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Comparison of anthropometric characteristics between inter university and inter collegiate volleyball players

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Abstract

The purpose of this study was to find out the differences in anthropometric characteristics between inter university and inter collegiate volleyball players. For this study, forty eight male volleyball players (Inter University level, $N_1=24$ and Inter Collegiate level, $N_2=24$) of age ranging from 18-24 years were selected as subjects from different colleges under Vidyasagar University, West Bengal. The purposive sampling technique was used to select the subjects. All subjects were assessed of their height, weight, body mass index, arm length, upper arm length, forearm length, leg length, upper leg length, lower leg length, upper arm circumference, fore arm circumference, chest circumference, thigh circumference, calf circumference, elbow diameter, shoulder diameter, hip diameter and knee diameter. Data was analyzed using SPSS, (Version 20.0). The level of significance chosen was 0.05. To compare between the mean scores of inter university and inter collegiate of the both groups Independent Sample t-test was applied. The independent samples t-test revealed that inter university volleyball players had significantly higher height ($p<0.05$), weight ($p<0.05$), arm length ($p<0.05$), forearm length ($p<0.05$), leg length ($p<0.05$) and lower leg length ($p<0.05$) than inter collegiate volleyball players. The inter university volleyball players also had significantly greater upper arm circumference ($p<0.05$), forearm circumference ($p<0.05$), thigh circumference ($p<0.05$) and calf circumference ($p<0.05$) than inter collegiate volleyball players. The inter university volleyball players had significantly wider elbow diameter ($p<0.05$), shoulder diameter ($p<0.05$) and knee diameter ($p<0.05$) than inter collegiate volleyball players. It is concluded that there were significant differences between inter university and inter college volleyball players with regard to anthropometric features. Inter university players showed better anthropometric measurements in compared to inter collegiate volleyball players of Vidyasagar University, West Bengal.

Keywords: Anthropometric characteristics inter university, inter collegiate, volleyball players.

Introduction

An athlete's anthropometric and physical characteristics may represent important prerequisites for successful participation in any given sport (Gualdi-Russo & Zaccagni, 2001)^[9]. 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 (Rienzi, *et al.*, 1999)^[16]. Anthropometric characteristics are related to a player's profile and might be used to predict a player's success. Anthropometric characteristics of players has been an interest of sports trainers, exercise scientists, physical education and sport medicine professionals for years and many of them assumed the practicing players might be expected to exhibited structural and functional characteristics that are specifically favorable for the sport (Milicerowa, 1973)^[13]. The knowledge of anthropometric characteristics is necessary to establish their importance for the success in competitive sport. Volleyball is a team sport which requires intermittent bouts of high intensity exercise, followed by periods of low intensity activity (i.e. walking or standing) (Gabbett & Georgieff, 2007)^[5]. Thus, during a volleyball match, players are involved in various performance movements such as; defensive and offensive jumps, blocks, knockouts, and sprints where power, strength, agility, and speed are required. As a result of these requirements optimal physical performance is necessary (Lidor & Ziv, 2010)^[12]. 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 (Ugarkovic, 2004)^[17]. In other words, successful participation in volleyball games, next to the high level of technical and tactical skills, also requires from each player's suitable anthropometric characteristics.

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Anthropometric characteristics are almost exclusively genetically determined therefore length and breadth measurements cannot be changed with training (Norton & Olds, 2001). Therefore, many previous studies have evaluated anthropometric profile of volleyball player (Bandyopadhyay, 2007; Duncan, 2006) [1, 3]. Moreover, to our knowledge, there were no study has compared the anthropometric characteristics of varsity level volleyball players in term to their performance level. Hence, the purpose of this study was to compare the anthropometric characteristics between inter university and inter collegiate volleyball players in relation to their performance level.

Material & methods

Subjects: For the present study, forty-eight (N=48) male volleyball players (inter university level, N₁=24, inter collegiate level, N₂=24) of age ranging from 18-24 years were selected as subjects from different colleges under affiliated to Vidyasagar University. Selected inter university players were taken from Vidyasagar University, those who were participated in the East Zone inter university volleyball tournaments in the years 2015 and 2016.

Tools: The instruments used for collection of data were anthropometric rod, weighing machine, sliding caliper and steel tape. Body weight was measured with portable weighing machine to the nearest 0.5 kg. Height measurements were taken by using the standard anthropometric rod to the nearest 0.5 cm. Body mass index (BMI) was calculated by the following formulae:

$$\text{BMI (Kg/m}^2\text{)} = (\text{Body mass in Kg})/(\text{Stature in Meters})^2$$

Widths and diameters of body parts were measured by using sliding caliper to the nearest 0.5-centimeter unit. Girths and lengths were taken with the steel tape to the nearest 0.5-centimeter unit.

Statistical Analysis: For the purpose of analysis of data descriptive statistics the mean, standard deviation and Independent Sample t-test were obtained through the Statistical Package for Social Studies, (SPSS, Version 20). The level of significance chosen was 0.05.

Results

Descriptive statistics of anthropometric characteristics and their comparison of inter university and inter collegiate level volleyball players in relation to their performance level are presented in table 1.

Table 1: Descriptive statistics of anthropometric characteristics and their comparison of inter university and inter collegiate level volleyball players in relation to their performance level.

Anthropometric Characteristics	Inter university volleyball players		Inter collegiate volleyball players		Mean Diff.	t-value	S/NS
	Mean	S. D	Mean	S. D			
Height (cm)	181.56	8.59	176.82	6.97	4.74	4.22*	S
Weight (kg)	71.38	8.49	68.76	9.12	2.62	2.96*	S
Body mass index (Kg/m ²)	20.65	2.56	20.29	2.29	0.36	0.78	NS
Arm length (cm)	80.58	4.37	78.04	4.93	2.54	2.68*	S
Upper arm length (cm)	31.06	2.53	30.85	2.44	0.21	0.59	NS
Forearm length (cm)	28.85	3.34	26.08	3.82	2.77	2.66*	S
Leg length (cm)	100.71	6.59	97.25	5.24	3.46	4.14*	S
Upper leg length (cm)	48.31	5.33	47.88	4.68	0.43	1.34	NS
Lower leg length (cm)	42.84	2.52	40.16	3.75	2.68	2.72*	S
Upper arm circumference (cm)	26.94	2.29	24.31	2.69	2.63	2.57*	S
Fore arm circumference (cm)	25.96	2.03	24.11	2.36	1.85	2.29*	S
Chest circumference (cm)	87.18	10.43	86.68	12.06	0.50	1.31	NS
Thigh circumference (cm)	49.22	4.42	45.72	6.36	3.50	3.17*	S
Calf circumference (cm)	35.93	3.22	34.17	2.86	1.76	2.38*	S
Elbow diameter (cm)	8.82	0.96	7.17	1.32	1.65	2.08*	S
Shoulder diameter (cm)	44.69	3.71	42.27	3.29	2.42	3.06*	S
Hip diameter (cm)	29.44	4.75	30.38	2.96	-0.94	1.15	NS
Knee diameter (cm)	10.55	0.88	8.91	1.12	1.64	2.42*	S

*Significant at 0.05 level.

Tabulated t₀₅ (46) = 2.02

Results of the present study revealed that inter university volleyball players had significantly higher height ($p < 0.05$), weight ($p < 0.05$), leg length ($p < 0.05$), arm length ($p < 0.05$), forearm length ($p < 0.05$), leg length, ($p < 0.05$) and lower leg length ($p < 0.05$) than inter collegiate volleyball players. The inter university volleyball players also had significantly greater in upper arm circumference ($p < 0.05$), forearm circumference ($p < 0.05$), thigh circumference ($p < 0.05$) and calf circumference ($p < 0.05$) than inter collegiate volleyball

players. The inter university volleyball players had significantly wider in elbow diameter ($p < 0.05$), shoulder diameter ($p < 0.05$) and knee diameter ($p < 0.05$) than inter college volleyball players. No significant differences were observed in body mass index, upper arm length, upper leg length; chest circumference and hip circumference between inter university and inter collegiate level volleyball players in relation to their performance level.

Discussion of findings

In the present study the anthropometric characteristics of inter university and inter collegiate volleyball players have been evaluated according to their performance level. The findings of this study indicated that there were significant differences exist in most of the anthropometric characteristics between

inter university and inter collegiate players. The overall results show that inter university volleyball players were taller and heavier as compared to the inter collegiate volleyball players. Body height, being the most important characteristic trait of volleyball players is significantly conditioned genetically (Milicerowa, H. 1973) [13]. The mean height of the

inter university volleyball players (181.56 ± 8.59 cm) in the present study is greater than the inter university volleyball players of Guru Nanak Dev University, Amritsar, Punjab (178.06 ± 6.14 cm), reported by Gourav, *et al.*, (2015) [7] but lesser than the Indian state level volleyball players (182.53 ± 5.88 cm) studied by Das, *et al.*, (2008) and Brazilian national volleyball team (197.0 ± 8.0 cm) studied by Petroski *et al.*, (2013) [15]. The taller player in volleyball has an advantage because they can easier control both, defensive and offensive actions over the top of the net. Thus, selection criteria can explain the observed results, as there has been a tendency to recruit the tallest players in this sport (Jankovic, *et al.*, 1995) [10]. Lower height of Indian volleyball players might be the one of the reason for their poor performance at the international level. 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 volleyball team (Gaurav, *et al.*, 2010) [6]. The main purpose of volleyball players is achieving greater height on the net. Higher body mass however, is a hurdle for volleyball players in achieving good jumping height (Bandyopadhyay, 2007) [1]. Maximum jump is one of the necessary components for spike and blocks during volleyball game. The mean body weight of inter university volleyball players in present study is (71.38 ± 8.49 kg) greater than the volleyball players of Indian inter university volleyball players (69.06 ± 8.52 kg) reported by Koley, *et al.*, (2010) [11] but lesser than the Brazilian national volleyball team (90.3 ± 13.0 kg) studied by Petroski *et al.*, (2013) [15]. In the present study, significantly greater body weight of inter university volleyball players than inter collegiate volleyball players might be disadvantageous for inter university volleyball players in attaining a good jumping height as they have to lift a greater weight. On the other hand inter university volleyball players had significantly greater upper arm and forearm circumference.

Results indicated that the inter university volleyball players had significantly greater thigh and calf circumference than the inter collegiate volleyball players (Gourav and Singh, 2014) [8]. Fattahi *et al.*, (2012) [4] observed that greater thigh and calf circumference has significant correlation with jump in volleyball players. Muscle size effects force producing and jump performance. The inter university volleyball players also possess higher diameters (i.e., elbow diameter, shoulder diameter and knee diameter) which show better growth and development as compared to inter collegiate volleyball players. The inter university volleyball players lesser in hip diameter than the inter collegiate volleyball players. These differences might be due to regular training programme and more training age of inter university volleyball players compared to inter collegiate volleyball players. Considering that in most of the components, there were significant differences between inter university and inter collegiate volleyball players according to their performance level.

Conclusion

In conclusion, we found that there were significant differences in most of the anthropometric characteristics between inter university and inter collegiate volleyball players in relation to their performance level. Inter university volleyball players are better in anthropometric component in compared with inter collegiate male volleyball players and it may also be concluded that various anthropometric characteristics has clear impact on the performance of the volleyball players.

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