Hand Anthropometry and Hand Function in Elite Cricket Bowlers – Correlation Study.

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Abstract: Cricket is the most popular sport in India. Its extension over the past decades has placed greater demands on cricketers due to different playing style and increased performance expectations. Anthropometric measurement was the first type of testing used in physical education in the world. An anthropometric measurement has revealed correlation between body structure physical characteristics & sports capabilities. Examination of dexterity provides a unique way of evaluating the function of entire hand. In this study we hypothesized that, there is no significant relation between anthropometric parameters and hand functions in elite male cricket bowlers. Anthropometric parameters hand length in cm (HL), hand breadth in cm (HB), pinch strength in kg, tip to tip (TT), lateral (LAT), palmar (PAL), and hand grip in kg (HG) was correlated with hand function (HF) Jebsens-Taylor hand function test. Three groups of players Spinner, Pace Bowler, and Batsman were assessed. The stepwise multiple regression analysis indicates that hand length in spinners and pace bowlers is significant predictors of Hand Function. Thus, individuals who have a more hand length do have higher potential to be a good bowler. This can be used as criteria by cricket authorities and coaches for sorting players for progression to higher levels of the game. Effect of Hand length on actual infield bowling performance should be assessed in future research

Key words - Jebsens-Taylor hand function test, pace bowlers, hand length.

1. Introduction

Cricket, the gentleman’s game was exported from England to all of its colonies including India during 19th century. It has undergone many changes. Addition of 20-20 style, alters some of vital characteristics of the game. It has placed greater demands on cricketers, and increased performance expectations. Bowler’s categorized into spin and pace which is further classified as slow, medium fast, fast (right arm/left arm each). Use of specific hand and wrist muscles is seen in spinners whereas in pace bowlers along with hand, arm and shoulder muscles are also used significantly.

Anthropometry is study of measurements of human being whether living or dead. The study of “body types” has a significant place in the field of sports. An anthropometric measurement has revealed correlation between physical characteristics & sports capabilities. It helps in Identification of talent and selection of sports in the early age.

Hand dexterity is described as fine, voluntary movements of hand used to manipulate small objects during a specific task. Examination of dexterity provides a unique way of evaluating the function of entire hand. Intrinsic hand strength combine with manipulating skills facilitate dexterous movements. 1

The aim of this study was to note the distinct anthropometric characteristics of bowlers and its relation with hand function. It may become a foundation of selection protocol for future bowlers.

2. Methods

Cross sectional study was design with total sample size of ninety. Apparently healthy elite cricketers participated voluntarily were for the study. Players were assigned according to their specialty that is group A spinners, group B med-fast pace bowlers, group C batsman. Recruited players were within 18 to 40 years of age. Recreational players with history of musculoskeletal injury to upper quadrant (neck, arm, forearm, wrist and hand) were excluded.

Ethical clearance has been obtained from the institutional ethical committee of D.Y.Patil University, school of Physiotherapy, Nerul, Navi Mumbai. An informed written consent was taken from each of the subjects. Demographic details like height, weight, sports history noted. Body mass index calculated.

Anthropometry parameters like, hand length was measured with non-elastic measuring tape as the distance from the tip of the middle finger to the midline of the distal wrist crease when the forearm and hand are supinated on a table.[2] Hand breadth was measured as a distance between the radial side of the second metacarpal bone to the ulnar side of the fifth metacarpal bone.[2]
Pinch strength was obtained by using Jamar pinch dynamometer. During the testing procedures, pinch strength was examined by measuring three types of pinches, tip to tip (TT), lateral (LAT), palmar (PAL). All three types of pinch were assessed by having each subject place her thumb on the pinch button and the appropriate fingers on the pinch block. When force is applied to the pinch button, a peak hold needle retained the highest pinch strength score for that particular trial. Each subject was given three trials with rest period in between, and the best reading was taken.

Grip strength was obtained by using Jamar hand grip dynamometer. Subject told to hold the dynamometer in mid-prone forearm with 90 degree elbow flexion and force was applied to the handle, a peak hold needle retained the highest grip strength score for that particular trial. Three trials with rest period in between given and the best reading was noted.

Jebsens-Taylor hand function test used to evaluate hand function. It consists of seven subtest including writing, card turning over 3-by-5 inch cards(simulating page turning), picking up small common objects, simulated feeding, stacking checkers, picking up large, light objects, picking up large and heavy objects. The subject is seated on a chair. All the seven components of Jebsens are arranged in the above mentioned order on a table. The subject performs the task in an order one component after another. Time taken by the subject was recorded at the completion of the task in seconds. Each subject is given three sets of trial and least time was selected.

### 3 Results

Multiple Regression statistics used to predict correlation of hand anthropometry parameters on Hand function of elite cricket bowlers. However, there are several assumptions to be tested before conducting and interpreting multiple regressions.

Assessment of suitability of the nominal/categorical variable ‘Player’ for multiple regressions on HF: the relationship between Player and HF tested using post hoc Tamhane test.

The post hoc Tamhane test (Table 1) shows that there is no significant difference Between the Spinners and Pace Bowlers (p = .798) in HF. On the other hand, there is a significant difference between Spinners and Batsmen (p = .015). These findings suggest that Batsmen are significantly different than bowlers in hand function.

#### Table 1: Post Hoc Tamhane for hand function (HF) by Player

<table>
<thead>
<tr>
<th>(I) Player</th>
<th>(J) Player</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>p Value</th>
<th>Lower Bound *</th>
<th>Upper Bound *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spinner</td>
<td>Pace Bowler</td>
<td>1.2</td>
<td>1.4568</td>
<td>0.798</td>
<td>-2.382</td>
<td>4.782</td>
</tr>
<tr>
<td>Spinner</td>
<td>Batsman</td>
<td>-3.6333*</td>
<td>1.2414</td>
<td>0.015</td>
<td>-6.693</td>
<td>-0.574</td>
</tr>
<tr>
<td>Pace Bowler</td>
<td>Batsman</td>
<td>-4.8333*</td>
<td>1.2992</td>
<td>0.001</td>
<td>-8.039</td>
<td>-1.628</td>
</tr>
</tbody>
</table>

*95% Confidence Interval

Linearity: The relationship between the independent and dependent variables must be linear; therefore the association of six continuous variables with the HF is computed using Pearson’s Correlation Coefficient, presented in Table 2.

#### Table 2: Results of Pearson’s Correlation Coefficient: Dependent HF

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Pearson Correlation</th>
<th>Sig. (2-tailed)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflect_Log10_HL(cms)</td>
<td>.354*</td>
<td>0.001</td>
<td>87</td>
</tr>
<tr>
<td>Reflect_log10_HB(cms)</td>
<td>.311*</td>
<td>0.003</td>
<td>88</td>
</tr>
<tr>
<td>TG(kg)</td>
<td>-0.013</td>
<td>0.901</td>
<td>90</td>
</tr>
<tr>
<td>LAT(kg)</td>
<td>-0.195</td>
<td>0.066</td>
<td>90</td>
</tr>
<tr>
<td>PAL(kg)</td>
<td>0.013</td>
<td>0.902</td>
<td>90</td>
</tr>
<tr>
<td>HG(kg)</td>
<td>-.208*</td>
<td>0.049</td>
<td>90</td>
</tr>
</tbody>
</table>

Table 2 reveal that out of six variables only three (Reflect_Log10_HL, Reflect_log10_HB, HG) are with statistically significant values (p <.05). Thus are correlated with HF.

Results of multiple regression analysis - the stepwise multiple regression analysis indicates that hand length emerged as significant predictors of Hand Function in a spinner or pace bowler. Overall, the model explains about almost 21 percent of the variance in HF (R2=0.21).

### 4. Discussion

The purpose of this study was to find a relation between anthropometry variables and hand functions in male elite cricket bowlers. Anthropometric dimensions and morphological characteristics play an important role in determining the success of an athlete .[4, 5 ] Interest in anthropometric characteristic and body composition of athletes from different competitive sports has increased tremendously over the last decades. As seen in table 2, a subject with a large HL may have a better hand function & have an advantage...
over others. Thus, HL has an impact on hand function. These variables may affect the performance of the player. In addition to the skill, we may infer that players with a larger HL may have a better hand function.

This goes along with research studies which conclude, all shorts & throws are finished with the finger and wrist, the longer the finger length better the accuracy of the throw.6 It is likely that taller young players with longer finger had an advantage in games.6 If the fingers and hand surface parameters are longer than required for grasping an object (ball), fingers are less widely spread, and grasping an object is more efficient and less fatiguing.7 So spinners & pace bowlers may be selected on the basis of anthropometry variables. These findings suggest that Spinners and pace bowlers are significantly different than batsman.

Our result provide support for, the inclusions of selected hand anthropometry parameters (hand length) and hand function evaluation for young developing bowlers to excel.

Future research should also include use of specific hand anthropometry parameters (hand length), hand function or comparison of these variables, for in field performance.

5. Conclusion

Hand Length can be used for, talent identification & training program development in young cricket bowlers. Future studies on correlation of field performance and anthropometry parameters should be designed.

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References