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# A Statistical Technique to Develop a Discriminant Model to Categories Senior Female Cricketers of Gujarat into Batsman and Bowler

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***Abstract -***

***Aim of the study: The aim of the study was to develop a criterion for classifying female cricket players into batsmen and bowlers by using discriminant analysis function on the basis of physiological and anthropometric variables.***

***Material and Methods: A sample of thirty [N = 30] female cricket players who was the part of inter university team of Swarnim Gujarat Sports University in the year 2021-22. So that the players were classified into batsmen and bowlers on the basis of predictor variables.***

***Results: A significant difference between batsmen and bowlers was found in physiological and anthropometric variables i.e. FVC, VO2 MAX, Total arm length, Shoulder diameter. Furthermore, The mean value is higher in bowlers in case of (vo2 max, shoulder diameter), While the mean value is more in batsmen in terms of Total arm length, FVC6. The attained discriminant model classified correctly 80.0% of the cases in the sample.***

***Conclusion- This study clearly remarks 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 i***

***Keywords - Cricket, Force vital capacity, Vo2 max, Total arm length, Shoulder diameter, Discriminant model.***

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## INTRODUCTION

From the several decades, cricket has been a well-liked sport all across the world. In actuality, this sport has been governed by a number of Codes of Law for over 250 years. The key characteristic of cricket, and the primary reason why cricket enthusiasts adore the game so much, is the strategy involved. This is comparable to baseball, which may be referred to as cricket's cousin due to their similarities. Cricket is a fantastic game from a statistician's perspective since the limited number of outcomes and balls allows for modelling. Also, a lot of information on cricket matches has been gathered.

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.

Physiological variables, namely, Forced vital capacity, vo2 max, FVC6, and body composition like muscle mass, fat plays a vital role in exhibiting better performance , no matter , be it batting & bowling. Anaerobic power is needed by a batsman to swing the bat with a tremendous force so as to score either four or six. Similarly, a fast bowler requires anaerobic power to bowl the ball with the speed of about 140 km/h. A test match require a great amount of endurance as batsman and bowlers are required to bat and bowl for few hours and 8-10 over at a stretch respectively. The present study is considered with various physiological variables, so as to compile the physiological characteristics of cricket players. The physiological aspect of human being is to increase

the ability of body to intake the oxygen in sufficient quantities to the muscle cell.

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 (Koley, 2006).

Extend (1987) revealed that common and international cricketers have a tall, athletic worked, with unmistakable morphological contrasts existing between batsmen, bowlers and all-rounders. Be that as it may, the batsmen had a tendency to be shorter and lighter, in spite of the fact that having more prominent relative fat mass than the bowlers. The bowlers were observed to be tall, with long legs, wide shoulders and a little measure of fat in the thigh and shoulder areas. The all-rounders had bigger girth measurements and less relative fat than the batsmen and bowlers. Alternate qualities of the all-rounders were like those of the other two gatherings. Once more, considering the physical fitness profile of South African university cricketer.

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.

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 develop a criteria for classifying female cricket players into batsmen and bowlers by using multivariate technique using discriminant analysis on the basis of selected physiological and anthropometric variables.

## METHODS

A sample of total thirty [N = 30] female cricket players belonging to the inter university team of Swarnim Gujarat Sports University. Further, the sample was divided into two separates groups i.e. Fifteen [N = 15] pure batsmen with mean age (Mean±SD; 22.7 ± 2.76) and remaining Fifteen [N = 15] medium pacers with mean age (Mean±SD; 21.65 ± 2.87) on the basis of predictor variables.

Forced Vital capacity (VC) were measured by using dry spirometer in liters, The Queen's College Phase Test was used to measure vo2 max and recorded in liters (McArdle et al., 1972). Total arm Length (distance between acromion point and dectylion point) were measured in cm and Shoulder diameter (Distance between the most lateral points of acromial processes on either side) were also measured in cm. Proper instructions and demonstration was given to the subjects regarding the use of different physiological as well as the anthropometrical instruments.

The data was analyzed using IBM SPSS. First, the Box M test assumption for discriminant analysis (DA) was met. The value of Wilk's lambda and the score of Eigen value were also used in the study. The model established a discriminant function with the aid of the most dominant factors contributed for classification purpose, which were used in the study, and the model also analyzed expected group membership (Classification Matrix).

## RESULTS

The data was analyzed by using discriminant analysis for developing discriminant function for classifying individuals into batsmen and bowlers groups.

**Table 1: Descriptive statistics of anthropometric and physiological parameters of groups.**

| VARIABLES | BATSMEN | BOWLERS |
|---|---|---|
| Force Vital capacity 6 | 4.39±0.56 | 3.87±0.65 |
| VO2 max | 4.44±6.29 | 2.8±6.16 |
| Total arm length | 87.6±7.07 | 84.3±11.9 |
| Shoulder diameter | 10.2±0.71 | 11.1±0.80 |

The descriptive results mentioned in table 1 showed the comparison of mean values between batsmen and bowlers in cricket in terms of their physiological and anthropometric variables. There was a significant difference between batsmen and bowlers in physiological and anthropometric variables i.e. FVC6, Vo2 max, Total arm length, Shoulder diameter,. 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 (vo2 max, shoulder diameter), While the mean value is more in batsmen in terms of Total arm length, FVC6. 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 |
|---|---|
| Force Vital capacity 6 sec | 0.19 |
| Vo2 max | 0.10 |
| Total arm length | -0.01 |
| Shoulder diameter | 0.79 |
| Constant | -13.0 |

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 = –13.0 + 0.19(FVC6) + 0.10 (Vo2max) - 0.01(TAL) + 0.79(SD----1**

**Table 3: Wilk's Lambda Distribution**

| Test of function(s) | 1 |
|---|---|
| Wilk's lambda | 0.312 |
| Chi-square | 2.036 |
| Df | 4 |
| Sig. | 0.15 |

The value of Wilks' lambda distribution as shown in Table 3 is 0.312 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 = 0.15), 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 | | |
|---|---|---|---|---|
| | | BATSMEN | BOWLER | Total |
| Original count | Batsmen | 12 | 2 | 14 |
| | Bowler | 2 | 14 | 16 |
| % | 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 5 showed 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 shoulder diameter is 0.910, i.e. maximum, therefore the discriminant power of this variable is maximum as well. On the other hand, the coefficient of Total arm length was -0.118, 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 |
|---|---|
| Force Vital Capacity | 0.194 |
| VO2 max | 0.711 |
| Total arm length | -0.118 |
| Shoulder diameter | 0.910 |

**Table 6: Functions at Group Centroids**

| Types of Group | |
|---|---|
| Batsmen | -1.166 |
| Bowlers | 1.166 |

Table 6 gives the new means for the transformed group's centroid. Thus, the new mean for Group 1 (Batsmen) is –1.166 and for Group 2 (Bowlers) is +1.166. 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.

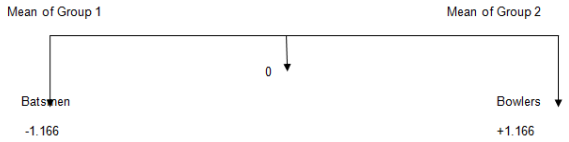


**Figure 3: Means of the Transformed Group Centroids**

## 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

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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