Journal of Exercise Science & Physiotherapy, Vol. 13, No. 1, 2017
ISSN: 0973-2020 (Print) I$_2$OR Impact Factor = 5.23 UGC Approved [no.20489] *ISSN: 2454-6089 (Online)*

Relationship between Shoulder Strength and Bowling Speed in Cricket Bowlers

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Abstract

Aim: Relationship between Shoulder Strength and Bowling Speed in Cricket Bowlers. **Method:** A total of 82 cricket bowlers from different academy provided informed consent participated in the study. Each subject's bowling speed was measured by with the BUSHNELL Velocity Instrument .The radar was used to pick up the speed of each ball in Km/hr as it leaves the bowler's hand. **Results:** The mean age, BMI, height, weight of the subjects was 19.9±1.86 years 22.15±2.44kg/m^2, 172.47±6.20 cm, 65.82±8.75kg. The mean value of percent body fat, muscle mass, total body fat and bone weight are 24.76±7.5, 44.34±5.42 Kg, 55.78±7.7 Kg, 2.69±0.29 Kg respectively. The mean values of internal rotation, external rotation, , abduction, adduction flexion, extension and bowling speed are 11.36±3.02 Kg, 10.8±2.6 Kg, 8.8±2.46 Kg, 10.6±3.3 Kg, 8.91±2.41 Kg, 7.32±2.07 Kg and 109.42±7.04 Kph respectively. The result revealed a significant positive correlation was found between bowling speed and adductor strength (r =0.60), bowling speed and abduction (r=0.56), bowling speed and internal rotation (r=0.59), bowling speed and external rotation (r=0.59).A positive mild correlation bowling speed and flexion (r=0.48), bowling speed and extension(r=0.46). **Conclusion:** The result of study concludes that a significant, moderate correlation exists between shoulder strength and bowling speed, so the shoulder strength training protocol can be incorporated for increasing the speed of the bowler.

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Key Words: Medium Fast Bowlers, shoulder strength, bowling speed

DOI: 10.18376/jesp/2017/v13/i1/111275

Introduction

Cricket is one the most popular game in the world. Cricket as a sport received considerable research attention which seems to have coincided with an increase in the global audience for cricket. As a result research in the determinants of bowling speed has also become prominent. Bowlers that use ball release speed as a tool for success are generally classed into two groups: fast bowlers are described as bowling at a speed of 142+ kph and while medium fast bowlers are described as bowling at a speed of above 96 kph (Loram 2005).

A combination of many factors determines success in medium fast bowling (Medium Pacers). 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 (Parameswari et.al, 2011).Ball release speed is a major contributor to fast bowling success, reducing the time the batsman has to assess the path of the ball and make decisions regarding which shot to play. (Worthington et.al, 2013). In biomechanical analysis in medium fast bowlers the action of bowling is divided into the four distinct stages of the run-up, the pre-delivery stride, the delivery stride and the follow-through. Run-up commences when the bowler walks or jogs over his approach marker, gradually increasing speed on his approach to the wicket, and ends as he leaps into the air at the start of the pre-delivery stride in preparation for the back foot to strike the ground, which marks the commencement of the delivery stride. Pre-delivery stride separates the run-up from the delivery stride and begins, for a right-handed bowler, with a jump off the left foot and is completed as the bowler lands on the right or back foot. As this is considered the most technical stage of the bowling action, the delivery stride will be outlined according to three key events: the back foot strike, front foot strike and ball release (Bartlett et al, 1996). One of the most demanding sports activities using the upper extremity is the throwing motion. The various anatomical components involved in the overhead throwing motion must be performed in a coordinated fashion in order to produce an accurate throw.Each articulation of the shoulder complex, the acromioclavicular, sternoclavicular, glenohumeral, and scapulothoracic, plays an integral part in the production of this movement. Literature reviewed suggest the shoulder muscle strength is important contributor to good bowling but to what extent the individual group of shoulder muscles contribute to bowling speed is ascertain. The objective of present study is to understand the relationship of shoulder muscles with bowling speed in cricketers.

Materials and Methods

A cross-sectional study was conducted on 82 district and university level cricket players in various academies and sports centers of Delhi and NCR. The subjects were recruited on the basis of inclusion and exclusion criteria and inform consent was signed. 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. They were required to be free of any orthopaedic injuries that could negatively influence their performance or ability to produce maximal efforts. Cricketer’s demographic details were collected using a questionnaire. The questionnaire was design to collect data related to the upper limb demands of cricket, including arm dominance for bowling. Information had been collected related to bowling practice sessions per year/month/week or day.

Shoulder muscle strength:

Subjects were tested in a gravity minimized position in standing for flexion, extension, abduction and adduction and in prone lying for external and internal rotation. Strain gauge dynamometer is attached to a stationary device stabilized at the edge of a portable examination table. Subjects were positioned in such a way that dynamometer was placed in parallel with the limb and in line with movement to be tested. The placements are different for different movements so as to perform it in gravity against plain. Proper Care is taken not to allow subjects to use other part of the body for the desired movement. Maximum effort is used to perform the test, in which a subject exerted a maximal isometric force against the dynamometer for two to four seconds on each of the three trials. The tester who explained the procedure will initiated the process with verbal instructions. Then each subject received two practice sessions on each dynamometer before performing the actual test. Testing consisted of subjects performing three trials on both sides, with one minute rest between each trials (Fenter et.al, 2003)

Position of subjects for: (Figure 1)

a) Internal rotator strength- Subject was positioned on a examination table in prone lying position. Ask the patient to place 90 degree shoulder abducted and 90 degree elbow flexed, placing out of the couch. Dynamometer was placed in perpendicular with the limb and in line with movement to be tested. Ask the patient to pull posteriorly. The test was performed against gravity plain.
b) External rotator strength - Subject was positioned on a examination table in prone lying position. Ask the patient to place 90 degree shoulder abducted and 90 degree elbow flexed placing out of the couch .Dynamometer was placed in perpendicular with the limb and in line with movement to be tested. Ask the patient to pull anteriorly. The test was performed against gravity plain.
c) Adductor Strength- Position of athlete standing and strain gauge dynamometer was attached to a stationary device stabilized at the edge of portable examination table. Subjects were positioned in such a way that dynamometer was placed in parallel with the limb and in line with movement to be tested. Athlete was positioned standing sideline, ask the athlete to pull the chain towards the body. The test was performed in gravity against plain.
d) Abductor Strength- Position of athlete was standing and strain gauge dynamometer was attached to a stationary device stabilized at the edge of portable examination table. Subjects were positioned in such a way that dynamometer was placed in parallel with the limb and in line with movement to be tested. Athlete is positioned in standing sideline, and then athlete is asked to pull the chain away from the body. The test was performed in gravity against plain.
e) Flexor Strength -Position of subject was standing and strain gauge dynamometer was attached to a stationary device stabilized at the edge of portable examination table. Subjects were positioned in such a way that dynamometer was placed in parallel with the limb and in line with movement to be tested. Athlete was positioned standing straight with back facing towards the strain gauge dynamometer then, ask the subject to pull the chain forward away from the body. The test was performed in against gravity plain.
f) Extensor Strength- Position of subject was standing and strain gauge dynamometer was attached to a stationary device stabilized at the edge of portable examination table. Subjects were positioned in such a way that dynamometer was placed in parallel with the limb and in line with movement to be tested. Athlete was positioned standing straight with face facing towards the strain gauge dynamometer then, ask the athlete to pull the chain backward away from the body. The test was performed in against gravity plain.

Figure 1.Positioning for shoulder strength

Bowling speed:

Each subject's bowling speed was measured by with the BUSHNELL Velocity Instrument .The radar was used to pick up the speed of each ball in KPH as it leaves the bowler's hand. Before each experimental session, the radar gun was calibrated in accordance with the manufacturer's specifications. . After a brief warm-up for the joints involved in the service motion (i.e., dynamic movements in the shoulder), players performed three bowling. To be recorded, bowling had to be in the bowling crease. The average speed of three is recorded and is used for analysis.

The participant was then put through a set five minute warm-up. This brief warm-up comprised of one and a half minutes jogging, two minutes of stretching of the kinematic chain which included generalized stretches of the lower and upper limbs and lower back region and one and half minutes of bowling practice. This was done in order to prevent injury to the kinematic chain. 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 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. Before each experimental session, the radar gun was calibrated in accordance with the manufacturer's specifications. The participants were required to bowl three times and the bowling speeds were measured using the sports radar. An average of the three measurements was recorded and this constituted one set of measurements (Hilligan et.al, 2008).

Bowlers were excluded from this study if their mean speed reading was less than 96 km/h. The rationale for this was that although Peterson (2004) suggested the mean bowling speed of a medium pace bowler to be 108 (±5) kph unofficial media classification, regarding a medium pace bowlers average ball speed, regard the range between 96 km/h and 113 km.h-1 to be the middle range between several speed classifications (Peterson et al,2004).

Data Analysis was performed using IBM SPSS Statistics, 2009 (SPSS V.21) Descriptive statistics was used to analyze and find out mean and standard deviation of subjects characteristics such as age, height and weight. The correlation between shoulder strength and bowling speed in male cricket medium fast bowlers was calculated by using Karl Pearson correlation coefficient. The level of significance was set at $p \leq 0.05$.

Results

The present study was conducted to find out the association between shoulder strength and bowling speed in male cricket medium fast bowlers. For this purpose 82 subjects in the age group 18 to 25 years were taken for the study after due consideration to the inclusion and exclusion criteria. The subjects consisted of 5 left arm bowlers and 77 right arm bowlers. The mean age, BMI, height, weight of the subjects was 19.9±1.86 years 22.15±2.44kg/m^2,172.47±6.20 cm, 65.82±8.75kg. The mean value of percent body fat, muscle mass, total body fat and bone weight are 24.76±7.5, 44.34±5.42 Kg, 55.78±7.7 Kg, 2.69±0.29 Kg respectively. The mean values of internal rotation, external rotation, , adduction, abduction flexion, extension and bowling speed are 11.36±3.02 Kg, 10.8±2.6 Kg, 8.8±2.46 Kg , 10.6±3.3Kg, 8.91±2.41 Kg, 7.32±2.07 Kg, 109.42±7.04 Kph respectively. The result revealed a significant positive correlation was found between bowling speed and adductor strength (r =0.60), bowling speed and abduction (r=0.56), bowling speed and internal rotation (r=0.59), bowling speed and external rotation (r=0.59).A positive mild correlation bowling speed and flexion (r=0.48), bowling speed and extension(r=0.46).

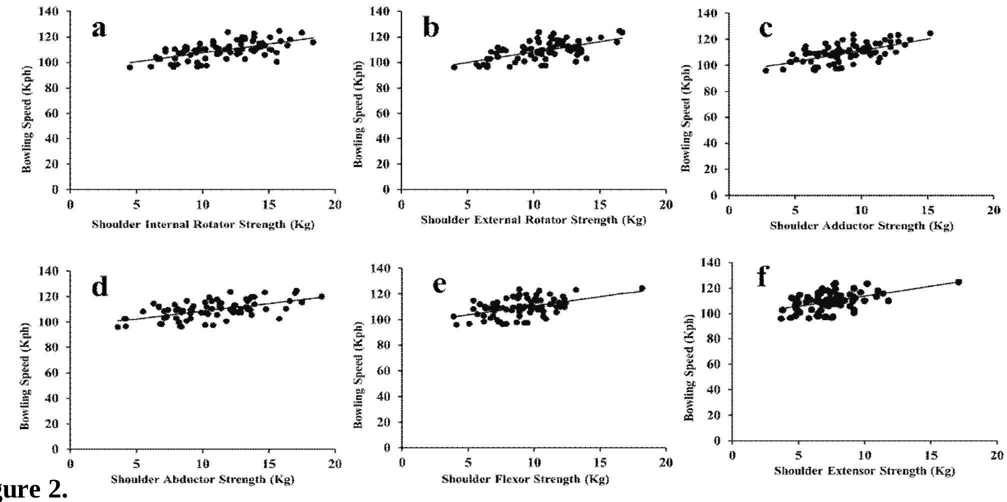

Figure 2.

Co-relation of bowling speed with a) Shoulder Internal Rotators b) Shoulder External Rotators c) Shoulder Adductors d) Shoulder Abductors e) Shoulder Flexor f) Shoulder Extensor

Discussion

The study was designed to measure the relationship between the shoulder strength and bowling speed. The study revealed positive correlation between shoulder strength and bowling speed. The shoulder strength was measured by strain gauge dynamometer and bowling speed was measured by Bushnell speed radar gun. The shoulder external and internal rotators which comprise the rotator cuff may be the most important dynamic stabilizers. A proper sequence of rotator cuff contraction is vital for smooth, coordinated movements of the glenohumeral joint (Jobe et al.1983). The shoulder extensors (latissimus dorsi) and horizontal adductors (pectoralis major) were found to be powerful forward movers of the shoulder during throwing (Jobe et al.1983). This study concludes that internal rotation and adduction are the major muscles of shoulder which plays important role in bowling and would help in increasing the speed of bowler. These results are likely to be useful in both the coaching and talent identification of fast bowlers.

Conclusion

The result of study concludes that a significant, moderate correlation exists between shoulder strength and bowling speed, so the shoulder strength training protocol can be incorporated for increasing the speed of the bowler.

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Conflict of Interest: None declared