68cm (Table 2). The variance in the mean values of thigh girth2 among different sports disciplines was statistical analyzed with the help of ANOVA. The results of ANOVA showed (Table 3) that the variance in the mean values of thigh girth2 between different groups (basketball, cricket and football players) was statistical significant. Further, results of scheffe posthoc (Table 4) showed that basketball players showed the significant difference in thigh girth2 at $P<0.05$ when compared with the cricket players. The cricket players also showed the significant difference in thigh girth2 at $P<0.05$ when compared with the football players.

3.11 Calf girth
It was observed that the mean calf girth of basketball players was 37.92±3.96cm, cricket players was 33.76±4.46cm and football players was 36.32±4.49cm (Table 2). The variance in the mean values of calf girth among different sports disciplines was statistical analyzed with the help of ANOVA. The results of ANOVA showed (Table 3) that the variance in the mean values of calf girth between different groups (basketball, cricket and football players) was statistical significant. Further, results of scheffe posthoc (Table 4) showed that basketball players showed the significant difference in calf girth at $P<0.05$ when compared with the cricket players.

3.12 Ankle girth
It was observed that the mean ankle girth of basketball players was 23.40±2.25cm, cricket players was 20.14±1.25cm and football players was 21.92±0.90cm (Table 2). The variance in the mean values of ankle girth among different sports disciplines was statistical analyzed with the help of ANOVA. The results of ANOVA showed (Table 3) that the variance in the mean values of ankle girth between different groups (basketball, cricket and football players) was statistical significant. Further, results of scheffe posthoc (Table 4) showed that basketball players showed the significant difference in ankle girth at $P<0.05$ when compared with the cricket and football players. The cricket players also showed the significant difference in ankle girth at $P<0.05$ when compared with the football players.

| Variable(s)         | Group               | N   | Mean ± SD   |
|---------------------|---------------------|-----|-------------|
| Arm girth relaxed, cm | 1 (Basketball)      | 25  | 29.74±3.77  |
|                     | 2 (Cricket)         | 25  | 24.72±2.17  |
|                     | 3 (Football)        | 25  | 26.84±2.76  |
|                     | Total               | 75  | 27.10±3.59  |
| Arm girth flexed tensed, cm | 1 (Basketball) | 25  | 32.28±2.03  |
|                     | 2 (Cricket)         | 25  | 28.10±2.32  |
|                     | 3 (Football)        | 25  | 30.74±2.96  |
|                     | Total               | 75  | 30.37±2.99  |
| Forearm girth, cm   | 1 (Basketball)      | 25  | 26.92±1.44  |
|                     | 2 (Cricket)         | 25  | 23.10±1.44  |
|                     | 3 (Football)        | 25  | 25.38±1.33  |
|                     | Total               | 75  | 25.13±2.10  |
| Wrist girth, cm     | 1 (Basketball)      | 25  | 17.74±2.05  |

Table 2: Mean ± SD of Body Girths of Basketball, Cricket and Football Players
| Variable(s)       | Sum of Squares | Mean Square | F       | Sig     |
|------------------|----------------|-------------|---------|---------|
| Arm girth relaxed|                |             |         |         |
| Between Groups   | 117,540        | 158.770     | 17.919  | .000    |
| Within Groups    | 637.960        | 8.861       |         |         |
| Arm girth flexed|                |             |         |         |
| Between Groups   | 223.447        | 111.723     | 18.299  | .000    |
| Within Groups    | 439.600        | 6.106       |         |         |
| Forearm girth    |                |             |         |         |
| Between Groups   | 184.687        | 92.343      | 46.664  | .000    |
| Within Groups    | 142.480        | 1.979       |         |         |
| Wrist girth      |                |             |         |         |
| Between Groups   | 88.647         | 44.323      | 22.531  | .000    |
| Within Groups    | 141.640        | 1.967       |         |         |
| Chest girth      |                |             |         |         |
| Between Groups   | 872.107        | 436.053     | 1.929   | .153    |
| Within Groups    | 16274.560      | 226.036     |         |         |
| Waist girth      |                |             |         |         |
| Between Groups   | 1757.627       | 878.813     | 6.386   | .003    |
| Within Groups    | 9908.960       | 137.624     |         |         |
| Gluteal girth    |                |             |         |         |
| Between Groups   | 907.440        | 453.720     | 12.508  | .000    |
| Within Groups    | 2611.840       | 36.276      |         |         |
| Thigh girth 1    |                |             |         |         |
| Between Groups   | 292.847        | 146.423     | 2.080   | .132    |
| Within Groups    | 5069.400       | 70.408      |         |         |
| Thigh girth 2    |                |             |         |         |
| Between Groups   | 261.787        | 130.893     | 11.098  | .000    |
| Within Groups    | 849.200        | 11.794      |         |         |
| Calf girth       |                |             |         |         |
| Between Groups   | 220.160        | 110.080     | 5.907   | .004    |
| Within Groups    | 1341.840       | 18.637      |         |         |
| Ankle girth      |                |             |         |         |
| Between Groups   | 133.220        | 66.610      | 26.703  | .000    |
| Within Groups    | 179.600        | 2.494       |         |         |

*significant at the 0.05 level

Table 4: Scheffe Posthoc Multiple Comparisons of Body Girths among different groups

| Dependent Variable | 1-Basketball; 2-Cricket; 3-Football | 1-Basketball; 2-Cricket; 3-Football | Mean Difference (I-J) | Sig.     |
|--------------------|-----------------------------------|-----------------------------------|-----------------------|---------|
| Arm girth relaxed  | 1                                 | 2                                 | 3                     | .000    |

*significant at the 0.05 level
4. Discussion
On the basis of the data obtained in this study, it was found that there are significant differences in certain anthropometric characteristics between cricketers, football and basketball players. Examining anthropometric factors of cricketers, footballers and basketball players and their association with each other is relevant to the player sports performance, playing technique, body biomechanics, selection predictability, predictability of sports injuries and its rehabilitation. Results relating to measures of the arm girth, forearm girth, wrist girth, chest girth, thigh girth, calf girth and ankle girth showed significantly higher values for basketball players.

As stated by Masanovic et al. (2018) being a professional athlete requires a high level of preparation which, in addition to motor and functional abilities, must be supported by morphological characteristics. He proposed that in basketball greater circumference of extremities and higher diameter of joints is required for better blocking activities. Ayeigbusi et al. (2017) and Cengizel (2021) suggested that calf girth has a significant impact on vertical jump performance and speed in basketball players. Proposed that there is little significant correlation between the agility performance and calf girth but the there is a highly significant correlation between calf girth and speed performance in the football players.

In footballers the calf girth and mid-thigh girth of defenders has shown to be greater than that of the midfields and forwards as stated by (Abdela 2019) [1]. As stated by Mogadham et al. (2012) the goalkeepers possessed larger limb girth as compared to other positions in the football ground. It is beneficial to measure body breadth to determine body build and physique, in his study it was stated that mean of relaxed arm girth of the goalkeepers is larger than that of the defenders and halfbacks, means of flexed arm and buttocks girth of goalkeepers are larger than halfbacks this difference can be attributed to variation in game engagement by the goalkeepers in the game.

Less movement, larger build, bulk weight and individually planned practices in long run may make the bones thicker, perform muscle tissue hypertrophy (with more practice with weights) and increase subcutaneous fat. Limb girths are a function of inner diameter and cross section of the limb; they can be a function of subcutaneous fat thickness, muscular bulk and bone diameter. The increase leads to the increase in the size of muscle.

Stuelken et al. (2007) stated that the male bowlers had higher girth measurements than their female counterparts. Singh (2015) stated that weight of the body and arm girth might have positively influenced the performance in throwing because the greater mass of the body plays an important role in increasing the movement of the object.
5. Conclusion
In conclusion, significant differences were observed in the anthropometric variables of cricket, basketball and football players. This statistically significant difference can be because of different roles, tactics and skills of each athlete in match. The acknowledgment of these differences will increase the knowledge of trainers and coaches for selecting specific players for specific game and planning different training techniques and recommending specific rehabilitation protocols. The physique characteristics mainly age, height, body weight, Arm girth relaxed, Arm girth flexed, Forearm girth, Wrist girth, Chest girth, Waist girth, Gluteal girth, Thigh girth1, Thigh girth2, Calf girth, Ankle girth bone diameter is significantly distinct on basketball, cricket and football players’ performance. This reference data will be helpful for researchers and practitioners interested in cricket, basketball and football.

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