

# Discriminant Analysis of Physiological and Anthropometric Variables among Young Female Cricketers: A Multivariate Technique

<sup>1</sup>Sapna Mandoli <sup>2</sup>Deepak Sharma

<sup>1</sup> Research scholar, <sup>2</sup> Assistant Professor

<sup>1,2</sup> Department of Exercise Physiology, L.N.I.P.E., Gwalior, Madhya Pradesh (India).

Mandolisapna824@gmail.com

## ABSTRACT

**Aim of the study** - The purpose of the study was to compare the physiological and anthropometric variables i.e. Vital Capacity (VC), Resting pulse rate(RPR), Leg length, Body fat% between the batsmen and bowlers in cricket and to develop a criteria for classifying female cricket players into batsmen and bowlers by using discriminant analysis on the basis of physiological and anthropometric variables.

**Material and Methods**-A sample of twenty female cricket players who was the part of seniors women's camp of Madhya Pradesh team participated in the year 2018. Thus, the players were classified into batsmen and bowlers on the basis of predictor variables.

**Results**- There was a significant difference between batsmen and bowlers in physiological and anthropometric variables i.e.VC, RPR, Leg length, Body fat %, . Furthermore, it may be concluded that the mean scores of the four variables were significantly differ in both the groups. The mean value is higher in bowlers in case of (VC,RPR,BFP), While the mean value is more in batsmen in terms of leg length. A discriminant function  $Z = -14.0 + 0.13(VC) + 0.11(RPR) - 0.01(LL) + 0.75(BF\%)$  was developed The attained discriminant model classified correctly 80.0% of the cases in the sample.

**Conclusion**- This study clearly demarks the difference present in the physiological and anthropometric variables of women's batsmen and bowlers. The result of the study is that the coaches can use physiological and anthropometric variables for players into different groups (batsmen and bowlers).

**Key words**- Cricket, vital capacity, Resting pulse rate, Leg length, Body fat %, Discriminant

## INTRODUCTION

Sports is an activity involving physical exertion, motor movements and skill in which an individual or team competes against another for entertainment as well as for winning and enhancing their motivation level. The sport of cricket has a known history beginning in the late 16th century. International matches have been played since 1844 and Test cricket began, retrospectively recognized, It's clear that cricket is at critical stage of evolution with three different formats enforcing their way to grab as much eyeballs as possible, and many fear that the shortest format is ahead in the race, while the relatively longer one and the prime one are lagging behind.

Nowadays in sports, science plays a vital and keen role for improvising different techniques through which an individual player can show their skill with grace and beauty in order to achieve best out of them. The physiological demands of a sporting performance, which inform what characteristics, an athlete should have to be successful competing at the highest level. Physiology examines how our body's structures and functions are altered when we are exposed to different pattern of exercise as well as indulge in different nature of game.

Vital capacity (VC) is the maximum amount of air a person can expel from the lungs after a maximum inhalation and in games a better vital capacity shows the better efficiency of the lungs. It is equal to the sum of inspiratory reserve volume, tidal volume, and expiratory reserve volume [1]. A normal adult has a vital

capacity between 3 and 5 liters. It can be very's from individual to individual in different games.

A normal resting heart rate for adults ranges from 60 to 100 beats per minute. Generally, at rest, lower heart rate implies better functioning of the cardiovascular system fitness. A elite athlete have resting heart rate near about 40 beat per minute, which shows better efficiency of their heart.

Anthropometry has a rich tradition in sports sciences and sports medicine. In different times, different terms were used like dynamic anthropometry, sports anthropometry, biometry, physiological anthropometry, anthropometrica, kinanthropometry etc, by scientists to establish some relationships between the body structure and the specialized functions required for various tasks [2].

Coaches often overlook the contribution of the physiological and anthropometric variables for success in cricket. cricket; however, physiological variables is related to successful performance in long duration matches in relation to endurance capacity. Through with the help of physiological and anthropometric variables players can be categorized in to different playing position to best out of them.

#### RATIONALE OF THE STUDY

In games like Hockey, Football, Handball and basketball, cricket, physiological and anthropometric variables required for good performance; a limited

concern is given by coaches to develop these variables . The purpose of the study was to compare the physiological i.e. vital capacity, Resting pulse rate, and anthropometric variables i.e. Leg length, body fat % between female cricketers and to develop a criteria for classifying female cricket players into batsmen and bowlers by using discriminant analysis on the basis of physiological and anthropometric variables.

#### METHODS

A sample of twenty [N = 20] female cricket players belonging to the senior women's cricket national camp of Madhya Pradesh. Further, the sample was subdivided into two separates sgroups' i.e. Ten [N = 10] pure batsmen with mean age, height and weight (Mean±SD; 25.84 ± 1.93) and remaining Ten [N = 10] spinners with mean age, height and weight (Mean±SD; 25.94 ± 1.67) on the basis of predictor variables. Vital capacity (VC) were measured in liters, Resting pulse rate (RPR) were measured for 30 sec. count, Leg Length were measured in cm, Body fat % were measured in kg.

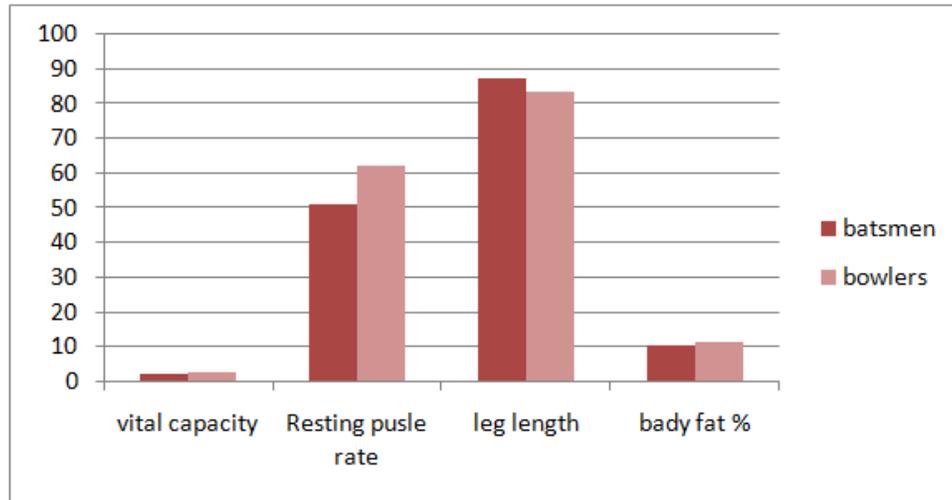
#### RESULTS

The data was analyzed by using discriminant analysis for developing discriminant function for classifying individuals into batsmen and bowlers groups. Analyses were carried out with the use of SPSS software package (ver. 20.0). The results so obtained are discussed in this section.

**Table I. Descriptive statistics of anthropometric and physiological parameters of groups.**

VARIABLES	BATSMEN	BOWLERS
Vital capacity	2.55±1.42	2.95±1.10
Resting pulse rate	51.4±7.33	62.5±7.20
Leg length	87.2±7.03	83.8±12.4
Body fat %	10.5±0.74	11.4±0.83

The descriptive results of all selected parameters were also represented in below graph which is give below in figure 1:



**Figure 1: Graphical Representation of Selected Variables for Both the Groups**

Batsmen and bowlers in cricket in terms of their physiological and anthropometric variables, there was a significant difference between of batsmen and bowlers in physiological and anthropometric variables i.e.VC, RPR, Leg length, Body fat %., Furthermore, it may be concluded that the mean scores of the four variables were significantly differ in both the groups. The mean value is higher in bowlers in case of (VC,RPR, BFP), While the mean

value is more in batsmen in terms of leg length. This is true also because much of the success in the game depends upon the efficiency Physiological and anthropometric variables of the players. The data was further analyzed by using discriminant analysis and the obtained results are shown in Tables II to VI. The un-standardized discriminant coefficients are shown in Table 2.

**Table 2: Un-Standardized Discriminant Coefficients**

Variables	Function
Vital capacity	0.13
Resting pulse rate	0.11
Leg length	-0.01
Body fat %	0.75
Constant	-14.0

These coefficients were used to develop the discriminant function. The resulting discriminant model included all four variables because all of them were found to have a significant discriminant power.

Thus, the discriminant function developed by using these discriminant coefficients was as follows:

$$Z = -14.0 + 0.13 (VC) + 0.11 (RPR) - 0.01(LL) + 0.75(BF\%) \text{ -----} 1$$

**Table 3 Wilk’s Lambda Distribution**

Test of function(s)	1
Wilk’s lambda	0.471
Chi-square	2.045
Df	4
Sig.	0.17

The value of Wilks’ lambda distribution as shown in Table 3 is 0.471 and therefore the discriminant model can be considered to be good enough for developing a discriminant function. The value of Wilks’ lambda falls between 0 and 1. A lesser Wilks’ lambda value indicates the

robustness, whereas its higher value indicates the weakness of the model. Since the value of chi-square in Table 3 is significant (p = 0.17), it may be inferred that the discrimination criterion between the two groups is highly significant

**Table 4: Classification Matrix**

Types of Group		Predicted group membership		
		High Performance	Low Performance	Total
Original count	Batsmen	7	2	9
	Bowler	2	9	11
%	Batsmen	77.8	22.2	100.0
	Bowler	18.2	81.8	100.0

**\* 80.0% of original grouped cases correctly classified.**

Table 4 is a classification matrix which provides the summary of correct and incorrect classification of subjects in both groups by the discriminant model. It can be seen that the percentage of correct classification amounted to 80.0%, which is fairly good and therefore it may be concluded that the discriminant model is efficient. Table V and Fig II shows the relative strength of the variables selected

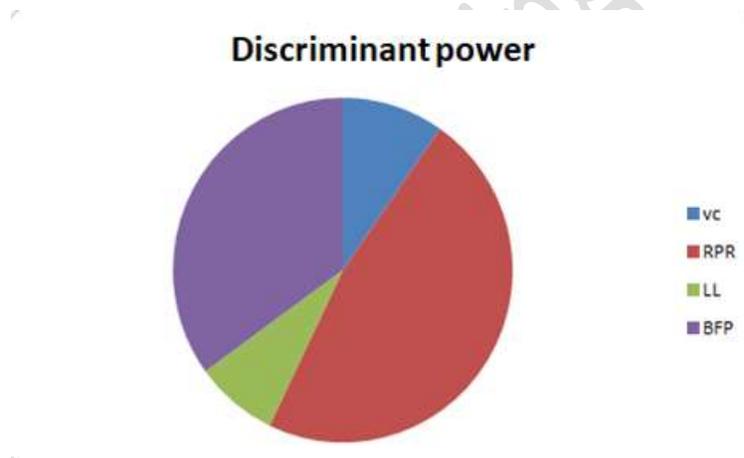
in the discriminant model on the basis of their discriminating power. The variable with a higher coefficient is more powerful in discriminating between the two groups. Since the coefficient of RPR is 0.814, i.e. maximum, therefore the discriminant power of this variable is maximum as well. On the other hand, the coefficient of Leg length was

-0.136, which shows that this variable had the least discriminant power among the four variables. The purpose of this study was to obtain a decision model for classifying female cricket players in to batsmen and bowlers. This can be done by using the

discriminant function (Z) developed in the equation (1) above.

**Table 5. Standardized Canonical Discriminant Function Coefficients**

Variables	Function
Vital Capacity	0.167
Resting pulse rate	0.814
Leg length	-0.136
Body fat %	0.600



**Figure 2 : Standardized Canonical Discriminant Function Coefficients**

**Table 6. Functions at Group Centroids**

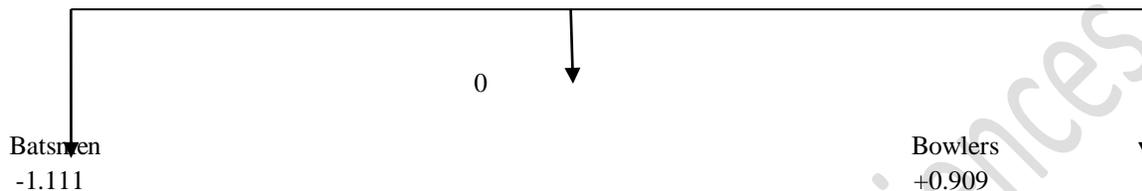
Types of Group	
Batsmen	-1.111
Bowlers	0.909

Table 6 gives the new means for the transformed group's centroid. Thus, the new mean for Group 1 (Batsmen ) is  $-1.111$  and for Group 2 (Bowlers) is  $+0.909$ . This indicates that the mid-point is zero. These two means can be plotted on a straight line by locating the mid-points as shown in Figure 3. Figure

3 gives the criteria for classifying any new subject. If the discriminant score of any female cricket player lies on the right side of the midpoint i.e.,  $Z > 0$ , he may be classified into the batsmen group, whereas if it lies on the left side of the midpoint i.e.  $Z < 0$ , he may be classified into the bowlers group.

Mean of Group 1

Mean of Group 2



**Figure 3:- Means of the Transformed Group Centroids**  
**DISCUSSION OF FINDINGS**

The study wanted to answer three research questions. The first question was whether physiological and anthropometric variables differ significantly between women's batsmen and bowlers in cricket. Secondly, we were interested to know as to whether, it is possible to develop a robust discriminant model on the basis of physiological and anthropometric variables. Thirdly, whether the model so developed can be effectively used for classification in future.

Since batsmen and bowlers groups differ in all four variables. The first question was well answered. The results of the finding are in table 1.

Since the percentage of correct classification of cases was 80.0% hence the developed model can be considered effective. This answers the second research question. Since the discriminant model in this study is developed on the basis of a small sample thus the level of accuracy shown in the classification matrix may not hold for all future classifications of new cases, therefore one should take caution in using this model. In order to obtain more accurate findings it is suggested that such future research studies may be undertaken on larger samples.

The outcomes of the study suggest the coaches and fitness trainers must work on physiological parameters as well as take anthropometric variables in to consideration from very basic levels. Team games are becoming fast day by day which requires proper and efficient working of physiological

parameters as well as the body structure plays a vital role as these are the key of improving and making the pace of the game.

### CONCLUSION AND FUTURE WORK

This study clearly demarks the difference present in the physiological and anthropometric variables of women's batsmen and bowlers. The result of the study is that the coaches can use physiological and anthropometric variables for players into different groups (batsmen and bowlers).

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