

## **STUDY OF SOME PREDICTIVE ANTHROPOMETRIC VARIABLES OF FAST BOWLING IN CRICKET**

**Dr. Daya Shankar Verma**

Assistant Professor, Dept. of Physical Education, Shri Vishwanath P.G. College, Kalan, Sultanpur

### **ABSTRACT**

The game of cricket requires considerable amount of physical fitness and mastery of skills. A key element of fast bowling is ball-release speed or peak bowling speed (V-peak). Ball-release speed in fast bowlers is influenced by various anthropometric factors. Certain anthropometric measurements are advantageous for a good performance in fast bowling in cricket like longer the arm length more the leverage which helps the bowler to bowl fast. In this study, the researcher has tried to find out the predictive anthropometric variables which contribute towards fast bowling in cricket. To achieve the purpose of the study, 45 males fast bowler of inter-collegiate cricket teams in various colleges affiliated to University of Lucknow, Lucknow are randomly selected as subjects. 18 anthropometric variables namely: The height, weight, foreleg length, thigh length, leg length, upper arm length, forearm length, Ponderal Index, Crural Ratio, arm length, hand length, upper arm girth, forearm girth, wrist circumference, shoulder width, chest girth, thigh girth and calf girth were selected and their individual and multiple correlation with Velocity of the ball were computed by using Pearson's Product Moment Method for Coefficient of Correlation and Multiple Correlation were applied. Multiple regression equation was developed in order to predict the most contributory factors towards fast bowling performance for the anthropometric variables. Bowling performance of a fast bowler was found highly correlated to height (0.4241), Fore arm length (0.4573), Wrist Circumference (0.4753) and Shoulder width (0.4464), whereas it was found significantly correlated to Leg length (0.2983) and Ponderal index (0.2974).

**Key words:** *Fast Bowling, Anthropometric Variables, Correlation, Regression.*

### **INTRODUCTION**

There are numerous factors which are responsible for the performance of a sportsman. The physique and body composition, including the size, shape and form are known to play a significant role in this regard. The game of cricket requires considerable amount of physical fitness and mastery of skills. A key element of fast bowling is ball-release speed or peak bowling speed (V-peak). Ball-release speed in fast bowlers is influenced by various anthropometric factors.

Heyward (2006) included body weight, height, circumference, skin fold thickness and bony widths and lengths as major anthropometric measurements (Heyward, 2006:13). Certain anthropometric measurements are advantageous for a good performance in fast bowling in cricket like longer the arm length more the leverage which helps the bowler to bowl fast. Height is an important factor in fast bowling and this is evident from the fact that most of the great fast bowlers have an advantage of height. Although strength and power characteristics are purported to be important factors influencing

ball-release speed (Bloomfield, Ackland, and Elliott, 1994), the extent to which they explain variations in bowling speed between different fast bowlers is unclear.

## **REVIEW OF LITERATURE**

Sharma (1983) found that fast bowlers were significantly taller than batsman. Mishra (1986) studied the relationship between flexibility, speed, strength and body segment to bowling performance and found that shoulder, wrist, trunk, neck flexibility, speed, and arm length are reliable variables in predicting bowling performance in cricket.

Results of the study conducted by Kumar and Gladkykirubakar (2014) reveal that there was significant difference between the standing height, arm length, leg length, body composition and there is no significant difference exist between the thigh girth of spin bowlers and medium pace bowlers in cricket. Pyne, et. al. (2006) conducted a study to characterize relationships between anthropometric and isoinertial strength characteristics and bowling speed in junior and senior cricket fast bowlers.

Parameswari and Gopinath (2012) used Arm span length, Total arm length, Arm length, Fore arm length, Hand length, Total leg length, Thigh length, Lower leg length, and Foot length to analysis the body dimensions found among Indian university women cricket. Data were analysed by using the Pearson's Product Moment Correlation. Positive Correlation on the body dimensions found among Indian university women cricket bowlers on arm span length, total arm length, fore arm length, hand length, leg length, lower leg length, and foot length ( $p < .05$  &  $.01$ ).

Rajendran (2013) conducted a study to find out relationship of Anthropometric Measurements to Performance in Cricket. Study found that height and shoulder width help the bowler to perform better. The results of the study conducted by Singh and Deol (2015) showed that there was significant difference in Hand length, Leg length, Speed, Strength and Agility variables between Softball and Cricket players at 0.05 level of significance.

## **OBJECTIVE OF THE STUDY**

In this study, the researcher has tried to find out the predictive anthropometric variables which contribute towards fast bowling in cricket.

## **DEFINITION OF TECHNICAL TERMS USED**

**Fast Bowling:** Fast bowling in cricket involves the projection of ball with maximum velocity towards the opposite end of wicket at a distance of twenty-two yards (Fingleton, 1972:11).

**Anthropometric variables:** Anthropometric variables are dimensions of the structure of the human body taken at specific sites to give measures of length, girth and width (Mathews, 1978:19). Anthropometric measurement plays an important role in fast bowling in cricket.



## **HYPOTHESES**

1. Performance in fast bowling is influenced by selected anthropometric, variables.
2. Anthropometric variables can be utilized in predicting performance in fast bowling.

## **METHODOLOGY**

**SELECTION OF SUBJECTS:** To achieve the purpose of the study, 45 males fast bowler of inter-collegiate cricket teams in various colleges affiliated to University of Lucknow, Lucknow are randomly selected as subjects. All the 45 fast bowlers were of fairly well-developed physique and all of them had been participating in cricket regularly for a number of years.

## **SELECTION OF VARIABLES**

**Dependent Variables:** Velocity of the ball was considered as the dependent variable.

**Independent Variables (Anthropometric Variables):** 18 anthropometric variables namely: The height, weight, foreleg length, thigh length, leg length, upper arm length, forearm length, Ponderal Index, Crural Ratio, arm length, hand length, upper arm girth, forearm girth, wrist circumference, shoulder width, chest girth, thigh girth and calf girth were selected.

## **COLLECTION OF DATA**

After establishing the reliability of the data, the data was collected by administering the standard procedure/tests for taking anthropometric measurements as well as fast bowling performance.

## **STATISTICAL TECHNIQUES USED FOR ANALYSIS OF DATA**

In order to find out the relationship of anthropometric variables, to velocity of ball, Pearson's Product Moment Method for Coefficient of Correlation and Multiple Correlation are applied. Multiple regression equation is developed in order to predict the most contributory factors towards fast bowling performance for the anthropometric variables.

For testing the hypotheses, the minimum level of confidence is set at 0.05.

## **RESULTS AND FINDINGS**

The scores of each of the independent variables selected under anthropometric variables and dependent variable (fast bowling performance) were correlated using Pearson's Product Moment Method for finding out the relationship between them. The Coefficient of Correlation have been presented in Tables 1.

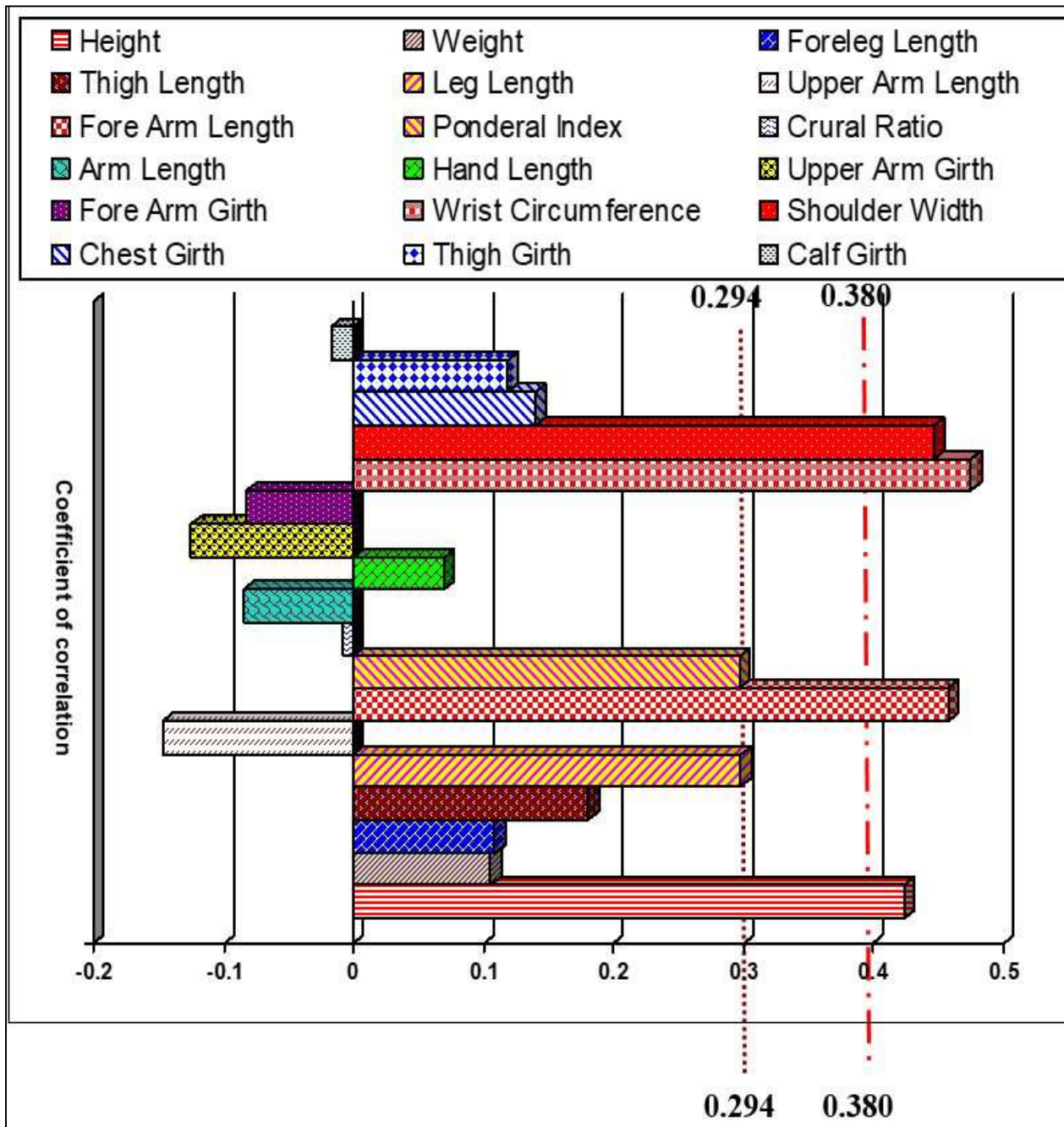
**Table No 1: Correlation Between Anthropometric Variables and Velocity of Ball**

Anthropometric Variables	Coefficient of Correlation 'r' (N=45)
Height	0.4241**
Weight	0.1060
Foreleg Length	0.1089
Thigh Length	0.1807
Leg Length	0.2983*
Upper Arm Length	-0.1464
Fore Arm Length	0.4573**
Ponderal Index	0.2974**
Crural Ratio	-0.0075
Arm Length	-0.0841
Hand Length	0.0703
Upper Arm Girth	-0.1245
Fore Arm Girth	-0.0821
Wrist Circumference	0.4753**
Shoulder Width	0.4464**
Chest Girth	0.1404
Thigh Girth	0.1192
Calf Girth	-0.0169

**Note:** \* = Significant at  $df=43$  and  $p=0.05$  ( $r>0.294$ ); \*\* Significant at  $df=43$  and  $p=0.01$  ( $r>0.380$ )

Table 1 reveals that Bowling performance of a fast bowler is highly correlated to height (0.4241), Fore arm length (0.4573), Wrist Circumference (0.4753) and Shoulder width (0.4464), whereas it is significantly correlated to Leg length (2983) and Ponderal index (0.2974).

This table also indicates that other anthropometric variables namely weight (0.106), Foreleg Length (0.1089), Thigh Length (0.1807), Upper arm length (0.1464), Crural ratio (0.1807), Arm Length (0.0841), Hand length (0.0703), Upper Arm Girth (0.1245), Fore Arm Girth (-0.082), Chest girth (0.1404), Thigh girth (0.119) and Calf girth (0.0169) are not found significantly correlated to bowling performance of respondents.



**Fig 1: Relationship Between Anthropometric Variables and Velocity of Ball Combined Contribution of Significant Anthropometric Variables to Fast Bowling Performance**

**Table No 2: Correlation Matrix of Significant Anthropometric Variables to Fast Bowling Performance**

	Height	Leg Length	Fore Arm Length	Ponderal Index	Wrist Circum-Ference	Shoulder Width	Velocity Of Ball
Hight	1						
Leg Length	0.2852	1					
Forearm Length	0.2579	0.2622	1				
Ponderal Index	0.7161	0.2152	0.3660	1			
Wrist Circum-ference	0.2213	0.2297	0.4674	0.2511	1		
Shoulder Width	0.2133	0.2124	0.4225	0.2427	0.3140	1	
Vilocity of Ball	0.4241	0.2983	0.4573	0.2974	0.4753	0.4464	1

Table 2 presents the inter-correlation between Significant Anthropometric, variables of Velocity of ball delivered. This table shows that all significant Anthropometric variables of fast bowling performance are also significantly inter correlated to each other.

**Table No 3: Multiple Correlation Between Significant Anthropometric Variables and Fast Bowling Performance**

Indicator	Value
Multiple R	0.7192
R Square	0.5172
Adjusted R Square	0.4695
Standard Error	3.2190
Observations	45

Table 3 reveals that the combined contribution of height, leg length, Forearm Length, Ponderal index, shoulder width and wrist circumference was significant at 0.05 level as the computed value of 0.7192 for multiple correlation was much more than the value of 0.339 required for the multiple correlation coefficient to be significant at 0.05 level with 43 degrees of freedom.

Therefore, it can be observed that Height, Leg Length, Forearm Length, Ponderal Index, Wrist Circumference, Shoulder Width, Arm and Shoulder Strength and Leg Strength are the six important variables which contribute towards fast bowling performance.

The Regression Equation developed for prediction of velocity of ball on the basis of anthropometric variables has been given as follows:

$$X_y = 42.623 X_H + 0.300 X_{LL} + 0.452 X_{FL} + 0.357 X_{PI} + 1.009 X_{WC} + 0.55 X_{SW} + 3.251$$

Where,

$X_H$	=	Hight
$X_{LL}$	=	Leg Length
$X_{FL}$	=	Forearm Length
$X_{PI}$	=	Ponderal Index
$X_{WC}$	=	Wrist Circumference
$X_{SW}$	=	Shoulder Width

The findings of regression equation revealed that Height, Leg Length, Forearm Length, Ponderal Index, Wrist Circumference and Shoulder Width play a significant role towards fast bowling performance.

### **DISCUSSION OF FINDINGS**

The findings of the present study are in agreement with the findings of Bagchi (1990), Sharma (1983), Kumar and Gladkykirubakar (2014). Therefore, the hypothesis stated earlier with respect to height, leg strength, shoulder width, leg length, ponderal index and wrist circumference is accepted. The significant relationship between Ponderal Index and velocity of the ball may also be due to the same reason as mentioned above because height plays an important role in the computation of Ponderal Index. A significant relationship between shoulder width and velocity of the ball may be due to the fact that main force is applied through shoulders. Greater shoulder width may mean well developed shoulder which may assist an individual to bowl fast.

Height and leg length contribute significantly towards bowling performance because a player may be able to generate greater force due to longer limbs. Usually, it is seen that fast bowlers have a greater height than that of the batsman or spinners. Even the research points out that fast bowlers who are between the height six feet and two inches to six feet six inches can have greater bounce and effective line in order to achieve excellent performance as a fast bowler. Further, it has been pointed out that the height of a bowler is directly proportional to the point of release as it may help in accuracy as well as adequate bounce.

### **CONCLUSION**

Based on the findings of the study, the following conclusions are drawn:

- Height, leg length and Ponderal Index contributed to fast bowling performance.
- Shoulder width and Wrist Circumference contributed significantly to fast bowling performance.
- Height, Leg Length, Forearm Length, Ponderal Index, Wrist Circumference and Shoulder Width contributed significantly to fast bowling performance.

## RECOMMENDATIONS

In the light of the conclusions drawn, the following recommendations have been made:

1. The selected anthropometric variables which limit the performance in fast bowling may be taken into consideration by the physical education teacher and coaches while selecting potential fast bowlers.
2. While preparing training programme for fast bowlers, the physical education teachers and coaches should give due emphasis to the selected anthropometric, variables which contributed significantly to fast bowling performance.

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