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Relationship of core stability with bowling speed in male cricket medium and medium fast bowlers

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Abstract: *Background:* A strong core muscles are believed to enhance athletic performance, few scientific studies have been conducted to identify the effectiveness of core stability on athletic performance especially in bowling speed in Medium and medium fast bowlers. The study aimed to examine the relationship between core stability and bowling speed in cricket medium and medium fast bowlers. *Methods:* 82 asymptomatic Cricket medium and medium fast bowlers participated in the study. The core stability was measured using a plank test and bowling speed was measured with a Radar speed gun. *Result:* The subject mean age, height, weight and BMI are 19.9± 1.86 years, 172.47±6.2cm, 65.83±8.75 Kgs and 22.16±2.44 kg/m^2 respectively. The mean values of Plank time and Bowling speed are 256.27±82.00 seconds and 109.43± 7.04 Km/h. The result revealed a significant strong positive correlation (r=0.736, p≤0.0001) core stability and the bowling speed. *Discussion & Conclusion:* Core stability is the ability to control the position and motion of the trunk over the pelvis and legs to allow optimum production, transfer, control of force and motion to the terminal segment in integrated kinetic chain activities. The subjects with well-developed core stability bowled significantly faster than the subjects with poorly-developed core stability.

Keywords: Core Stability, Bowling Speed, Medium Fast Bowlers and Medium Bowlers.

Introduction

Most of the scientific research to date into the biomechanics of men's cricket has however been carried out on the technique of fast or fast-medium bowling. A combination of many factors determines success in fast bowling. One of these factors is the speed of the ball at release. A fast ball release speed reduces the time available for a batsman to perceive and use information about the delivery and execute an appropriate motor response. To attain high ball release speeds, the bowler's trunk must flex, extend, laterally flex, and rotate within a short period and the body must absorb ground reaction forces as high as six times body weight [1].

In the kinematic chain of bowling athlete the force delivery mechanism is the arm while the shoulder functions as a funnel, which regulates the force. The generators of the force are the ground, legs and trunk. The throwing force generating capability of the shoulder in itself is not large, viz., for the shoulder segment to function properly in these athletes contributions are required from other body segments to generate the necessary forces for ball propulsion as well as to transfer the forces to more distal segments [2]. For that core stability plays a very important role.

Core stability is defined as the body's ability to control the position of the trunk and pelvis for optimum production; transfer and control of functional activities [3]. Many sporting activities such as bowling require complex coordination between the upper and lower extremities. The core functions as the central link between the upper and lower extremities, and stability of this region is proposed to be a requisite for optimal athletic performance and injury prevention. The kinetic chain theory describes core stability as the ability to control the position and motion of the trunk and pelvis relative to the extremities in order to allow for optimal force production, dissipation, and transfer to the extremities during movement. A weak core is believed to cause alterations in the transfer of energy, resulting in reduced sport performance and risk of injury to a weak or underdeveloped muscle group [4].

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Fast bowlers have consistently been identified as being at the greatest risk of injury, with a combination of predisposing factors including poor technique, poor physical preparation, and overuse. Most common cricket injury is lower back injury (stress fracture to the pars inter - articularis and lumbar musculoligamentous strains). Other injuries recorded were muscular strains to the shoulder and quadriceps, calcaneal apophysitis and ankle sprain [5].

Clinical assessments of muscle endurance are commonly used to evaluate core stability. Numerous tests of core muscle endurance (prone plank and side plank) have been described for assessing core stability in healthy adults and athletic populations [6]. Studies that have examined core and sport-specific performance were unable to establish a relationship between these variables [7-9]. Explanations for the lack of significant relationships in these studies include inconsistent methods used to measure core stability with the performance variables or the population being tested. Therefore, the purpose of this study was to determine a relationship between core stability and bowling speed in a group of medium and medium fast cricket bowlers.

Material and Methods

A cross-sectional study was conducted on 82 district and university level cricket players from various academy, sport centres and university with age between 18 to 25 years. The subjects were recruited on the basis of inclusion and exclusion criteria. The subjects recruited were medium Bowlers and medium fast bowlers who 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 on contracting the abdominal and shoulder muscles or having any current injury to the kinematics chain that impaired their ability to bowl were excluded. Prior to the study the informed consent was signed by the subject after explaining the procedure as per the guidelines of Indian Council of Medical Research.

Procedure: The subject were asked about the injury history, training routine, practice session and diet. The height, weight and BMI of the bowlers were calculated. The assessment of core stability by plank test and speed by radar gun was measured. Prior to the test the detailed information regarding the procedure was given to the subjects and method of doing the plank test was explained and demonstrated.

Plank Test: The protocol consisted of three tests that measured all aspects of the torso via isometric muscle endurance: prone plank, left side plank and right side plank. A handheld stopwatch was used to measure the length of time participants were able to hold each isometric position. Individuals were given a minimum of 5 minutes of rest between each test. For prone plank test, participants maintained a prone position. Start with the upper body supported off the ground by the elbows and forearms, and the legs straight with the weight taken by the toes. The hip is lifted off the floor creating a straight line from head to toe. As soon as the subject is in the correct position, the stopwatch is started. 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 centimetres. The holding time of the prone plank test, right and left side plank test, and combine score of all plank tests was used for analysis [10].

Bowling Speed: Each subject's bowling speed was measured using Radar Speed Gun (BUSHNELL Velocity Speed Gun, Model No.101911) having an accuracy of +/- 1 mph and +/- 2 kph (27 meters away). The radar was used to pick up the speed of each ball in KPH as it leaves the bowler's hand. The participant was then put through a set five minute warm-up. Before each experimental session, the radar gun was calibrated in accordance with the manufacturer's specifications. The radar was positioned behind the nets at the batting end, aligned with the approximate height of ball release and in line with the stumps places in the batting end. The participants were then asked to bowl in their own action in the nets as fast as possible towards the stumps placed at batting end. The participants bowled three balls each and the bowling speeds were measured. Averages of the three bowling speed measurements were recorded [11].

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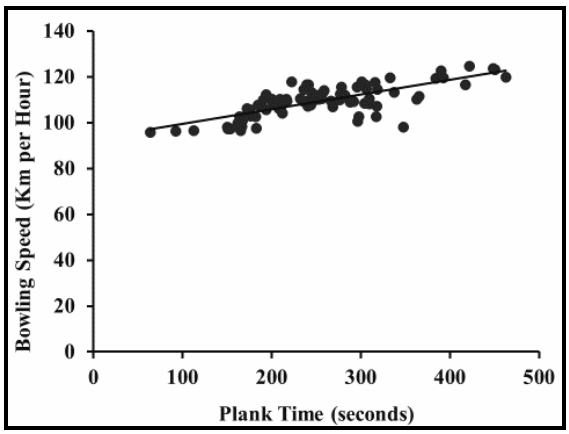
Data Analysis: Data Analysis was performed using IBM SPSS Statistics, 2009 (SPSS V.21) Descriptive statistics was used to analyse and find out mean and standard deviation of subjects characteristics such as age, height, weight. The correlation was calculated by using Karl Pearson correlation coefficient. The level of significance was set at $p<0.05$.

Results

The subject mean age, height and weight are 19.9± 1.86 years, 172.47±6.2cm, 65.83±8.75Kg and 22.16±2.44 kg/m^2 respectively. The mean values of Plank time and Bowling speed are 256.27±82.00 seconds and 109.43± 7.04 km/h. The result revealed a significant strong positive correlation ($r=0.736$, $p\leq0.0001$) core stability and the bowling speed. The results seem to indicate that subjects with well-developed core stability showed improvement in the kinetic chain of the specific movement of bowling in cricket thus, increasing bowling speed.

Fig-1: Correlation between core stability and Bowling Speed



Discussion

The purpose of this study was to examine the relationship between core stability and bowling speed in cricket medium Bowler and medium fast bowlers. The results of the present work supported the research hypothesis, indicating that the subjects with well-developed core stability have significantly better bowling speed as compared to the subjects with poorly-developed core stability. The probable rationale for the findings is by the virtue of kinetic chain concept. The current research has shown that the core musculature serves as the centre of the functional kinetic chain and motor control strength and endurance has been advocated as being essential to achieve the stability target under all possible conditions and as a way to enhance athletic performance [12-13]. The findings are in accordance with the work of Hilligan (2008) that showed subjects with well-developed core have better bowling speed [11]. Furthermore, the result of Pedersen et al (2006), showed that after an 8 week period of core training, elite soccer players presented increased kicking velocity [14].

The study by Okada et al. (2011), also revealed significant correlations between core stability and performance tests [15]. According to Kibler et al. (2006), players who showed higher levels of strength in the core muscles and therefore obtained better results in the Bunkie test also performed better in the various physical tests. These findings magnified the result of the present study [3]. The findings have relevance as stated in the work done by Willson et al. (2005) that suggested decreased core stability may predispose to injury and that appropriate training may reduce injury. This showed that a well-developed core stability not only increase the performance of the person but also helps in preventing the injuries [16].

Players with high level of core stability is able to control the position and motion of the trunk over the pelvis and leg to allow optimum production, transfer and control of force and motion to the terminal segment in integrated kinetic chain activities. Core stability creates several advantages for integration of proximal and distal segments in generating and controlling forces to maximize bowling speed.

The core musculature and the muscles in the shoulder and pelvis as they are critical for the transfer of energy from the larger torso to the smaller extremities, which may be more involved in sporting movements than everyday task. The core functions as the central link between the upper and lower extremities, and stability of this region is proposed to be a requisite for optimal bowling performance as the force is been generated from the lower extremity [3].

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Conclusion

Conclusively, it has been found that there exist a positive strong correlation between core stability and bowling speed probably due to the interaction and synergism with shoulder complex muscle.

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