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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 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.

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 ($r = .525 P < .01$), 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 sportsperson (Rico-Sanz, 1998; Wilmore and Costill, 1999; Keogh,

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1999) [23, 25, 12]. 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; Gabbet, 2000; Ackland *et al.*, 2003; Slater *et al.*, 2005) [9, 7, 22, 11, 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; Ostojic *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±3.77cm, 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 ± 17.12 cm, cricket players was 84.36 ± 12.96 cm and football players was 86.28 ± 14.72 cm (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 ± 7.77 cm, cricket players was 73.28 ± 12.74 cm and football players was 74.84 ± 13.78 cm (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 ± 7.40 cm, cricket players were 88.08 ± 4.10 cm and football players was 92.40 ± 6.09 cm (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 ± 7.72 cm, cricket players was 54.28 ± 8.52 cm and football players was 57.84 ± 8.88 cm (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 not statistical significant.

3.1.0 Thigh girth2

It was observed that the mean thigh girth2 of basketball players was 54.04 ± 2.89 cm, cricket players were 49.52 ± 3.66 cm and football players was 52.40 ± 3.68 cm (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.

3.1.1 Calf girth

It was observed that the mean calf girth of basketball players was 37.92 ± 3.96 cm, cricket players was 33.76 ± 4.46 cm and football players was 36.32 ± 4.49 cm (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.

3.1.2 Ankle girth

It was observed that the mean ankle girth of basketball players was 23.40 ± 2.25 cm, cricket players was 20.14 ± 1.25 cm and football players was 21.92 ± 0.90 cm (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.

Table 2: Mean \pm SD of Body Girths of Basketball, Cricket and Football Players

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

	2 (Cricket)	25	15.08±1.11
	3 (Football)	25	16.52±0.65
	Total	75	16.44±1.76
Chest girth, cm	1 (Basketball)	25	92.36±17.12
	2 (Cricket)	25	84.36±12.96
	3 (Football)	25	86.28±14.72
	Total	75	87.66±15.22
Waist girth,cm	1 (Basketball)	25	84.24±7.77
	2 (Cricket)	25	73.28±12.74
	3 (Football)	25	74.84±13.78
	Total	75	77.45±12.55
Gluteal girth,cm	1 (Basketball)	25	96.60±7.40
	2 (Cricket)	25	88.08±4.10
	3 (Football)	25	92.40±6.09
	Total	75	92.36±6.89
Thigh girth1,cm	1 (Basketball)	25	58.90±7.72
	2 (Cricket)	25	54.28±8.52
	3 (Football)	25	57.84±8.88
	Total	75	57.00±8.51
Thigh girth2,cm	1 (Basketball)	25	54.04±2.89
	2 (Cricket)	25	49.52±3.66
	3 (Football)	25	52.40±3.68
	Total	75	51.9867±3.87
Calf girth,cm	1 (Basketball)	25	37.92±3.96
	2 (Cricket)	25	33.76±4.46
	3 (Football)	25	36.32±4.49
	Total	75	36.00±4.59
Ankle girth,cm	1 (Basketball)	25	23.40±2.25
	2 (Cricket)	25	20.14±1.25
	3 (Football)	25	21.92±0.90
	Total	75	21.82±2.05

Table 3: Analysis of Variance of (ANOVA) Body Girths among different groups

Variable(s)		Sum of Squares	Mean Square	F	Sig.
Arm girth relaxed	Between Groups	317.540	158.770	17.919	.000
	Within Groups	637.960	8.861		
Arm girth flexed tensed	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 girth1	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	(I) 1-Basketball; 2-Cricket ; 3-Football	(J) 1-Basketball; 2-Cricket ; 3-Football	Mean Difference (I-J)	Sig.
Arm girth relaxed	1	2	5.02000*	.000
		3	2.90000*	.004

	2	3	-2.12000*	.048
Arm girth flexed tensed	1	2	4.18000*	.000
		3	1.54000	.095
	2	3	-2.64000*	.001
		3	3.82000*	.000
Forearm girth	1	3	1.54000*	.001
		2	-2.28000*	.000
Wrist girth	1	2	2.66000*	.000
		3	1.22000*	.012
	2	3	-1.44000*	.002
		2	8.00000	.178
Chest girth	1	3	6.08000	.365
		2	-1.92000	.903
Waist girth	1	2	10.96000*	.006
		3	9.40000*	.022
	2	3	-1.56000	.896
		2	8.52000*	.000
Gluteal girth	1	3	4.20000	.054
		2	-4.32000*	.046
Thigh girth1	1	2	4.62000	.158
		3	1.06000	.905
	2	3	-3.56000	.330
		1	4.52000*	.000
Thigh girth 2	1	3	1.64000	.247
		2	-2.88000*	.016
Calf girth	1	2	4.16000*	.005
		3	1.60000	.428
	2	3	-2.56000	.118
		1	3.26000*	.000
Ankle girth	1	3	1.48000*	.006
		2	-1.78000*	.001

*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 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 midfielders 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 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.

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