Does Anthropometric Variables Affect Archery Performance? An Analytical Study

Mr. Vikram Singh* & Dr. Rakesh Malik**
*(P.E.T at Directorate Of Education Delhi)
**Deputy Director Of Physical Education and Sports ,Panjab University Chandigarh

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ABSTRACT *The present study focuses on prediction of archery performance of female archers on the basis of selected anthropometric variables. The data were collected on 100 female archery players. The training age of all the archers were equal to or more than 3 years. This study recruited all the subjects after taking their written consent for voluntarily participation in this study. Amongst the anthropometric variables 6 were selected for the purpose of this study namely (Height, weight, finger length, flexed arm biceps girth, shoulder width, arm length). It was assumed that a regression equation can be developed using all these anthropometric variables. Multiple regression analysis was used to develop prediction model. Level of significance was set at 0.05. Finally the research study produced 2 models. The first model includes only one anthropometric variable "finger length" possess the prediction ability of 61.7% of total variability in dependent variable. The second model includes 2 variables namely finger length and height, this model has greater prediction ability of 63.5%, and considered to be more robust than the previous one. The adjusted R value pertaining to both models can be expressed as .613, & .635 respectively.*

Keywords: *Archery, Accuracy, Performance, Anthropometry.*

INTRODUCTION

Nobody knows how long man first designed the bow and arrow. It was a finding of major importance to him, for he had learnt how to conserve energy by using the elasticity of wood. Having knotted a string of leather or warped grass to both ends of an elongated stick, he bent the stick through pulling on the string consequently that the energy from his arms became stored up in the thing he had made. By fitting another stick on the string and then letting go, the stored energy was moved to by the string to the smaller stick and away it flew.

When he fastens a sharp, pointed glint near the end of the smaller stick and made it fly further and straighter by fixing a bird's feather to the end of it, he had an effective weapon than a stone for killing the wild animals. The prehistoric sketches over the walls of cases of men with bows and arrows are alleged to be 20000 years old. Museums are jam-packed of flint arrows heads expertly chipped to thin edges. They are originate all over the world excluding Australia where men not ever understood the possibilities of a bent tree branch. The sport of archery has glorious history across the world. With time the sports has improvised its equipment to greater extent. A big difference can be seen in bow and arrow, compared to ancient days. Science has provided basis to improve almost all the games in improving their efficiency. New world records are being set day by day. Sports has got a new face after including so many allied fields into it. Today almost all national teams are equipped with a coach, manager, sports physiologists, sports Bio-mechanist, sports psychologist and many more personnel's.

METHODOLOGY

A sample of 100 female Subjects were selected in random fashion, training age of 3 or more years was the primary criteria of selecting subjects for this study. The subjects were called to sports performance testing lab of the University, there anthropometric data was collected. Then they were exposed to accuracy test, their data were recorded in the same way for independent and dependent variable. The subjects were asked to gather in sports lab in skin tight dress suitable for marking anthropometric measurements. Then they were called to field for measurement of accuracy performance. They should be equipped with their own bow and arrow at the time of accuracy measurement. To provide statistical authenticity to research findings multiple regression analysis was applied as statistical tool. The level of significance was set at 0.05.

ANALYSIS OF DATA

The data on various anthropometric measurements were recorded with the help of non-stretchable tape. Then the data was analysed using SPSS (Statistical package for social science) version 20. To obtain general idea regarding sample characteristics descriptive statistics were calculated.

Table-1
Descriptive Statistics

	Mean	Std. Deviation	N
HEIGHT	160.4600	8.49292	100
WEIGHT	57.8100	7.45179	100
FINGER LENGTH	61.7100	8.33430	100
FLEXED ARM BICEPS GIRTH	29.0700	3.74235	100
SHOULDER WIDTH	30.8400	3.04750	100
ARM LENGTH	60.0900	5.83285	100
ACCURACY	206.6000	9.84424	100

Mean and SD have been reported in table-1. This table is helpful in obtaining general idea about population characteristics. These two outputs are of foremost important to draw any legal conclusion regarding any population. Although these two descriptive statistics does not allow one to conclude something with firm belief but they are like stepping stone for later statistical processes.

Table-2
Correlation table

Variable name		ACCURACY
HEIGHT	Pearson Correlation	**.578****
	Sig. (2-tailed)	.000
	N	100
WEIGHT	Pearson Correlation	.051
	Sig. (2-tailed)	.617
	N	100
FINGER LENGTH	Pearson Correlation	**.785****
	Sig. (2-tailed)	.000
	N	100
FLEXED ARM BICEPS GIRTH	Pearson Correlation	.054
	Sig. (2-tailed)	.594
	N	100
SHOULDER WIDTH	Pearson Correlation	.076
	Sig. (2-tailed)	.451
	N	100
ARM LENGTH	Pearson Correlation	-.149
	Sig. (2-tailed)	.138
	N	100
ACCURACY	Pearson Correlation	1
	Sig. (2-tailed)	
	N	100

Table-2 shows that 2 variables out of 6 were found to be significantly correlated with accuracy score obtained by subjects. Height and finger length variables were found to be significantly correlated with accuracy even at 0.01 level of significance. This trend shows that these two variables have strong chances of getting included in model.

Table-3 Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.785[a]	.617	.613	6.12597
2	.801[b]	.642	.635	5.95060

a. Predictors: (Constant), FINGER LENGTH
b. Predictors: (Constant), FINGER LENGTH, HEIGHT
c. Dependent Variable: ACCURACY

Table-3 indicates that on the basis of present dataset a total of 2 models can be developed. The present research study recommends using 2nd model as it has highest prediction capability. The second model is capable of predicting 63.5% of total changes in dependent variable.

Table-4
ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5916.302	1	5916.302	157.652	.000[b]
	Residual	3677.698	98	37.528		
	Total	9594.000	99			
2	Regression	6159.263	2	3079.631	86.971	.000[c]
	Residual	3434.737	97	35.410		
	Total	9594.000	99			

a. Dependent Variable: ACCURACY
b. Predictors: (Constant), FINGER LENGTH
c. Predictors: (Constant), FINGER LENGTH, HEIGHT

The ANOVA table presented above shows that if the prepared model is significant at 0.05 level. Table-4 verifies that all the prepared models are significant and either model can be taken in account for prediction of archery performance.

Table-5
Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	149.361	4.600		32.472	.000
	FINGER LENGTH	.928	.074	.785	12.556	.000
2	(Constant)	121.386	11.577		10.485	.000
	FINGER LENGTH	.797	.087	.675	9.129	.000
	HEIGHT	.224	.086	.194	2.619	.010

a. Dependent Variable: ACCURACY

Table-5 shows the unstandardized and standardized coefficients of both the selected independent variables. Unstandardized coefficients are used for the development of prediction equations while standardized coefficients shows the actual contribution of an independent variable towards dependent variable.

FINDINGS

On the basis of present dataset the following findings were observed:

- The mean score of subjects on anthropometric variable height was recorded as 160.46 with SD 8.49.
- The mean score of subjects on anthropometric variable weight was recorded as 57.81 with SD 7.45.
- The mean score of subjects on anthropometric variable finger length was recorded as 61.71 with SD 8.33.
- The mean score of subjects on anthropometric variable flexed arm biceps girth was recorded as 29.07 with SD 3.74.
- The mean score of subjects on anthropometric variable shoulder width was recorded as 30.84 with SD 3.04.
- The mean score of subjects on anthropometric variable arm length was recorded as 60.09 with SD 5.83.
- The mean score of subjects on accuracy variable was recorded as 206.60 with SD 9.84.

CONCLUSION

In conclusion 2 regression models have been developed. This research study recommends second model for prediction of archery performance. Second model have been presented below:

Archery performance of female archers = 121.386 + (Finger length in mm* .797) + (Height in cm* .224).

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