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Selected Anthropometric Parameters as a Predictors of Volleyball Playing Ability

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Abstract: ***Purpose: The first purpose of the study was to find out correlation between Independent Variables (selected Anthropometric Parameters) and Dependent Variable (Volleyball Playing Ability). The second purpose of the research was to study the joint contribution of Independent Variables in estimating Dependent Variable and the third purpose was to establish regression equation for predicting Dependent Variable on the basis of Independent Variables. Selected Variables were Height, Weight, Arm Length, Upper Arm Circumference, Leg Length, Thigh Circumference (Independent Variables). Methodology: Total of 48 male Inter-university level Volleyball players were selected from different colleges of R.M.L.A.U Faizabad during inter collegiate tournament. Age of the subjects was ranging between 18 to 25 years. Selected Variables were Height, Weight, Arm Length, Upper Arm Circumference, Leg Length, Thigh Circumference (Independent Variables). Volleyball Performance was considered as Dependant Variable. The selected physical fitness variables were measured by different tests and performance was measured through subjective rating with the help of three experts of volleyball game, at the time of match. To find out correlation between Independent Variables (Height, Weight, Arm Length, Upper Arm Circumference, Leg Length and Thigh Circumference) and Dependent Variable (Volleyball Performance), Product Moment Method of correlation was used. To study the joint contribution of Independent Variables in estimating Dependent Variable, Multiple correlation method was used. Regression equation was established for predicting Dependent Variable on the basis of Independent Variables. Findings: There exists a significant relationship between Volleyball Performance* **and** *Weight (r = -.268, p < .05), Height (r = .638, p <.05), Arm length (r = .492, p < .05) and Thigh Circumference (r = .262, p < .05). There exists an insignificant relationship between Volleyball Performance and Upper Arm Circumference (r = .107, p > .05) and Leg Length (r = .182, p > .05). Regression equation (Volleyball Performance = 28.032 - 0.104(Weight) + 0.227 (Height) + 0.057(Arm Length) + 0.064(Thigh Circumference) was found fructiferous in estimating Volleyball Performance on the basis of selected Anthropometric* **Variables (***Height, Weight, Leg Length, Thigh Circumference***).**

Keywords: Volleyball Playing Ability, Anthropometric variables, Arm Length, Upper Arm Circumference, Leg Length and Thigh Circumference.

1. Introduction

Generally, it is considered that success in team game is more related to knowledge of the game strategies, technical efficiency, and tactical skills and performance capabilities. Therefore, it becomes difficult to predict potentially talented players. There are number of factors which affect the performance of sportspersons, such as age, sex, physical growth, physiological, biochemical, biomechanical, genetically, anthropological and psychological factors **(Carter, 1970).** Among these factors, the size, shape, physique, proportions, physical fitness, skill efficiency level also plays significant role in better performance.

After an intensive study of anthropometric measures of Olympic athletes, Garay, Levine and Lindsay Carter concluded that level of performance in a particular event demand a particular type of body size and shape, other aspect being similar, they established high relationship between structure of an athlete and the specific task (event) in which he excelled **(Alfonso L. Garay, Louis levine and Y. E. Lindsay Carter, 1974).**

Anthropometrics measurements were central concerns of the first phase of the scientific era of measurements, which have been began in the 1860's current interest in anthropometrics measurements focus in three areas, girth measures, body type and body composition. Assess of such measures include classification, prediction of growth patterns and prediction of success in motor activities as well as assessment of ability **(Allen Philips and James E. Harnok, 1979).**

Volleyball is a team sport which requires specific anthropometric characteristics of players for elite performance, particularly in relation to dominance over the net. Volleyball coaches have been paying greater attention on anthropometric characteristics in recruitment of potential players. However, according to the literature we collected, at present there are few reports on the anthropometry profile of elite volleyball players. Particularly there is a paucity of information on the differences between players at different playing positions and the relationships between the anthropometry measurements and physical performance.

2. Objectives of the study

1. To find out correlation between Independent Variables (Height, Weight, Arm Length, Upper Arm Circumference, Leg Length and Thigh Circumference) and Dependent Variable (Volleyball Playing Ability).
2. To establish regression equation for predicting Dependent Variable on the basis of Independent Variables.
3. To study the joint contribution of Independent Variables in estimating Dependent Variable.

3. Methodology

Selection of subjects

A total of 48 Male Inter-university level Volleyball players were selected from different colleges of R.M.L.A.U Faizabad during inter collegiate tournament. Age of the subjects was ranging between 18 to 25 years.

Selection of variables

Dependent variable – Volleyball Playing Ability
Independent variables – Anthropometric Parameters

a) Height
b) Weight
c) Arm Length
d) Upper Arm Circumference
e) Leg Length
f) Thigh Circumference

Criterion measures

- The performance of the volleyball players was evaluated by the panel of three experts on the basis of subjective observation of the player's performance during the course of competition. Each expert was evaluating the performance of the each player out of 20 points. The mean points of the three experts were recorded as a final score for the performance of each player.
- Standing Height was measured with the help of Stadiometer and recorded in cm.
- Weight was measured with the help of weighing machine and recorded in kg.
- Arm Length, Upper Arm Circumference, Leg Length & Thigh Circumference were measured with the help of flexible steel tape and recorded in cm.

Statistical technique

- To find out correlation between Independent Variables (Anthropometric parameters) and Dependent Variable (Volleyball Performance), Product Moment Method of correlation was used at 0.05 level of significance.
- To study the joint contribution of Independent Variables in estimating Dependent Variable, Multiple correlation method was used at 0.05 level of significance.
- Regression equation was established for predicting Dependent Variable on the basis of Independent Variables.

4. Result And Findings

Table 1: Descriptive table of selected variables

Variables	Mean	Std. Deviation	N
Performance	13.2083	1.79785	48
Weight	65.5833	5.92087	48
Height	178.35	3.94370	48
Arm Length	78.4167	3.62517	48
Upper Arm	28.1667	3.67472	48
Leg Length	102.75	4.06595	48
Thigh	49.3333	4.37271	48

Table 1 shows that the descriptive analysis (Mean, SD & N) of selected variables i.e. Performance, Weight, Height, Arm Length, Upper Arm Circumference, Leg Length and Thigh Circumference.

Table 2: Residuals statistics for checking outliers

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	9.8465	16.7534	13.2083	1.28352	48
Residual	-2.40694	2.38448	.00000	1.25891	48
Std. Predicted Value	-2.619	2.762	.000	1.000	48
Std. Residual	-1.786	1.769	.000	.934	48

a. Dependent Variable: performance

The table 2 reveals that std. (standardized) residual, maximum value (1.769) and minimum value (-1.786), both values doesn't exceed +3 & -3. This proves that the range doesn't have any outliers.

Table 3: Correlation between Dependent Variable (Volleyball Performance) and Independent Variables (Weight, Height, Arm Length, Upper Arm Circumference, Leg Length and Thigh Circumference)

Dependent variable	Independent variables	N	Coefficient correlation (r)	Sig.
Performance	Weight	48	-.268*	.033
	Height	48	.638*	.000
	Arm Length	48	.492*	.000
	Upper Arm Circumference	48	.107	.234
	Leg Length	48	.182	.108
	Thigh Circumference	48	.262*	.036

Table - 3 clearly indicates that there exists a significant relationship between Volleyball Performance and Independent Variables i.e. Weight, Height, Arm Length and Thigh Circumference as the correlation coefficient values were found higher than the tabulated value at .05 level of significance.

On the other hand there exists an insignificant relationship between Volleyball Performance and Independent Variable i.e. Upper Arm Circumference and Leg Length as the correlation coefficient values were found lower than the tabulated value at 0.05 level of significance.

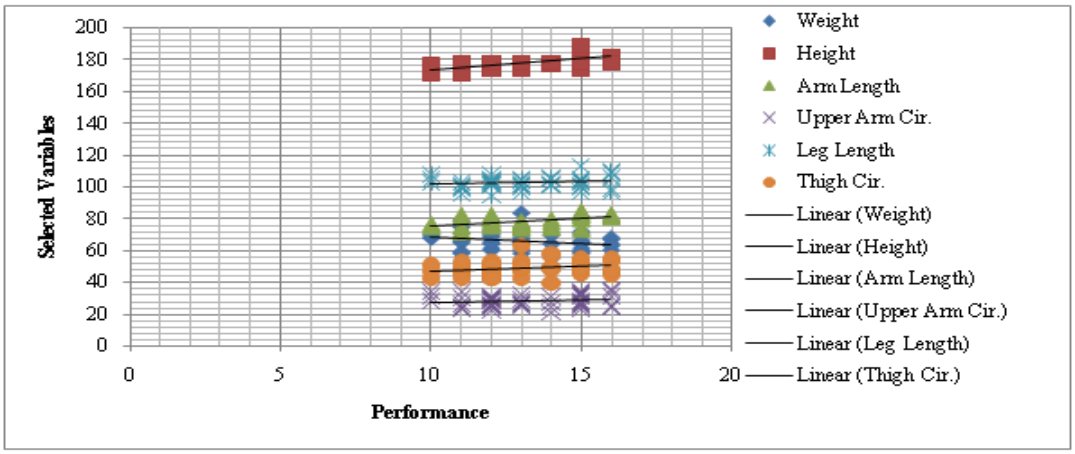

Figure 1: Graphical representation of Correlation between Dependent Variable (Volleyball Performance) and Independent Variables (Weight, Height, Arm Length, Upper Arm Circumference, Leg Length and Thigh Circumference)

Table 4: Model Summary showing Pearson's correlation between performance and selected anthropometric variables

Model[b]	*R*	*R Square*	*Adjusted R Square*	*Std. Error of the Estimate*	*Durbin-Watson*
1	.714[a]	.510	.438	1.34788	1.385

a. Predictors: (Constant), thigh circumference, leg length, arm length, weight, upper arm circumference, height
b. Dependent Variable: performance

In table 4 Pearson's correlation (r) between performance of volleyball players and selected anthropometric variables is .714. R square is .510, which impales that 51% of volleyball performance is obtained by the selected anthropometric variables.

Table 5: The ANOVA table of the linear regression model in relation to performance of volleyball players on the basis of selected anthropometric variables

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	77.429	6	12.905	7.103	.000[a]
	Residual	74.488	41	1.817		
	Total	151.917	47			

a. Predictors: (Constant), thigh cercumfrance, leg length, arm length, weight, uppar arm cercumfrance, height
b. Dependent Variable: performance

Table 5 shows that the usefulness of the linear regression model. This model has found useful in estimating the performance of volleyball players on the basis of selected anthropometric variables, since F value (7.103) has found significant ($p<0.05$).

Table 6: Regression coefficient of selected variables in predicting Dependent variable (Volleyball playing ability)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-28.032	10.262		-2.732	.009
	Weight	-.104	.037	-.341	-2.815	.007
	Height	.227	.081	.497	2.793	.008
	Arm Length	.057	.081	.115	.701	.487
	Upper Arm Circumference	.038	.059	.078	.643	.524
	Leg Length	-.011	.053	-.024	-.202	.841
	Thigh Circumference	.064	.051	.156	1.264	.213

Dependent Variable: performance

Table 6 shows that the quantification of relationship between selected anthropometric variables and volleyball performance.

Regression model for estimating performance of volleyball on the basis of selected anthropometric variables

Y = -28.032 - 0.104(X1) + 0.227 (X2) + 0.057(X3) + 0.064(X4)

Where: Y= performance of volleyball players, X1= Weight, X2= Height, X3= Arm Length, X4= Thigh Circumference.

Volleyball Performance = -28.032 - 0.104(Weight) + 0.227 (Height) + 0.057(Arm Length) + 0.064(Thigh Circumference).

5. Discussion of the Findings

Mishra, M.K. & Choudhary R. (2015) conducted a study on "Estimation of the raiders performance on the basis of reaction ability in Kabaddi." Results of the study showed that there exists a significant relationship between raiders performance and reaction ability (r=0.929).

Mishra, M.K. and Thakur, J. S. (2015) have conducted a study on "An Estimation of Kho-Kho Performance on the Basis of Selected Physical Fitness Parameters." They found significant relationship between Kho-kho Performance and Cardiovascular Endurance ($r = .533$, $p < .05$), Agility ($r = .601$, $p < .05$), Speed ($r = .315$, $p < .05$) and Explosive Strength ($r = .342$, $p < .05$), and an insignificant relationship between Kho-Kho Performance and Flexibility ($r = .115$, $p > .05$.

These studies are similar to the present study and supports the results of the present study which shows that the significant relationship exists between Volleyball Performance and body weight, height, arm length and thigh circumference, where as there exists an insignificant relationship between Volleyball Performance and upper arm circumference and Leg Length.

6. Conclusions

1) Significant relationship was found between Volleyball Performance and Weight (r = -.268, p < .05).
2) Significant relationship was found between Volleyball Performance and Height (r = .638, p <.05).
3) Significant relationship was found between Volleyball Performance and Arm length (r = .492, p < .05).
4) Significant relationship was found between Volleyball Performance and Thigh Circumference (r = .262, p < .05).
5) Insignificant relationship was found between Volleyball Performance and Upper Arm Circumference (r = .107, p > .05).
6) Insignificant relationship was found between Volleyball Performance and Leg Length (r = .182, p > .05).
7) Multiple Relationship (R) between performance of volleyball players and selected anthropometric variables is R=0.714 and R square is .510, which shows that 51% of volleyball performance is obtained by the selected anthropometric variables.
8) Regression equation (Volleyball Performance = 28.032 - 0.104(Weight) + 0.227 (Height) + 0.057(Arm Length) + 0.064(Thigh Circumference) was found fructiferous in estimating Volleyball Performance on the basis of selected *Variables (*Height, Weight, Arm Length, Upper and Thigh Circumference*)*.

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