



ISSN: 2456-0057

IJPNPE 2018; 3(1): 870-873

© 2018 IJPNPE

www.journalofsports.com

Received: 11-11-2017

Accepted: 12-12-2017

Dr. Deba Prasad SahuAssociate Professor & HoD,
Department of Physical
Education Mahishadal Girls'
College, Purba Medinipur,
West Bengal, India

Anthropometric and physiological features of specific back court defensive and front court offensive volleyball players: A comparative analysis

Dr. Deba Prasad Sahu**Abstract**

The purpose of the study was to investigate and compare on a set of basic anthropometric and physiological features of specific back court defensive and front court offensive inter university level male volleyball players. A total of twenty six inter university level volleyball players from Vidyasagar University, West Bengal were selected as subjects of this study who participated in the East Zone Inter University Volleyball Tournaments from the year 2013 to 2016. The players were categorized according to their court positions and playing role. They were mainly categorized as specific back court defensive players i. e. libero ($N_1=8$) and front court offensive players which includes middle blockers and outside hitters ($N_2=18$) in volleyball game. The variables selected for the study under anthropometric measurements were standing height, body weight, body mass index (BMI), total arm length, total leg length, palm length, elbow diameter, shoulder diameter, hip diameter, knee diameter, calf circumference, thigh circumference, chest circumference, biceps skin fold, triceps skin fold, subscapular skin fold, suprailliac skin fold and calf skin fold, while under physiological characteristics were resting heart rate, systolic blood pressure, diastolic blood pressure, percent body fat and resting metabolism. The subjects were assessed for height, body weight, lengths & circumferences, diameters and skin fold thickness through anthropometric rod, weighing machine, flexible steel tape, sliding caliper and skin fold caliper respectively. Body mass index (BMI) was calculated using the formula of weight in kg/height in meter square. Among the physiological characteristics percent body fat and resting metabolism were measured with a Karada Scan; Body Composition Monitor. Blood pressure (systolic & diastolic) and resting heart rate were measured by Panasonic Digital Blood Pressure Monitor. Data was analyzed using SPSS, (Version 20.0). Results of t-test revealed that specific front court volleyball players had significantly higher in height ($p<0.05$), body weight ($p<0.05$), total arm length ($p<0.05$), total leg length ($p<0.05$), palm length ($p<0.05$), elbow diameter ($p<0.05$), shoulder diameter ($p<0.05$), hip diameter ($p<0.05$), knee diameter ($p<0.05$), calf circumference ($p<0.05$), thigh circumference ($p<0.05$), chest circumference ($p<0.05$), biceps skin fold ($p<0.05$), triceps skin fold ($p<0.05$), subscapular skin fold ($p<0.05$), suprailliac skin fold ($p<0.05$) and calf skin fold ($p<0.05$), resting heart rate ($p<0.05$), percent body fat ($p<0.05$) and resting metabolism ($p<0.05$) as compared to specific back court defensive volleyball players. No significant differences was found in age, body mass index (BMI), systolic blood pressure and diastolic blood pressure between specific back court defensive and front court offensive volleyball players.

Keywords: Specific back court defensive players, Specific front court offensive players, BMI**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) [5]. Anthropometric measurements are widely used to assess and predict performance in various sports. An athlete's anthropometric characteristics may represent important prerequisites for successful participation in any given sport. It has been well established that specific anthropometric profiles indicate whether the player would be suitable for the competition at the highest level in a specific sport (Ackland, *et al.* 2003 [1]; Slater, *et al.* 2005) [11]. Volleyball belongs to sport activities in which anthropometric characteristics of its participants influence the level of sport performance. Performing many volleyball skills requires accessibility to higher height, and this has resulted in considering the athletes' height as one of the most important physical factors. Findings of Marques *et al.* (2009) [7] indicated

Correspondence**Dr. Deba Prasad Sahu**Associate Professor & HoD,
Department of Physical
Education Mahishadal Girls'
College, Purba Medinipur,
West Bengal, India

that the attackers were the taller and heavier and the liberos were the most shorter and light weight players. The researchers support this issue that, in events in which height is considered, height and the body limbs' length are the main conditions of athletic talent. Physiological capacity of athletes is an important element of success in sports achievements. The assessment of physiological work capacity is a major consideration in preparing athletes for high-level competition. A special physiological ability is needed to perform volleyball's skills (Kalinski, *et al.* 2002) [6]. Ideal physiologic abilities can be determinant factors for success in this sport. Although various studies have examined the anthropometric and physiological profiles of different sports, (Callan, *et al.* 2000) [2] it appears that no study have examined the anthropometric and physiological profile of volleyball players, particularly in relation to their positional role according to court positions within this sport.

Volleyball is an interactive game and can be divided into the two main phases of attack and defense, each having three or four sequential skill events that are expected to occur sequentially in a hierarchical order. It is, therefore, logical to expect that players' performances in one phase of the game will be dependent upon their performances in the previous phase. Before the rule changes, positional roles were not so obvious and there were many universal players that could play different roles. But in modern volleyball each position plays a specific and different role during a volleyball match (Gabbett *et al.* 2006) [4]. However, it seems that anthropometric and/or physiological profiles of inter university level volleyball players have not been previously reported. So, determining of anthropometric and physiological differences between specific back court defensive and front court offensive volleyball players is currently great importance due to demanding competition requirements and evolving tactical play strategies, which led to even further specialization of different positions. Therefore the aim of this study was to investigate and compare the anthropometric and physiological features of specific back court defensive and front court offensive inter university level male volleyball players.

Methodology

A total of twenty six (N=26) male inter university level volleyball players (mean and SD of age 22.29±1.83 years) from Vidyasagar University, West Bengal, India, who participated in the East Zone Inter University Volleyball Tournaments were selected as subjects in this study. The age of the subjects ranged between 18 to 26 years. The players were categorized according to their court positions and role. They were mainly categorized as specific back court defensive players i. e. libero (N₁=8) and front court offensive

players which includes middle blockers and outside hitters (N₂=18). The subjects were selected from the different colleges affiliated to Vidyasagar University, West Bengal, during their coaching camps for the participation of East Zone Inter University Volleyball Tournaments for the year 2013 to 2016. The required data in anthropometric and physiological features were taken during the course of their residential coaching camps at Vidyasagar University Sports Complex.

Tools

The age of each subject was calculated from the date of birth as recorded in the university registered. Specific court positions were categorized as per player's verbal consent. The parameters selected for the study under anthropometric measurements were standing height, body weight, body mass index (BMI), total arm length, total leg length, palm length, elbow diameter, shoulder diameter, hip diameter, knee diameter, calf circumference, thigh circumference, chest circumference, biceps skin fold, triceps skin fold, subscapular skin fold, suprailliac skin fold and calf skin fold, while under physiological parameters under taken were resting heart rate, systolic blood pressure, diastolic blood pressure, percent body fat and resting metabolism. The subjects were assessed for height, body 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 using the formula of weight in kg/height in meter square. Length and circumference were taken with the help of steel tape to the nearest 0.5 cm while diameters of body parts were measured by using sliding caliper to the nearest 0.5 cm and skin folds thicknesses were assessed by using skin fold caliper in mm unit. Among the physiological characteristics percent body fat and resting metabolism were measured with a Karada Scan; Body Composition Monitor; HBF-375, (OMRAN), Japan; by the feeding of respective personal data of date of birth and gender of the every individuals. Blood pressure and resting heart rate were measured by Panasonic Digital Blood Pressure Monitor.

Statistical Procedure

To determine the significant difference between the mean scores of subjects belonging to specific back court defensive and front court offensive volleyball players on anthropometric and physiological features the Independent-Samples t-test was applied. Data was analyzed using SPSS Version 20.0 software. The level of significance was set at 0.05.

Discussion of findings

Table 1: Demographic characteristics of specific front court offensive and specific back court defensive inter university volleyball players

Demographic Characteristics	Specific Front Court Offensive Players		Specific Back Court Defensive Players		M. D	t-value	p-value
	Mean	S. D	Mean	S. D			
Age (year)	22.22	1.733	22.37	1.922	-0.15	0.20	0.84
Height (cm)	183.05	1.551	166.12	1.125	16.93	27.65*	0.00
Body weight (kg)	72.33	4.801	60.75	1.982	11.58	6.52*	0.00
Body Mass Index (kg/m ²)	21.59	1.845	22.01	1.498	-0.42	0.57	0.57

*Significant at 0.05 level

Table-1 depicts the demographic characteristics of specific front court offensive and specific back court defensive inter university level male volleyball players. The mean ages of

specific front court offensive volleyball players and specific back court defensive volleyball players were 22.22 year and 22.37 year respectively. The mean heights of specific front

court offensive volleyball players was 183.05 cm and specific back court defensive volleyball players was 166.12 cm. The mean weights of specific front court offensive volleyball players and specific back court defensive volleyball players were 72.33 kg and 60.75 kg respectively. The mean BMI values of specific front court offensive volleyball players was 21.59 (kg/m²) and specific back court defensive volleyball

players was 22.01(kg/m²). Results indicated that specific front court offensive volleyball players had significantly higher in height and weight than specific back court defensive volleyball players. No significant differences were exist in age and body mass index (BMI) between specific front court offensive and specific back court defensive inter university level volleyball players.

Table 2: Comparison of length measurements of specific front court offensive and specific back court defensive inter university volleyball players

Measurements	Specific Front Court Offensive Players		Specific Back Court Defensive Players		M. D	t-value	p-value
	Mean	S. D	Mean	S. D			
Total arm length (cm)	83.22	4.808	71.25	1.669	11.97	6.79*	0.00
Total leg length (cm)	95.05	1.392	83.75	1.669	11.30	17.99*	0.00
Palm length (cm)	17.28	0.64	20.46	0.61	3.18	11.87*	0.00

*Significant at 0.05 level

Table-2 represents the comparison of different length measurements between specific front court offensive and specific back courts defensive inter university male volleyball players. It is evident from the results that significant differences were found with regards to total arm length ($p<0.05$), total leg length ($p<0.05$) and palm length ($p<0.05$)

between specific front court offensive and specific back court defensive inter university level volleyball players. The specific front court offensive players had better length measurements than specific back courts defensive inter university volleyball players.

Table 3: Comparison of diameter measurements of specific front court offensive and specific back court defensive volleyball players

Measurements	Specific Front Court Offensive Players		Specific Back Court Defensive Players		M. D	t-value	p-value
	Mean	S. D	Mean	S. D			
Elbow diameter (cm)	7.46	0.295	6.13	0.184	1.32	11.68*	0.00
Shoulder diameter (cm)	40.88	1.450	35.62	1.302	5.26	8.79*	0.00
Hip diameter (cm)	31.50	1.886	25.75	1.832	5.75	7.23*	0.00
Knee diameter (cm)	9.15	0.185	7.02	0.183	2.12	7.05*	0.00

*Significant at 0.05 level

Table-3 shows the comparison of diameter measurements between specific front court offensive and specific back courts defensive inter university male volleyball players. Results indicated that specific front court offensive volleyball

players had significantly greater in elbow diameter ($p<0.05$), shoulder diameter ($p<0.05$), hip diameter ($p<0.05$) and knee diameter ($p<0.05$) as compare to specific back court defensive volleyball players.

Table 4: Comparison of circumference measurements of specific front court offensive and specific back court defensive volleyball players

Measurements	Specific Front Court Offensive Players		Specific Back Court Defensive Players		M. D	t-value	p-value
	Mean	S. D	Mean	S. D			
Calf circumference (cm)	33.44	1.854	28.12	1.959	5.31	6.64*	0.00
Thigh circumference (cm)	49.94	1.625	42.12	1.885	7.81	10.78*	0.00
Chest circumference (cm)	84.50	1.917	75.25	2.052	9.25	11.11*	0.00

*Significant at 0.05 level

Table-4 shows the comparison of circumference measurements between specific front court offensive and specific back court defensive inter university male volleyball players. Results revealed that specific front court offensive

volleyball players had significantly greater calf circumference ($p<0.05$), thigh circumference ($p<0.05$) and chest circumference ($p<0.05$) as compare to specific back court defensive inter university level volleyball players.

Table 5: Comparison of skin folds measurements of specific front court offensive and specific back court defensive volleyball players.

Measurements	Specific Front Court Offensive Players		Specific Back Court Defensive Players		M. D	t-value	p-value
	Mean	S. D	Mean	S. D			
Biceps (mm)	4.78	0.137	3.92	0.224	0.85	12.07*	0.00
Triceps (mm)	6.35	0.206	5.16	0.192	1.19	13.87*	0.00
Subscapular (mm)	9.82	0.224	7.20	0.177	2.62	29.20*	0.00
Suprailliac (mm)	7.43	0.206	6.28	0.145	1.15	14.21*	0.00
Calf (mm)	7.58	0.200	6.31	0.180	1.27	15.32*	0.00

*Significant at 0.05 level

Table-5 shows the comparison of skin folds measurements between specific front court offensive and specific back courts defensive inter university male volleyball. Results

indicated that significant differences were found between specific front court offensive and specific back court defensive inter university volleyball players with regard to

biceps skin fold ($p<0.05$), triceps skin fold ($p<0.05$), subscapular skin fold ($p<0.05$), suprailliac skin fold ($p<0.05$) and calf skin fold ($p<0.05$). The specific front court offensive

players had significantly greater skin fold thicknesses as compare to specific back court defensive volleyball players.

Table 6: Comparison of physiological characteristics of specific front court offensive and specific back court defensive volleyball players

Characteristics	Specific Front Court Offensive Players		Specific Back Court Defensive Players		M. D	t-value	p-value
	Mean	S. D	Mean	S. D			
Resting Heart Rate (beat/min)	61.50	1.689	59.87	1.807	1.62	2.218*	0.03
Systolic Blood Pressure (mm/Hg)	121.05	1.764	120.50	2.138	0.55	0.695	0.49
Diastolic Blood Pressure (mm/Hg)	80.55	2.035	79.75	2.65	0.80	0.848	0.80
Percent Body Fat (%)	15.94	1.433	11.75	1.035	4.19	7.423*	0.00
Resting Metabolism (Kcal)	1438.00	49.642	1358.12	32.171	79.87	4.154*	0.00

*Significant at 0.05 level

Table-6 shows the comparison of physiological characteristics between specific front court offensive and specific back courts defensive inter university male volleyball players. Results indicated that significant differences were found between specific front court offensive and specific back court defensive inter university volleyball players with regard to resting heart rate ($p<0.05$), percent body fat ($p<0.05$) and resting metabolism ($p<0.05$). The specific front court offensive players had significantly higher in resting heart rate, percent body fat and resting metabolism as compare to specific back court defensive volleyball players. No significant differences exist in systolic blood pressure and diastolic blood pressure between specific front court offensive and specific back courts defensive inter university volleyball players.

Conclusions

A perusal of summary of results shows that there were significant differences in most of the anthropometric and physiological characteristics between specific back court defensive and front court offensive male inter university level volleyball players. From Table 1 it was seen that there are significant difference in height and body weight between specific back court defensive and front court offensive volleyball players and no significant differences exist in age and body mass index (BMI) between the groups of male inter university volleyball players. From Table 2 and Table 3 it was revealed that there are significant differences in all length and diameter measurements of anthropometric feature as total arm length, total leg length, palm length, elbow diameter, shoulder diameter, hip diameter and knee diameter of specific back court defensive and front court offensive volleyball players according to their playing court positions. From Table 4 and Table 5 it was observed that there are significant differences in all circumference and skin fold measurements of anthropometric features as calf circumference, thigh circumference, chest circumference, biceps skin fold, triceps skin fold, subscapular skin fold, suprailliac skin fold and calf skin fold between specific back court defensive and front court offensive male inter university level volleyball players too. From Table 6 it was seen that there are significant difference in resting heart rate, percent body fat and resting metabolism between specific back court defensive and front court offensive volleyball players and no significant differences exist in systolic blood pressure and diastolic blood pressure between the groups. All significant differences of anthropometric and physiological features shows that specific front court offensive volleyball players are better in compare with specific back court defensive male inter university level volleyball players.

References

- Ackland TR, Ong KB, Kerr DA, Ridge B. Morphological characteristics of Olympic sprint canoe and kayak paddlers. *Journal of Science and Medicine in Sport*. 2003; 6:285-294.
- Callan SD, Brunner DM, Devolve KL. Physiological profiles of elite freestyle wrestlers. *J Strength Cond Res*. 2000; 14:162-169.
- Carter J, Heath H. *Somatotyping: development and applications*. Cambridge: Cambridge University Press, 1990.
- Gabbett TJ, Georgieff B, Anderson S. Changes in skill and physical fitness following training in talent-identified volleyball players. *J Strength Cond Res*. 2006; 20:29-35.
- Heyward VH. *Advanced fitness assessment and exercise prescription*. (5th Ed.). Champaign, IL: Human Kinetics, 2006.
- Kalinski MI, Norkowski H, Kerner MS, Tkaczuk WG. Anaerobic Power Characteristics of Elite Athletes in National Level Team-Sport Games. *European Journal of Sport Science*. 2002; 2(3):1-14.
- Marques MC, van den Tillaar R, Gabbett TJ, Reis VM, González-Badillo JJ. Physical fitness qualities of professional volleyball players: determination of positional differences. *Journal of Strength and Conditioning Research*. 2009; 23(4):1106-11.
- Rienzi E, Reilly T, Malkin C. Investigation of anthropometric and work-rate profiles of Rugby Sevens players. *J Sports Med Phys Fitness*. 1999; 39:160-164.
- Sheppard JM, Chapman DW, Gough C. Twelve-month training-induced changes in elite international volleyball players. *J Strength Cond Res*. 2009; 23:2096-101.
- Sheppard JM, Gabbett TJ, Stanganelli LC. An analysis of playing positions in elite men's volleyball: Considerations for competition demands and physiologic characteristics. *J Strength Cond Res*. 2009; 23:1858-66.
- Slater GJ, Rice AJ, Mujika I, Hahn AG, Sharp K, Jenkins DG. Physique traits of lightweight rowers and their relationship to competitive success. *British Journal of Sports Medicine*. 2005; 39:736-741.