

Relationship of Anthropometric Measurements and Volleying Ability Among Male University Volleyball Players

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Abstract- The purpose of the study was to find out the relationship of anthropometric measurements and volleying ability. To achieve this purpose of the study, various football teams participated in the South Zone Inter University Volleyball Tournament for men and those teams, which entered into the pre-quarter finals stage were contacted and selected. From that one hundred and sixty eight university male volleyball players from fourteen universities (n = 12), were selected. The average age of the subjects was twenty three years ranging from 18 to 25 years. The variables of body weight, standing height, arm span, hand span, palm length, leg length, thigh girth and calf girth were recorded. The score of the volleying test was the number and was average of the three trials. The data so obtained was statistically treated and analyzed. For this purpose, the performance of subjects on volleying ability (AAPHER volleyball skills wall pass test) was considered the dependent variable and the measurements of body weight, standing height, arm span, hand span, palm length, leg length, thigh girth and calf girth constituted the independent variables. The statistical tool used for the present study was correlation, Pearson Product Moment correlation test and Regression Co-efficient for the predicted score was applied. The selected anthropometric variables such as, body weight, height, arm length, leg length, palm span, thigh girth and calf girth, in the multiple regression equation has high significant positive relationship with the criterion variable - the volleying ability.

Key Words: anthropometric variables, volleying ability.

I. INTRODUCTION

Volleyball is a sport distinguished by an astonishing range of continually changing conditions in which players participate in a variety of activities with the objective of scoring goals while avoiding mistakes that result in a loss of concentration, which invariably

results to a point dispute [Afonso et al., (2012)]. The match's outcome is determined by a number of interactive elements, including the type of attacks, blocks, serves, and number of errors made by the opposition [Zetou et al., (2007); Yiannis and Panagiotis, (2005); Conti et al., (2011); Bergeles, Barzouka, and Nikolaidou, (2009); and Monteiro, Mesquita, and Marcelino, (2009)].

Volleyball players usually perform their attacks and blocks high over the net. According to Katić, Grgantov, and Jurko (2006), players' ability to leap during assaults and stand during blocks predicts their potential activity. This ability is a crucial consideration when picking young volleyball players. In their research of volleyball players aged 14 to 15, Hermoso et al. (2013) discovered significant disparities in winning and losing sets based on players' ability to dig, serve, and spike. Conti et al. (2011) found that fast and aggressive assaults had a substantial detrimental impact on scoring potential open openings in elite volleyball youth groups.

When Smith et al. (1992) compared volleyball players from public and college groups, they discovered that while there were no anthropometric differences between the two groups, public volleyball players were much faster, had better vertical jump execution, were stronger, and used more oxygen. These findings indicate that volleyball execution is multi-layered [Rikberg and Raudsepp, (2011)], and that successful players have more engine capacity and are taller and more slender than less successful players [Milic et al., 2017].

Anthropometry is the area of anthropology that deals with measuring human bodies. Anthropometry is the measurement of external body components, such as body perimeters and measurements. In logical writing,

rivals' kinanthropometric features are frequently discussed. These profiles are especially relevant in volleyball since a player's physical characteristics have a significant influence on their overall performance. Athletes' anthropometric traits influence their performance and are necessary for excelling in sports activities. They are necessary conditions for effective participation in the same sport.

Anthropometry is the study of the size and extent of the human body. The calculations take into account body weight, level, circuit, skin overlap thickness, and hand widths and lengths [Heyward, 2006]. Anthropometric assessments are widely used in various games to evaluate and forecast execution. Anthropometric measures and physical attributes have a significant part in defining a sportsperson's growth [Wilmore and Costill, 1999; Keogh, 1999].

The anthropometric characteristics of volleyball players influence their level of athletic performance. It has been established that volleyball players possess different anthropo-morphological features that distinguish them from the majority of other competitors [Ercollesi, (1999); Jankovic et al., (1995); and Ugarkovic, (2004)]. Anthropometric traits of a rival address critical needs for successful support in any random game [Gualdi-Russo and Zaccagni, 2001].

II. METHODOLOGY

The study's goal was to analyse selected anthropometrical variables such as, weight, standing height, arm span, hand span, palm span, leg length, thigh girth, and calf girth and volleying ability of inter-university male volleyball players. To achieve this purpose of the study, various football teams participated in the South Zone Inter University Volleyball Tournament for men (2023-24) and those teams, which entered into the pre-quarter finals stage were contacted and selected. From that one hundred

and sixty eight university male volleyball players from fourteen universities ($n = 12$), were selected. The variables of body weight, standing height, arm span, hand span, palm length, leg length, thigh girth and calf girth were recorded. The score of the volleying test was the number and was average of the threetrials. The data so obtained was statistically treated and analyzed. For this purpose, the performanceof subjects on volleying ability (AAPHER volleyball skills wall pass test)was considered the dependent variable and themeasurements of body weight, standing height, arm span, hand span, palm length, leg length, thigh girth and calf girth constituted the independent variables. The statistical tool used for the present study was correlation, Pearson Product Moment correlation test and Regression Co-efficient for the predicted score was applied.

III. ANALYSIS OF DATA

The descriptive statistics of the study, the selected criterion variables were tabulated below in Table – I.

Table – I DESCRIPTIVE STATISTICS ON
SELECTED CRITERION VARIABLES

Sl. No.	Variables	Mean	S.D.
1.	Body weight	78.86	2.16
2.	Standing height	169.37	2.34
3.	Arm span	1.73	0.0019
4.	Hand span	7.11	0.08
5.	Palm length	6.24	0.13
6.	Leg length	30.22	1.34
7.	Thigh girth	52.01	2.51
8.	Calf girth	14.32	0.99
9.	Volleying Ability	16.89	0.78

Table – II indicates the correlation between the selected independent and dependent variables.

Table – II CORRELATION BETWEEN SELECTED CRITERION VARIABLES OF
MALE UNIVERSITY VOLLEY PLAYERS

	Weight	Height	Arm span	Hand span	Palm Span	Leg length	Thigh girth	Calf girth	Volleying ability
Weight	-	0.427*	0.48*	0.49*	0.60*	0.40*	0.84*	0.60*	0.55*
Height	-	-	0.26*	0.33*	0.55*	0.86*	0.56*	0.41*	0.63*
Arm span	-	-	-	0.86*	0.71*	0.11	0.26	0.56*	0.61*
Hand span	-	-	-	-	0.52*	0.47*	0.21	0.16	0.52*
Palm span	-	-	-	-	-	0.18	0.15	0.11	0.43*
Leg length	-	-	-	-	-	-	0.27	0.20	0.31*
Thigh girth	-	-	-	-	-	-	-	0.12	0.64*

Calf girth									0.37*
Volleying Ability									-

From the scores exhibited in Table – IV following inferences were drawn:

1. The correlation between weight and height was positive and $r = 0.427$ and it was as much as higher than the 0.001 ($p > 0.01$) and found to be statistically significant.
2. The correlation between weight and arm span was positive and $r = 0.48$ and it was as much as higher than the 0.001 ($p > 0.01$) and found to be statistically significant.
3. The correlation between weight and hand span was positive and $r = 0.49$ and it was as much as higher than the 0.001 ($p > 0.01$) and found to be statistically significant.
4. The correlation between weight and palm length was positive and $r = 0.60$ and it was as much as higher than the 0.001 ($p > 0.01$) and found to be statistically significant.
5. The correlation between weight and leg length was positive and $r = 0.40$ and it was as much as higher than the 0.019 ($p > 0.01$) and found to be statistically significant.
6. The correlation between weight and thigh girth was positive and $r = 0.84$ and it was as much as higher than the 0.023 ($p > 0.01$) and found to be statistically significant.
7. The correlation between weight and calf girth was positive and $r = 0.60$ and it was as much as higher than the 0.001 ($p > 0.01$) and found to be statistically significant.
8. The correlation between weight and volleying ability was positive and $r = 0.55$ and it was as much as higher than the 0.001 ($p > 0.01$) and found to be statistically significant.
9. The correlation between height and arm span was positive and $r = 0.26$ ($p > 0.01$) and it was as much as higher than the 0.001 and found to be statistically significant.
10. The correlation between height and hand span was positive and $r = 0.33$ ($p > 0.01$) and it was as much as higher than the 0.001 and found to be statistically significant.
11. The correlation between height and palm length was positive and $r = 0.55$ ($p > 0.01$) and it was as much as higher than the 0.001 and found to be statistically significant.
12. The correlation between height and leg length was positive and $r = 0.86$ ($p > 0.01$) and it was as much as higher than the 0.001 and found to be statistically significant.
13. The correlation between height and thigh girth was positive and $r = 0.56$ ($p > 0.01$) and it was as much as higher than the 0.001 and found to be statistically significant.
14. The correlation between height and calf girth was positive and $r = 0.41$ ($p > 0.01$) and it was as much as higher than the 0.001 and found to be statistically significant.
15. The correlation between height and volleying ability was positive and $r = 0.63$ ($p > 0.01$) and it was as much as higher than the 0.001 and found to be statistically significant.
16. The correlation between arm span and hand span was positive and $r = 0.86$ and it was as much as higher than the 0.001 ($p > 0.01$) and found to be statistically significant.
17. The correlation between arm span and palm length was positive and $r = 0.55$ and it was as much as higher than the 0.001 ($p > 0.01$) and found to be statistically significant.
18. The correlation between arm span and leg length was positive and $r = 0.56$ and it was as much as higher than the 0.001 ($p > 0.01$) and found to be statistically significant.
19. The correlation between arm span and thigh girth was positive and $r = 0.26$ and it was as much as lesser than the 0.001 ($p < 0.01$) and found to be statistically insignificant.
20. The correlation between arm span and calf girth was positive and $r = 0.56$ and it was as much as higher than the 0.001 ($p > 0.01$) and found to be statistically significant.
21. The correlation between arm span and volleying ability was positive and $r = 0.61$ and it was as much as higher than the 0.001 ($p > 0.01$) and found to be statistically significant.
22. The correlation between arm span and hand span was positive and $r = 0.68$ and it was as much as

- higher than the 0.001 ($p > 0.01$) and found to be statistically significant.
23. The correlation between hand span and palm length was positive and $r = 0.52$ and it was as much as higher than the 0.001 ($p > 0.01$) and found to be statistically significant.
 24. The correlation between hand span and leg length was positive and $r = 0.47$ and it was as much as higher than the 0.001 ($p > 0.01$) and found to be statistically significant.
 25. The correlation between hand span and thigh girth was positive and $r = 0.21$ and it was as much as lesser than the 0.001 ($p < 0.01$) and found to be statistically insignificant.
 26. The correlation between hand span and calf girth was positive and $r = 0.16$ and it was as much as lesser than the 0.001 ($p < 0.01$) and found to be statistically insignificant.
 27. The correlation between hand span and volleying ability was positive and $r = 0.52$ and it was as much as higher than the 0.001 ($p > 0.01$) and found to be statistically significant.
 28. The correlation between palm span and leg length was positive and $r = 0.18$ and it was as much as lesser than the 0.001 ($p < 0.01$) and found to be statistically insignificant.
 29. The correlation between palm span and thigh girth was positive and $r = 0.15$ and it was as much as lesser than the 0.001 ($p < 0.01$) and found to be statistically insignificant.
 30. The correlation between palm span and calf girth was positive and $r = 0.14$ and it was as much as lesser than the 0.001 ($p < 0.01$) and found to be statistically insignificant.
 31. The correlation between palm span and volleying ability was positive and $r = 0.43$ and it was as much as higher than the 0.001 ($p < 0.01$) and found to be statistically significant.
 32. The correlation between leg length and co-ordination was positive and $r = 0.27$ and it was lesser than the 0.001 ($p < 0.01$) and found to be statistically insignificant.
 33. The correlation between leg length and calf girth was positive and $r = 0.20$ and it was lesser than the 0.001 ($p < 0.01$) and found to be statistically insignificant.
 34. The correlation between leg length and balance was positive and $r = 0.33$ and it was greater than

the 0.001 ($p < 0.01$) and found to be statistically significant.

35. The correlation between leg length and volleying ability was positive and $r = 0.31$ and it was higher than the 0.001 ($p < 0.01$) and found to be statistically significant.
36. The correlation between leg length and spiking ability was positive and $r = 0.68$ and it was higher than the 0.001 ($p < 0.01$) and found to be statistically significant.
37. The correlation between leg length and serving ability was positive and $r = 0.42$ and it was higher than the 0.001 ($p < 0.01$) and found to be statistically significant.
38. The correlation between thigh girth and calf girth was positive and $r = 0.12$ and it was lesser than the 0.001 ($p < 0.01$) and found to be statistically insignificant.
39. The correlation between thigh girth and volleying ability was positive and $r = 0.64$ and it was higher than the 0.001 ($p < 0.01$) and found to be statistically significant.
40. The correlation between calf girth and volleying ability was positive and $r = 0.58$ and it was higher than the 0.001 ($p < 0.01$) and found to be statistically significant.

Table – III Pearson Product Moment
Correlation Between The Selected Variables
And Volleying Ability

Dependent Variable	Variables	'r' value
Volleying ability	1. Weight	0.55*
	2. Height	0.63*
	3. Arm span	0.61*
	4. Hand span	0.52*
	5. Palm span	0.43*
	6. Leg length	0.31*
	7. Thigh girth	0.64*
	8. Calf girth	0.58*
	9. Balance	0.43*
	10. Agility	0.39*
	11. Co-ordination	0.31
	12. Finger dexterity	0.51

* Significant at 0.05 level of confidence.

Table III shows that there is a substantial association between volleying skill and male university volleyball players' weight, height, arm span, handspan, palm span, leg length, thigh girth, and calf girth, in each variable independently. The multiple regression equation was only constructed since the numerous

correlations were high enough to forecast. The correlation then determined which independent variables should be included in the regression equation, as well as in what order. Multiple

correlations were estimated using the entry selection technique on data received for male volleyball players' volleyball playing abilities, and the findings are shown in Table IV.

Table –IV Multiple Correlation Co-Efficient for the Predictors of Volleying Ability of Male Volleyball Players

S. No	Variables (Enter Selection)	R	R Square	Adjusted R Square	R Square Change
1.	Weight	0.531	0.282	0.315	0.320
2.	Weight, Height, Arm span and Hand span	0.718	0.515	0.489	0.180
3.	Weight, Height, Arm span, Hand span, Palm length, and Leg length	0.701	0.491	0.507	0.022
4.	Weight, Height, Arm span, Hand span, Palm length, Leg length, Thigh girth and Calf girth	0.755	0.570	0.563	0.057

From the Table - IV, it is found out that the multiple correlations co-efficient for predictors, such as weight, height, arm span, hand span, palm length, leg length, thigh girth, calf girth and is 0.76 which produces highest multiple correlations with volleyball playing ability of male university volleyball players. R square values show that the percentage of contribution of predictors to the volleying ability (dependent variable) is in the following order.

1. About 57% of the variation in the volleying ability was explained by the regression model with eight predictors, such as, weight, height, arm span, hand span, palm length, leg length, thigh girth, calf girth and balance.
2. About 49% of the variation in the volleying ability was explained by the regression model with six predictors, such as, weight, height, arm span, hand span, palm length, and leg length.
3. About 52% of the variation in the volleying ability was explained by the regression model with four predictors, such as, weight, height, arm span, and hand span.
4. About 28% of the variation in the volleying ability was explained by the regression model with one predictor, such as, weight. Multiple regression equation was computed and the results were presented in Table VII.

Table – VII Regression Co-Efficient for The Predicted Variables with Volleying Ability of Male University Volleyball Players

S. No	Variables	B	Std. Error	Beta Weights
1.	(Constant)	1.502	0.584	
	Weight	0.355	0.043	0.565

2.	(Constant)	-0.416	0.575	
	Weight	0.192	0.045	0.306
	Height	0.104	0.016	0.421
	Arm span	0.052	0.02	0.177
3.	(Constant)	5.79	2.539	
	Weight	1.63	0.046	0.260
	Height	0.097	0.016	0.394
	Arm span	0.045	0.019	0.155
	Hand Span	- 0.066	0.026	- 0.165
4.	(Constant)	3.209	2.464	
	Weight	0.088	0.046	0.140
	Height	0.75	0.016	0.305
	Arm span	0.034	0.019	0.114
	Hand span	- 0.049	0.025	- 0.124
	Palm length	0.101	0.023	0.325
5.	(Constant)	1.809	2.596	
	Weight	0.085	0.046	0.135
	Height	0.072	- 0.016	0.290
	Arm span	0.034	0.018	0.117
	Hand span	- 0.056	0.025	- 0.141
	Palm length	0.093	0.024	0.299
	Leg length	0.013	0.008	0.096
6.	(Constant)	2.414	2.731	
	Weight	0.086	0.046	0.137
	Height	0.068	0.017	0.277
	Arm span	0.032	0.019	0.109
	Hand span	- 0.059	0.025	- 0.147
	Palm length	0.095	0.024	0.305
	Leg length	- 0.005	0.028	0.035
	Thigh girth	3.387	4.676	0.139

From Table - VII, the following regression equations were derived for university volleyball players with dependent variables.

$$1. \text{Regression Equation in obtained scores form} = X_c \\ X_c = (0.086)X_1 + (0.0068)X_2 + (0.032)X_3 + (-0.059)X_4 \\ + (0.095)X_5 + (-0.005)X_6 + (3.87) + 2.414$$

Where, X_c = Volleying ability, X_1 = Weight, X_2 = height, X_3 = arm span, X_4 = hand span, X_5 = palm length X_6 = leg length, X_7 = thigh girth,

2. Regression Equation in standard scores form = Z_c
 $Z_c = (0.0137)Z_1 + (0.277)Z_2 + (0.109)Z_3 + (-0.147)Z_4 + (0.305)Z_5 + (-0.035)Z_6 + (0.139)$

Where, Z_c = Volleying ability, Z_1 = Weight, Z_2 = height, Z_3 = arm span, Z_4 = hand span, Z_5 = palm length, Z_6 = leg length, Z_7 = thigh girth.

The regression equation for the prediction of volleying ability of male volleyball players includes weight, height, arm span, hand span, palm length, and leg length were predictive. As the multiple correlations on volleyball playing ability with the combined effect of these independent variables are highly significant, it is apparent that the obtained regression equation has a high predictive validity. Thus, this equation may be successfully utilized in selecting university male volleyball players.

IV. DISCUSSION ON FINDINGS

Based on the results of the study the following conclusions were drawn:

The following factors were predictive of male volleyball players' volleying ability: weight, height, arm and hand spans, palm lengths, leg lengths, and thigh girths. Given that the combined effect of these independent factors and the multiple correlation on volleying skill were extremely significant, it is clear that the resulting regression equation has a high predictive validity.

V. CONCLUSIONS

Based on the findings of the investigation, the following conclusions were reached:

1. Predictor factors can help pick male volleyball players for university teams.
2. The selected anthropometric factors (body weight, height, arm length, leg length, palm span, thigh girth, and calf girth) in the multiple regression equation had a significant positive connection with the criterion variable (volleying skill).

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