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The Study about Physiological Characteristics of Indian Volleyball Players: A Case Study of Inter-**University Athletes**

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Abstract – The reason for this study was of two-folds, firstly, to assess the anthropometric profile of Indian inter-university volleyball players and, also, to look the connection of body mass file, % body fat, hand grasp strength (right prevailing) and Vo2max. with other anthropometric characteristics contemplated. Eleven anthropometric characteristics, four body composition parameters, two physical and two physiological variables and nine arm anthropometric characteristics were measured on randomly selected 63 inter-university Indian volleyball players (38 males and 25 females) aged 18-25 years from randomly selected universities, India with satisfactory controls (n = 102, 52 males and 50 females). The results demonstrated that male volleyball players were taller (6.63%) and heavier (7.31%) and female volleyball players were somewhat taller (0.31%) and lighter (3.74%) than their control partners. One path analysis of fluctuation demonstrated critical (p≤0.004-0.000) between gathering contrasts in every one of the variables (aside from hip outline) between volleyball players and controls. In volley players, altogether positive relationships were found with BMI and other 19 variables, with percent body fat and 6 variables, with right hand grasp strength and 20 variables and with Vo2max and other 19 variables, and fundamentally negative connections were found with percent body fat and other 16 variables, with right hand hold strength and other 7 variables and with Vo2max with other 8 variables. The discoveries of the present study may be helpful in future examination on player determination, ability distinguishing proof in volleyball and training program development.

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INTRODUCTION:-

Anthropometric measurements and morphological characteristics assume a critical part in deciding the accomplishment of an athlete. Naturally, the interest in anthropometric characteristics and body composition of sportspersons from various aggressive sports has expanded hugely in the course of the most recent decades. It has been entrenched that particular physical characteristics or anthropometric profiles show whether the player would be reasonable for the opposition at the highest level in a particular sport. These anthropometric and morphological parameters are the sensitive pointers of physical development and nutritional status of the sportspersons for their maximal exhibitions. These markers of point of view sports execution depend to a great extent on hereditary qualities, connected with age, sex, socio-economic status, ethnicity, altitude, nutritional status, individual cleanliness and exercise hone. Appropriate assessment of these parameters extends the evaluation of morphological characteristics of first class athletes which can be indispensable in relating body structure and sports execution.

A few studies have inspected the relationships amongst anthropometric and physiological characteristics of volleyball players. The discoveries of these studies have demonstrated that specific anthropometric characteristics are advantageous to the volleyball players, including more noteworthy height, more prominent vertical jump separation, more noteworthy mass, more noteworthy upper body strength and lower body fat percent.

Regardless of the accessibility of the literature identified with anthropometric and morphological parameters in volleyball players, standard information on such parameters are sparse in Indian connection. To satisfy the lacunae of literature, the present study was arranged.

RESEARCH METHODOLOGY

The present cross-sectional study depends on randomly selected 63 inter-university Indian volleyball players (38 males and 25 females) aged 18-25 years (mean 19.05±1.40 years) from six Indian universities and the opposition was held in Guru Nanak Dev. A

sufficient number of controls (n = 102, 52 males and 50 females, mean age 21.60±2.13 years) with no specific athletic background were additionally gathered from the same spot for correlations. The age of the subjects were recorded from the date of birth registered in their separate establishments. The subjects were separated in a manner that age 18 alludes to the people aged 17 years and 6 months through 18 years and 5 months and 29 days. A composed assent was gotten from the subjects. The information were gathered under regular ecological conditions in morning (between 8 AM. to 12 twelve). The study was endorsed by the nearby moral advisory group.

Calculations -

Eleven anthropometric variables, viz. height, weight, BMI, chest outline, hip circuit, femur biepicondylar diameter, humerus biepicondylar diameter, biceps skinfold, triceps skinfold, subscapular skinfold and calf skinfold, four body composition parameters, viz. percent body fat, percent incline body mass, basal metabolic rate and water percent, two physical parameters, viz. right and left hand grasp strength and two physiological variables, viz. heart rate and Vo2max were tackled every subject. Nine arm anthropometric variables, viz. upper arm length, lower arm length, total arm length, upper arm boundary, arm muscle territory, arm region, arm fat region and arm fat list were measured on every subject. Anthropometric variables of the subjects were measured utilizing the methods gave by Lohmann, Roche, and Martorell (1988) and were measured in triplicate with the middle value utilized as the standard.

The height was recorded amid motivation utilizing a stadiometer (Holtain Ltd., Crymych, and Dyfed, UK) to the closest 0.1 cm, and weight was measured by advanced standing scales (Model DS-410, Seiko, Tokyo, Japan) to the closest 0.1 kg. BMI was then computed utilizing the formula weight (kg)/height2(m)2. Chest, hip and upper arm peripheries were measured by an adaptable metallic tape (Holtain Ltd). Femur and humerus biepicondylar diameters, upper arm length, forearm length and total arm length were measured by sliding caliper and anthropometer. Percent body fat was evaluated utilizing skinfold measurements taken from four sites, viz. biceps, triceps, subscapular and calf utilizing Harpenden skinfold caliper (Holtain Ltd, Crosswell, Crymych, UK) to the closest 0.2 mm, and utilizing the Durnin and Womersley (1974) skinfold mathematical statement. Percent incline body mass was ascertained subtracting percent body fat from 100. Basal metabolic rate and water percent were surveyed by Bioelectrical Impedance Analysis. The grasp strength of both right and left hands was customizable measured utilizing standard а computerized handgrip dynamometer (Takei Scientific Instruments Co., LTD, Japan) at standing position with shoulder adducted and impartially pivoted and elbow in full augmentation. The dynamometer was held uninhibitedly without backing, not touching the subject's trunk. The position of the hand stayed steady without the descending heading. The subjects were requested that put maximum force on the dynamometer thrice from both sides of the hands. The maximum value was recorded in kilograms. All subjects were tested following 3 minutes of independent warm-up. Thirty seconds time interval was kept up between every handgrip strength testing. Heart rate was evaluated physically. Vo2max was assessed by Queen's College Step Test. The instruments were aligned before use and all measurements were tackled the subject's right side. Arm muscle bigness, Arm-muscle zone, arm territory, arm fat zone and arm fat record were figured utilizing standard methodologies as:

Arm muscle circumference (cm)=G arm-(π Skin fold triceps); Arm muscle zone, cm2=[G arm-(Π Sf tri)]/4 π ; Arm zone (A), cm2=(G arm)2/4 π ; Arm fat range, cm2=arm area-arm muscle territory; Arm fat file, % fat area=(arm fat region/arm zone), G arm= Arm Girth.

Statistical tools used -

Standard descriptive statistics (mean ± standard deviation) were determined for directly measured and derived variables. One way analysis of variance was tested for the comparisons of data among Indian inter-university volleyball players and controls, followed by post hoc Bonferroni test. Pearson's correlation coefficients were applied to establish the relationships among the variables measured. Data were analyzed using SPSS (Statistical Package for Social Science) version 14.0. A 5% level of probability was used to indicate statistical significance.

RESULTS

Descriptive statistics of different anthropometric, body composition, physical, physiological and arm anthropometric characteristics in volleyball players and controls are given in Table 1 and 2. Male volleyball players were taller (6.63%) and heavier (7.31%) while female volleyball players were somewhat taller (0.31%) and lighter (3.74%) than their control partners. Both male and female volleyball players have higher mean values for chest and hip circuits, femur and humerus biepicondylar diameters, percent incline body mass, basal metabolic rate (just in male players), percent water, right and left hand hold strength, Vo2max, upper arm length, lower arm length, total arm length and arm muscle territory (just in male players) and lesser mean values in biceps, triceps, sub scapular and calf (just in male players), percent body fat, heart rate, upper arm outline, upper arm region, arm fat zone and arm fat record (just in male players) than their control partners. One path analysis of change demonstrated noteworthy (p≤0.004-0.000) between gathering contrasts in every

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one of the variables (aside from hip outline) between volleyball players and controls.

		Controls (n=102)						
Variables	Males		Females		Males		Females	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Height (cm)*	181.93	6.37	159.67	5.85	170.62	5.88	159.17	6.05
Weight (kg)*	69.09	69.09	49.96	7.51	64.38	11.03	51.83	8.97
BMI (kg/mL)**	20.66	2.46	19.62	2.79	22.15	3.56	20.46	3.8
Chest circumfe. (cm)***	87.39	7.07	82.66	4.26	85.18	7.35	82.28	7.32
Hip circumfe. (cm)	91.47	5.95	90.55	5.45	90.29	7	89.43	8.01
Fem. Biepic on. dia. (cm)*	8.89	1.03	8.02	1.2	8.14	0.86	7.42	1.02
Hum. bi-epicon. dia. (cm)*	6.77	0.58	5.74	0.72	6.18	0.76	5.49	0.71
Biceps skinfold (mm)*	6.83	2.01	9.44	2.16	10.54	2.44	12.38	4.94
Triceps skinfold (mm)*	10.17	3.56	14.72	3.08	15.1	4.67	16.86	5.28
Subscapular skinfold (mm)*	12.95	3.08	17.52	4.13	18.88	5.5	20.82	5.9
Calf skinfo Id (mm)*	11.5	3.24	20.24	4.84	15.98	3.55	17.98	6.45
Percent body fat (%)*	13.48	2.91	20.4	2.92	18.75	5.21	21.88	4.45
Percent lean body mass (%)	86.52	2.91	79.6	2.92	81.26	5.21	78.12	4.45
Basal metabo lic rate (kcal)*	1783.58	161.31	1326.16	82.33	159.98	8.14	1352.92	106.2 3
Water percent (%)*	61.74	3.76	56.72	3.84	54.89	4.49	49.72	7.02
Right hand grip strength (kg)*	43.66	5.88	24.21	3.64	41.11	6.57	21.25	4.24
Left hand grip strength (kg)*	42.33	6.17	23.6	4.44	38.62	6.4	20.45	4.18
Heart rate (beats/min)*	99.05	2.72	101.6	6.11	119.31	13.32	123.2	12.07
Vo ₂ max (ml/kg/ min)*	69.73	3.82	47.04	1.13	61.22	5.59	43.04	2.22

* significant at 0.000 level, ** significant at .008 and *** significant at .004 level

Table 1. Descriptive statistics of various anthropometric and physiological characteristics in Indian volleyball players and controls.

Variables	Volleyball males (n=38)		Volleyball females		Control males (n=52)		Control females	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Upper arm length (cm)*	31.58	2.72	29.54	1.66	28.77	2.91	28.19	2.49
Lower arm length (cm)*	30.13	1.8	25.66	1.48	27.71	3.47	26.04	1.88
Total arm length (cm)*	81.84	4.42	72.86	2.94	75.04	3.82	70.82	3.76
Upper arm circumference (cm)*	26.24	2.62	23.16	2.00	26.97	2.91	24.52	2.99
Upper arm muscle area (cm2)*	42.48	6.9	24.44	3.64	39.86	10.32	29.39	8.39
Upper arm area (cm ²) *	55.3	10.73	42.98	7.27	58.54	12.77	48.56	11.96
Upper arm bone free muscle area (cm ²)*	32.48	6.9	17.94	3.64	29.86	10.32	22.89	8.39
Upper arm fat area (cm ²)*	12.82	5.17	1853	5.47	18.68	6.86	19.1 7	8.2
Arm fat index*	22.47	6.00	42.42	7.61	32.00	9.25	38.95	11.47

*significant at 0.000 level, ** significant at .008 and *** significant at .004 level

Table 2. Descriptive statistics of various armanthropometric variables in Indian volleyballplayers and controls.

Table 3 and 4 demonstrated the relationship coefficients of BMI, percent body fat, right hand grasp strength and Vo2max with other anthropometric, body composition, physical and physiological variables in volleyball players and controls. In volley players, fundamentally positive relationships were found with BMI and other 19 variables, with percent body fat and 6 variables, with right hand hold strength and 20 variables and with Vo2max and other 19 variables, and altogether negative connections were found with percent body fat and other 16 variables, with right hand grasp strength and other 7 variables and with Vo2max with other 8 variables. Figures 1-4 demonstrated the scattered plot of BMI, %body fat, hand grasp strength (right prevailing) and Vo2max in volleyball players.



Figure 1. Scatter-plot of BMI in volleyball players.





Madakia	В	MI	B	F	RH	IGS	Vo ₂	max
Valiables	VBP	Cont	VBP	Cont	VBP	Cont	VBP	Cont
Height (cm)	0.200	0.059	-0.585**	-0.213*	0.854**	0.704**	0.835**	0.620**
Weight (kg)	0.705**	0.857**	-0.279*	0.293**	0.761**	0.603 **	0.685**	0.416**
Body mass index (kg/m ²)			0.24	0.463**	0.289*	0.293**	0.167	0.133
Chest circum. (cm)	0.794**	0.818**	0.015	0.445**	0.400**	0.269**	0.327**	0.087
Hip circum. (cm)	0.679**	0.762**	0.320*	0.457**	0.241	0.163	0.042	-0.018
Fem. Epicon. Dia. (cm)	0.447**	0.307**	-0.229	0.135	0.395**	0.383**	0.326**	0.323**
Hum. Epicon. Dia. (cm)	0.384**	0.365**	-0.486**	0.049	0.648**	0.459**	0.605**	0.343**
Biceps skinfold (mm)	0.261*	0.341**	0.777**	0.563**	-0.471**	-0.219*	-0.526**	-0.255**
Triceps skinfold (mm)	0.313*	0.497**	0.845**	0.773**	-0.434**	-0.1	-0.523**	-0.182
Subscapular skinfold (mm)	0.355**	0.614**	0.852**	0.832**	-0.420**	-0.095	-0.526**	-0.177
Calf skinfold (mm)	0.204	0.383**	0.796**	0.462**	-0.638**	-0.143	-0.719**	-0.216*
Body fat (%)	0.24	0.463**			-0.608**	-0.182	-0.736**	-0.253*
Lean body mass (%)	-0.24	-0.463**	-1.000**	-1.000**	0.608**	0.182	0.736**	0.253*
Right hand grip strength (kg)	0.289*	0.293**	-0.608**	-0.182			0.839**	0.747**
Left hand grip strength (kg)	0.297*	0.328**	-0.586**	-0.212*	0.958**	0.957**	0.841**	0.742**
Basal metabolic rate (Kcal)	0.506**	0.615**	-0.464**	0.03	0.865**	0.748**	0.817**	0.619**
Water (kg)	0.608**	0.550**	-0.345**	0.103	0.793**	0.506**	0.743**	0.433**
Water (%)	-0.117	-0.168	-0.474**	-0.352**	0.501**	0.408**	0.600**	0.403**
Heart rate (beat/min)	0.053	0.147	0.114	-0.046	-0.119	-0.117	-0.400**	-0.530**
Vo2max (ml/kg/min)	0.167	0.133	-0.736**	-0.253*	0.839**	0.747**		

*Significant at. 05 level; **Significant at. 01 level; BMI= Body mass index. BF= Body fat. RHGS= Right hand grip strength. VBP= Volleyball players. Conf= Control.

Table 3. Correlation coefficients of BMI, percent body fat, right hand grip strength and Vo2max with other anthropometric and physiological

characteristics in Indian volleyball players and controls.



Figure 3. Scatter-plot of hand grip strength (right dominant) in volleyball players.



Figure 4. Scatter-plot of Vo2max in volleyball players.

Variables	BI	BMI		BF		RHGS		Vo ₂ max	
	Volley	Contr	Volley	Contr	Volley	Contr	Volley	Contr	
Upper arm length (cm)	0.108	0.102	-0.279*	0.208*	0.417**	0.218*	0.358**	0.132	
Lower arm length (cm)	0.279*	0.158	-0.549**	-0.178	0.776**	0.321**	0.733**	0.309**	
Total arm length (cm)	0.226	0.115	-0.471**	-0.016	0.747**	0.500**	0.716**	0.490**	
Arm circumference (cm)	0.761 **	0.767**	-0.031	0.288**	0.618**	0.482**	0.512**	0.333**	
Arm muscle area (cm ²)	0.508**	0.504**	-0.491**	-0.154	0.833**	0.549**	0.800**	0.438**	
Upper arm area (cm ²)	0.749**	0.770**	-0.035	0.287**	0.620**	0.479**	0.515**	0.322**	
Upper arm bone free muscle area (cm ²)	0.548**	0.501**	-0.422**	-0.111	0.796**	0.443**	0.741**	0.311**	
Upper arm Fat area	0.507**	0.642**	0.808**	0.728**	-0.315*	0.062	-0.455**	-0.056	
Arm fat index	0.095	0.214*	0.877**	0.677**	-0.696**	-0.260**	-0.794**	-0.313**	

* Significant at .05 level; ** Significant at .01 level; BMI= Body mass index. BF= Body fat. RHGS= Right hand grip strength. Contre Control.

Table 4. Correlations coefficients of BMI and percent body fat, right hand grip strength and Vo2max with other arm anthropometrics characteristics in Indian volleyball players and controls.

DISCUSSION

Anthropometric and morphological characteristics assume an indispensable part in determining the achievement of sportspersons. Particular physical characteristics or anthropometric profiles are required for the highest level of execution in a particular sport.

1. Anthropometric characteristics -

In volleyball, teams contend by nail trims taking care of the ball over the head, height is thought to be the most essential physical property. In the present study, the mean height of the male players (181.93±6.37 cm) was more noteworthy than the male volleyball players of West Bengal, India (173.10±4.19 cm) reported by Bandyopadhyay (2007), however lesser than the English (191.00±5.0 cm) (Duncan et al., 2006), while in female players, the mean height (159.67±5.85 cm) was lesser than the American $(176.70\pm4.60 \text{ cm})$ (Ferris, Signorile, and Caruso, 1995) and Japanese (168.70±5.89 cm) (Tsunawake et al., 2003) female volleyball players. In the concentrate, fundamentally more prominent body weight among volleyball players may be disadvantageous for them in achieving a decent jumping height as they need to lift a more prominent weight. The skinfold thickness is analyzed for the assessment of the nutritional status and physical changes with training. In the present study, the skinfold thickness of four sites, biceps, triceps, subscapular and calf, of male volleyball players were more than the discoveries of Bandyopadhyay (2007).

2. Body composition -

Body composition significantly influences the vitality related physical strength and aptitude in different sports (Kitagawa, Ikuta, Hara, and Hirota, 1974). The evaluated % body fat was lower in both sexes than controls and the discoveries of Filaire, Duche, and Lac (1998) in volleyball players. Then again, % LBM and water % was accounted for to be higher than controls. These contrasts amongst players and controls may be because of general physical exercise and delayed training impact.

3. Physical variables -

In volleyball players of both sexes, hand hold strength (right overwhelming) was accounted for to be higher than controls, indicating biomechanical advantages in the game. At the point when correlations were made with the information of Barut et al. (2008), Indian volley athletes have higher values for this attribute.

4. Physiological variables -

A few studies have reported the physiological and anthropometric characteristics of volleyball players. In the present study, Indian volleyball players have lesser value for heart rate and more prominent value for Vo2max than controls. These distinctions were

International Journal of Physical Education and Sports Sciences Vol. VIII, Issue No. XV, July-2015, ISSN 2231-3745

may be because of normal physical exercise and training in volleyball players. Truth be told, volleyball is an intermittent sport. It obliges players to take part in successive short episodes of high-intensity exercise, trailed by times of low-intensity activity. The high intensity episodes of exercise, combined with the total span of the match obliges players to have very much created aerobic and anaerobic alactic (ATP-CP) vitality frameworks. As a result, volleyball players require all around created speed, nimbleness, upper-body and lower body muscular force, and maximal aerobic force (VO2max).

5. Arm anthropometry -

Despite the fact that volleyball players of both sexes have more noteworthy upper arm length, lower arm length, total arm length, arm muscle region than controls, they have lesser arm fat region, arm periphery and arm fat file, these distinctions may be because of less fat on the arm in the players. Customary training program of volleyball players made these distinctions.

CONCLUSION

Changes in the physiological and anthropometric characteristics of volleyball players in light of training and throughout a season have additionally been archived. Investigations of the impact of volleyball and physical molding training on the physiological and anthropometric characteristics of players are obscure, with reports of expanded, diminished or unaltered wellness in light of training. What's more, it was as of late demonstrated that volleyball training altogether enhanced the expertise levels of ability recognized volleyball players, without essentially modifying skinfold thickness and Vo2max, indicating aptitude execution was physiological and as vital as anthropometric characteristics for anticipating accomplishment in junior volleyball players.

The information displayed in the present study convey enormous down to earth application and ought to be helpful in future examination on player choice, ability distinguishing proof in volleyball and training program development.

REFERENCES

- BANDYOPADHYAY A. Anthropometry and body composition in soccer and volleyball players in West Bengal, India. Journal of Physical Anthropology. 2007; (4):501-505.
- BARUT C, DEMIREL P, KIRAN S. Evaluation of hand anthropometric measurements and grip strength in basketball, volleyball and handball players. Anatomy. 2008; 2:55-59.

- CHATTERJEE S, CHATTERJEE Ρ. BANDYOPADHYAY A. Skinfold thickness, body fat percentage and body mass index in obese and non-obese Indian boys. Asia Pacific Journal of Clinical Nutrition. 2006; 15:232-235.
- DUNCAN MJ, WOODFIELD L, AL-NAKEEB Y. Anthropometric and Physiological characteristics of junior elite volleyball players. British Journal of Sports Medicine. 2006; 40:649-51.
- FILAIRE E, DUCHE P, LAC G. Effects of training for two balls on the saliva response of adrenocortical hormones to exercise in elite sportswomen. European Journal of Applied Physiology. 1998; 77:452-456.
- HASCELIK Z, BASGOZE O, TURKER K, NARMAN S, OZKER R. The effects of physical training on physical fitness tests and auditory and visual reaction times of volleyball players. Journal of Sports Medicine and Physical Fitness. 1999; 29:234-239.
- KITAGAWA K, IKUTA K, HARA Y, HIROTA K. Investigation of lean body mass as a limiting factor of maximum oxygen uptake. Japan Journal of Physical Fitness and Sports Medicine. 2004; 23:96-100.
- LOHMANN TG, ROCHE AF, MARTORELL R. Anthropometric Standardization Reference Manual. Champaign, IL: Human Kinetics Books; 1988.
- REILLY T, BANGSBO J, FRANKS A. Anthropometric and physiological predispositions for elite soccer. Journal of Sports Sciences. 2000; 18(9):669-683.
- TSUNAWAKE N, TAHARA Y, MOJI K, MURAKI S, MINOWA K, YUKAWA V. Body composition and physical fitness of female volleyball and basketball players of the Japan inter-high school championship teams. Applied Human Science: Journal of Physiological Anthropology. 2003; 22(4):195-201.
- WILMORE JH, COSTILL DL. Physiology of Sports and Exercise. 2nd ed. Human Kinetics, Champaign; 2009. Pp. 490-507.