



## Anthropometric Measurements of Volleyball Players at Different Level of Competition

### KEYWORDS

Anthropometric, inter-college, inter-school, volleyball.

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**ABSTRACT** The purpose of this study was to compare the anthropometric characteristics of volleyball players at different level of competition (i.e. inter-college level and inter-school level). A sample of 60 subjects, which includes 30 each, inter-college level (N=30, mean  $\pm$  SD: age 20.42  $\pm$  0.87 years, height 178.06 $\pm$  6.14cm, weight 67.64 $\pm$  6.88kg, BMI 21.34 $\pm$  2.06) and inter-school level (N=30, mean  $\pm$  SD: age 17.42  $\pm$  0.87 years, height 174.06 $\pm$  6.14cm, weight 64.64 $\pm$  6.88kg, BMI 21.33 $\pm$  2.12) male volleyball players, was selected for the present study. The purposive sampling technique was used to select the subjects. All the subjects were assessed for height, weight, lengths, circumferences, diameters and skin fold thicknesses. An independent samples t-test revealed that inter-college volleyball players had significantly higher height ( $p < 0.05$ ), arm length ( $p < 0.05$ ), upper leg length ( $p < 0.05$ ) and lower leg length ( $p < 0.05$ ) as compared to inter-school level volleyball players. The inter-college level volleyball players were also found to have significantly greater elbow diameter ( $p < 0.05$ ), shoulder diameter ( $p < 0.05$ ), hip diameter ( $p < 0.05$ ), knee diameter ( $p < 0.05$ ), calf circumference ( $p < 0.05$ ), chest circumference ( $p < 0.05$ ), upper arm circumference ( $p < 0.05$ ) and fore arm circumference ( $p < 0.05$ ). Inter-school volleyball players had significantly greater biceps ( $p < 0.05$ ), triceps ( $p < 0.05$ ), sub scapular ( $p < 0.05$ ) and supra iliac skin fold ( $p < 0.05$ ) as compared to basketball players.

### Introduction

Anthropometry is the measurement of body size and proportions. The measurements include body weight, height, circumference, skin fold thickness and bony widths and lengths (Heyward, 2006). 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). Volleyball belongs to sport activities in which anthropometric characteristics of its participants influence the level of sport performance. It was established that volleyball players compared to most other athletes have distinctive anthrop-morphological characteristics (Ercolessi, 1999; Jankovic et al., 1995; Ugarkovic, 2004). An athlete's anthropometric characteristics represent important prerequisites for successful participation in any given sport (Gualdi-Russo & Zaccagni, 2001). Body height, being the most characteristic trait of volleyball players is significantly conditioned genetically (Milicerowa, 1973). Many previous studies have evaluated anthropometric profile of volleyball player (Bandyopadhyay, 2007; Gabbett & Georgieff, 2007; Bayioset al, 2006; Duncan et al, 2006; Gaurav et al., 2010, Hadzic et al., 2012; Petroski et al., 2013; Gaurav & Singh, 2014). Therefore, the purpose of this study was to compare the anthropometric characteristics of volleyball players at different level of competition (i.e. inter-college level and inter-school level).

### Material & Methods Subjects

A sample of 60 subjects, which includes 30 each, inter-college level (N=30, mean  $\pm$  SD: age 20.42  $\pm$  0.87 years, height 178.06 $\pm$  6.14cm, weight 67.64 $\pm$  6.88kg, BMI 21.34 $\pm$  2.06) and inter-school level (N=30, mean  $\pm$  SD: age 17.42  $\pm$  0.87 years, height 174.06 $\pm$  6.14cm, weight 64.64 $\pm$  6.88kg, BMI 21.33 $\pm$  2.12) male volleyball players, was selected for the present study. The purposive sampling technique was used to select the subjects. The inter-college level subjects were selected from different colleges affiliated to Calicut and Kerala University, and

inter-school level subjects were selected from different schools affiliated to Education Department Kerala, India.

### Methodology

The subjects were assessed for height, weight, lengths, circumferences, diameters and skin fold thickness. Height measurements were taken by using the standard anthropometric rod to the nearest 0.5 cm. Body weight was measured with portable weighing machine to the nearest 0.5 kg. Body Mass Index (BMI) was calculated by the following formulae: BMI (Kg/m<sup>2</sup>) = (Body weight in Kg)/(Height in Meters)<sup>2</sup>. Girths and lengths were taken with the steel tape to the nearest 0.5 cm while widths and diameters of body parts were measured by using sliding caliper. Skin folds thicknesses were assessed by using skin fold caliper.

### Statistical Analyses

Values are presented as mean values and SD. Independent samples t test was used to test if population means estimated by two independent samples differed significantly. The level of significance was set at 0.05. Data was analyzed using SPSS Version 16.0.

### Results

**Table-1 Demographic characteristics of inter-college and inter-school level volleyball players**

| Variables                | Inter-College Volleyball Players (N=30) |      | Inter-School Volleyball Players (N=30) |      | t-value | Sig.  |
|--------------------------|---|------|--|------|---------|-------|
|                          | Mean                                    | SD   | Mean                                   | SD   |         |       |
| Age (yrs)                | 20.42                                   | 0.87 | 17.42                                  | 0.87 | 14.559* | 0.000 |
| Height (cm)              | 178.06                                  | 6.14 | 174.06                                 | 6.14 | 2.766*  | 0.007 |
| Body weight (kg)         | 67.64                                   | 6.88 | 64.64                                  | 6.88 | 1.849   | 0.069 |
| BMI (kg/m <sup>2</sup> ) | 21.34                                   | 2.06 | 21.33                                  | 2.12 | 0.028   | 0.978 |

\*Significant at 0.05 level

**Table-2 Comparison of length measurements of inter-college and inter-school level volleyball players**

| Variables             | Inter-College Volleyball Players (N=30) |       | Inter-School Volleyball Players (N=30) |       | t-value | Sig.  |
|-----------------------|---|-------|--|-------|---------|-------|
|                       | Mean                                    | SD    | Mean                                   | SD    |         |       |
| Arm length(cm)        | 80.06                                   | 3.70  | 76.06                                  | 3.70  | 4.583*  | 0.000 |
| Leg length (cm)       | 94.36                                   | 15.98 | 90.36                                  | 15.98 | 1.062   | 0.292 |
| Upper leg length (cm) | 51.75                                   | 6.54  | 47.75                                  | 6.54  | 2.597*  | 0.011 |
| Lower leg length(cm)  | 41.83                                   | 3.53  | 37.83                                  | 3.53  | 4.803*  | 0.000 |

\*Significant at 0.05 level

**Table-3 Comparison of diameter measurements of inter-college and inter-school level volleyball players**

| Variables              | Inter-College Volleyball Players (N=30) |      | Inter-School Volleyball Players (N=30) |      | t-value | Sig.  |
|------------------------|---|------|--|------|---------|-------|
|                        | Mean                                    | SD   | Mean                                   | SD   |         |       |
| Elbow diameter (cm)    | 7.33                                    | 0.57 | 6.33                                   | 0.57 | 7.389*  | 0.000 |
| Shoulder diameter (cm) | 43.31                                   | 2.09 | 38.31                                  | 2.09 | 10.158* | 0.000 |
| Hip diameter (cm)      | 29.83                                   | 1.93 | 28.83                                  | 1.93 | 2.194*  | 0.032 |
| Knee diameter(cm)      | 9.98                                    | 0.87 | 8.98                                   | 0.87 | 4.861*  | 0.000 |

\*Significant at 0.05 level

Table-1: depicts the demographic characteristics of inter-college and inter-school level volleyball players. The mean age of inter-college players was 20.42 years and inter-school were 17.42 years. The mean height of inter-college was 178.06 cm and inter-school were 174.06 cm. The mean weight of inter-college was 67.64 kg and inter-school were 64.64 kg. The mean BMI values of inter-college were 21.34 and inter-school were 21.33. Results indicated that inter-college players had more height and weight than inter-school volleyball players.

Table-2 shows the comparison of length measurements of inter-college and inter-school level volleyball players. It is evident from the results that significant differences were found between inter-college and inter-school level volleyball players with regard to arm length( $p < 0.05$ ), upper leg length ( $p < 0.05$ ) and lower leg length ( $p < 0.05$ ). The inter-college players had better lengths measurements than inter-school volleyball players.

**Table-4 Comparison of circumference measurements of inter-college and inter-school level volleyball players**

| Variables               | Inter-College Volleyball Players (N=30) |      | Inter-School Volleyball Players (N=30) |      | t-value | Sig.  |
|-------------------------|---|------|--|------|---------|-------|
|                         | Mean                                    | SD   | Mean                                   | SD   |         |       |
| Calf circumference(cm)  | 33.25                                   | 3.02 | 30.25                                  | 3.02 | 4.218*  | 0.000 |
| Thigh circumference(cm) | 48.92                                   | 8.46 | 45.92                                  | 8.46 | 1.505   | 0.137 |

| Variables                    | Inter-College Volleyball Players (N=30) |       | Inter-School Volleyball Players (N=30) |       | t-value | Sig.  |
|------------------------------|---|-------|--|-------|---------|-------|
|                              | Mean                                    | SD    | Mean                                   | SD    |         |       |
| Chest circumference(cm)      | 86.61                                   | 10.27 | 80.61                                  | 10.27 | 2.478*  | 0.016 |
| Upper arm circumference (cm) | 26.33                                   | 2.35  | 23.33                                  | 2.35  | 5.406*  | 0.000 |
| Fore arm circumference (cm)  | 25.08                                   | 3.70  | 22.08                                  | 3.70  | 3.441*  | 0.001 |

\*Significant at 0.05 level

**Table-5 Comparison of skin folds measurements of inter-college and inter-school level volleyball players**

| Variables         | Inter-College Volleyball Players (N=30) |      | Inter-School Volleyball Players (N=30) |      | t-value | Sig.  |
|-------------------|---|------|--|------|---------|-------|
|                   | Mean                                    | SD   | Mean                                   | SD   |         |       |
| Biceps (mm)       | 4.53                                    | 1.13 | 6.53                                   | 1.13 | 7.486*  | 0.000 |
| Triceps (mm)      | 6.97                                    | 2.40 | 10.97                                  | 2.40 | 7.082*  | 0.000 |
| Sub scapular (mm) | 9.11                                    | 2.21 | 12.11                                  | 2.21 | 5.749*  | 0.000 |
| Supra iliac (mm)  | 9.08                                    | 3.59 | 14.08                                  | 3.59 | 5.911*  | 0.000 |
| Calf (mm)         | 7.92                                    | 2.23 | 8.92                                   | 2.23 | 1.899   | 0.062 |

Table-4. Show the comparison of circumference measurements of inter-college and inter-school level volleyball player. Results indicated that inter-college players had significantly greater calf circumference ( $p < 0.05$ ), chest circumference ( $p < 0.05$ ), upper arm circumference ( $p < 0.05$ ) and fore arm circumference ( $p < 0.05$ ) as compare to inter-school volleyball players.

Table-5. Show the comparison of skin folds measurements of inter-college and inter-school level volleyball players. Results indicated that significant differences were found between inter-college and inter-school level volleyball players with regard to biceps ( $p < 0.05$ ), triceps ( $p < 0.05$ ), sub scapular ( $p < 0.05$ ) and supra iliac skin fold ( $p < 0.05$ ) respectively. The inter-school had significantly greater skin folds thickness as compare to inter-college volleyball players.

**Discussion and Conclusion**

In the present study the anthropometric measurements of the volleyball players have been evaluated in relation to their competition level (i.e., inter-college and inter-school). This study indicates the existence of differences between inter-college and inter-school players. The overall results show that inter-college volleyball players were taller and heavier as compared to the inter-school volleyball players. Body height, being the most characteristic trait of volleyball players is significantly conditioned genetically (Milicerowa, 1973). The mean height of the inter-college volleyball players (178.06±6.14 cm) and inter-school volleyball players (174.06±6.14 cm) in the present study is greater than the volleyball players of West Bengal, India (173.10±4.19 cm) reported by Bandyopadhyaya, (2007). In volleyball, teams compete by manipulating skills of spiking and blocking high above the head. Therefore, the presence of tall players is an indispensable factor in the

success of a team (Gaurav et al., 2010). In this study the inter-college volleyball players had significantly greater arm length, upper leg length and lower leg length than inter-school volleyball players because anthropometric characteristics are almost exclusively genetically determined therefore length and breadth measurements cannot be changed with training (Norton & Olds, 2001). On the other hand inter-college volleyball players had significantly greater all the diameters. Results indicated that the inter-college volleyball players had significantly greater calf circumference, chest circumference, upper arm and forearm circumference than the inter-school volleyball players. The findings of the present study are in line with the study of Gaurav and Singh (2014), evaluated the differences in anthropometric characteristics of volleyball players in relation to their performance level (i.e., inter-university and

inter-college). They observed that inter-university players had better anthropometric measurements as compared to inter-college volleyball player. In case of skin fold measurements, the inter-school volleyball players had significantly greater skin folds thickness as compare to inter-college volleyball players. The skinfold in the present study were more than those of reported by Bandyopadhyay (2007). The skinfold thickness of four sites, biceps, triceps, subscapular and suprailiac, of volleyball player's thickness are significantly higher in the inter-school volleyball players group, indicating that the inter-school volleyball players had a greater quantity of subcutaneous fat deposition. It is concluded that various anthropometric characteristics has clear impact on the competition level of the volleyball players.

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