



## RELATIONSHIP BETWEEN CORE STABILITY AND THROWING ACCURACY IN CRICKET BOWLERS

### Physiotherapy

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### ABSTRACT

The purpose of this study was to identify the relationship between core stability and throwing accuracy in cricket bowlers. A total of 82 asymptomatic Cricket bowlers from different academies were recruited and informed consent was obtained. Participants performed a series of two tests: plank test- prone plank, side plank test and functional throwing performance index (FTPI). The subject mean age (years), height (cm), and weight (kg) and BMI (kg/m<sup>2</sup>) are 19.9±1.86 years, 172.47±6.2cm, 65.82±8.75 (kg) and 22.15±2.44 kg/m<sup>2</sup> respectively. The mean value of percent body fat, percent muscle mass, total body water and bone weight are 23.96±5.54%, 44.35±4.64%, 56.017±6.33%, 2.703±25Kg respectively. The mean values of Plank time (seconds) and Functional throwing performance index (percentage) were 256.26±82 seconds and 55.03 ±14.59% respectively. The result revealed a significant positive correlation ( $r=0.22$ ,  $p<0.05$ ) between core stability and the throwing accuracy. The results obtained support the initial hypothesis, indicating that the subjects with well-developed core stability have significantly better throwing accuracy than the subjects with poorly-developed core stability.

### KEYWORDS:

Medium Fast Bowlers, Core Stability, Throwing Accuracy, Functional Throwing Performance

### INTRODUCTION

Cricket is generally considered a relatively low-injury sport with prevalence rates ~5% of elite players. There are five common cricket injuries hamstring strain, low back pain, side strain, shoulder pain, and sprained ankle (Padhye et al, 2013). When examining the pathomechanics of low back injury in fast bowlers researchers have examined trunk kinematics during the delivery stride (Ranson, 2009).

The overhand throw is considered a dynamic movement that involves not only skill, but also the proper coordination of all body segments. The sequential activation begins with the contralateral foot and is transferred up the trunk, through the shoulder, to the wrist and hand for acceleration of the ball.

In throwing overhead, there is a proximal to distal sequencing supplied by the kinetic chain. Alterations in this sequential motion could result in decreases in not only ball velocity, but more importantly, increased injury potential. Habitual motor patterns of the upper extremity are dependent upon lower extremity and torso muscle activation prior to any upper extremity muscle activation (Platt, 2012).

The trunk plays an important role in transfer of energy and the connection of movements between the lower and upper extremities. In recent research, the prone plank test has been used to assess trunk flexor endurance. Although biomechanical differences between the prone plank test and McGill's trunk flexor test have been reported, the relationships between the prone plank endurance test and athletic performance tests were not investigated (Imai and Kaneoka, 2016). Core stability refers to musculature control around the lumbo-pelvic region, with aim maintaining functional stability in a neutral position and assisting in the generation and transfer of energy from the trunk to the extremities (Araujo et al, 2015). The core musculature becomes active in a feed-forward fashion during upper extremity movements. This mechanism occurs as the body prepare for potential perturbation of spinal stability when movement begins (Radwan et al, 2014).

Literature reviewed suggests that the studies are in dearth that predicts the relationship between core stability and athletic performance

measures. Therefore, the study intends to determine the extent to which core stability and throwing accuracy in cricket bowlers are associated.

### Methodology

A cross-sectional study was conducted on 82 university and district level cricket players in various academies and sports centers. The subjects were recruited on the basis of inclusion and exclusion criteria. Prior to the study the informed consent was signed by the subject after explaining the procedure. The subjects were medium and medium fast bowlers, were playing or into training for at least six months prior to the study. Cricketers with any current episode of lower back pain for three months, discomfort contracting the abdominal muscles and any upper limb musculoskeletal injury were excluded. Those suffering from any other neurological disorders, and those who were regularly participating in overhead sports other than cricket were excluded from the study. Demonstration of all the protocols like warm-up, plank test and functional throwing performance test were done. Before initiating the session the athlete were encountered with a warm-up session of 10 min. The assessment of core stability had been done by Plank test and the throwing accuracy had been measured by functional throwing performance index.

### Procedure

#### Plank Test

Prone plank test, participants maintain a prone position in which body weight was supported by the toes and forearms. Side plank test, it was performed with the participant lying on their side, supported by the foot and elbow. It was performed on both the sides. Participant was instructing to maintain a neutral position of a supine and pelvic, and to breathe normally during testing. Each test was terminating when the participants unable to maintain their posture and their pelvic moved up or down five or more cm. Each holding time was recording using a stopwatch. The holding time of the prone plank test, right and left side plank test, and combine score of all plank tests was use for analyses.

#### Functional performance

The subject had to stand at a distance of 4.57 m from the target. The

target was a square measuring 30.48 × 30.48 cm on a wall at a height of 1.22 m from the floor. The objective of the test was to throw a rubber playground ball (50.8-cm circumference) into the target as many times as possible over three 30-second trials. Before testing, subjects had performed 8 throws as a warm-up. Tests were begun immediately after the warm-up and consist of the subject throwing the ball into the target, catching the rebound off the wall, and repeating as many times as possible within 30 seconds. The FTPI was calculated as the number of throws within the target divided by the total number multiplied by 100. (Davies et al, 1995)

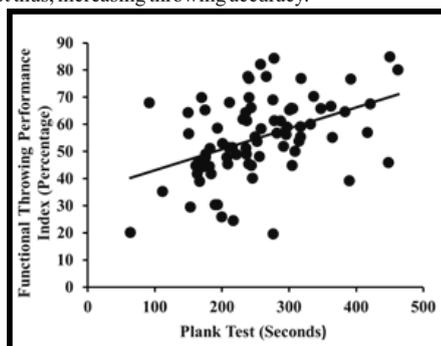
### Data Analysis

Data Analysis was performed using IBM SPSS Statistics, 2009 (SPSS V.21) Descriptive statistics was used to analyses and find out mean and standard deviation of subjects characteristics such as age, height and weight. The correlation between plank test and functional throwing performance index was calculated by using Karl Pearson correlation coefficient. The level of significance was set at  $p \leq 0.05$ .

### Result

The subject mean age (years), height (cm), weight (kg) and BMI ( $\text{kg}/\text{m}^2$ ) are  $19.9 \pm 1.86$  years,  $172.47 \pm 6.2\text{cm}$ ,  $65.82 \pm 8.75$  and  $22.15 \pm 2.44 \text{ kg}/\text{m}^2$  respectively. The mean value of percent body fat, percent muscle mass, total body water and bone weight are  $23.96 \pm 5.54\%$ ,  $44.35 \pm 4.64\%$ ,  $56.017 \pm 6.33\%$ ,  $2.703 \pm 25 \text{ Kg}$  respectively. The mean value of Plank time and Functional throwing performance index is  $256.2676 \pm 81.49$  seconds and  $55.03854 \pm 14.50\%$  respectively.

The result revealed a significant positive correlation ( $r=0.22$ ,  $p \leq 0.05$ ) core stability and the throwing accuracy. The results seem to indicate that subjects with well-developed core stability showed some improvement in the kinetic chain of the specific movement of bowling in cricket thus, increasing throwing accuracy.



**Figure:1 Correlation between Core stability and Functional throwing performance index.**

### Discussion

The goal of the study was to understand the relationship between core stability and functional performance in bowlers. The results obtained support the initial hypothesis, indicating that the subjects with well-developed core stability have significantly better throwing accuracy than the subjects with poorly-developed core stability. The result found significant but weak relationship between core stability and throwing accuracy performance variables. The rationale supporting the results is human motion works on the concept of kinetic chain that suggests integrated functions of different body segments. The concept is supported by the fact that all athletic movement, hitting, throwing, twisting, swing, or running, all powerful movements start from the centre of the body out, and never from the limbs alone. It allows a body to maintain a solid foundation in the torso and transfer that energy from the centre of the body out of the limbs (Allah and Nagi, 2013).

The findings also magnified by the results of Imai and Kaneoka, (2016), that suggested that high correlation with the yo-yo intermittent recovery test with combined scores of plank tests for sprint performance including change in direction.

Furthermore, Fortenbaugh (2009) mentioned several kinematic parameters at the instant of foot contact were associated with increased upper extremity kinetics: front foot position, front foot orientation, shoulder abduction, and shoulder horizontal adduction. The timing of shoulder external rotation, pelvis rotation, and upper trunk rotation

was associated with increased kinetics and decreased ball velocity. Decreased maximum shoulder external rotation, shoulder abduction, knee extension, and trunk tilt were also associated with decreased ball velocity. As pitchers fatigued, kinetic values remained constant, but increases in arm pain were reported. To enhance performance and reduce injury risk, pitchers need to learn proper fastball mechanics at an early age. A changeup is recommended as a safe secondary pitch to complement the fastball; the curveball can be added after fastball and changeup mechanics are mastered.

### Conclusion:

The results of study suggest that a significant, but weak relationship exists between plank test as a measure of core stability and functional throwing performance index. Hence, core training protocol in the routine training sessions will help in increasing the bowling accuracy.

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