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## Relationship between shoulder performance and scapular positions in recreational cricket bowlers

**HS Krishna, PSB Roshan and Jeevan M Dsouza**

### Abstract

**Background:** Cricket is a global sport which requires skill, strategy and physical fitness. The scapula facilitates optimal shoulder complex function to produce efficient movement which maintain mobility and stability to the shoulder complex. The relationship between shoulder performance and scapular positions in recreational cricket bowlers is not well addressed. Hence aim of the study was to find the relationship between shoulder performance and scapular positions in recreational cricket bowlers as to see any relation in these and to prevent further injuries in recreational cricket bowlers.

**Materials and Method:** A cross-sectional study was conducted on 46 recreational cricket bowlers between ages 20-25 years. Bowlers who played for more than one to 3 hours per week and irregular practice without any history of injury to upper extremity or spine, shoulder or spine surgery were recruited for the study. Shoulder performance and Scapular positions were measured using Upper Quarter Y Balance test (UQYBT) and Lateral Scapular Slide test (LSST) respectively. The Karl Pearson correlation coefficient is used to establish relationship between the variables.

**Result and Conclusion:** A statistically significant negative correlation found between UQYBT and Lateral scapular slide test at the positions of 0°, 45°, 90°  $p < 0.05$ . Hence we concluded that there is a relationship between shoulder performance and scapular positions in recreational cricket bowlers. Therefore, dynamic balance training should be added along with scapular strength training to enhance the performance of the recreational cricket bowlers.

**Keywords:** shoulder performance, scapular positions, recreational cricket bowlers

### 1. Introduction

Cricket is a global sport which requires physical activity, skill and strategy. Cricket is the action of propelling the ball towards the wicket defended by the batsman. A bowler's arm must not extend during the bowling action [1]. The rotator cuff is a group of tendons and muscles that help to keep the shoulder in place, providing stability and range of movement. The rotator cuff connects the humerus to the scapula [2]. The scapula facilitates optimal shoulder complex function to produce efficient movement [3]. Alteration of scapular position results not only in decreased neuromuscular performance but also may predispose the individual to reduce performance and lead to shoulder injury [4]. In overhead sports, high physical demands are placed on the shoulder which may lead to abnormal scapular kinematics [5]. The abnormal scapular mechanics occurs as a result of dysfunction creating imbalance between agonist and antagonist muscles and further predispose the shoulder to injuries [6]. It is proved that among cricket players, there is a large distraction force imposed on posterior structure of the shoulder joint during deceleration phase of bowling [7]. In order to counteract these distraction forces, scapular retractor muscles, shoulder abductors and external rotators contract eccentrically [8]. These posterior capsular adaptations change the kinematics of the joint and hence predispose the athlete to labral and rotator cuff injuries [9].

However, there is another aspect that is untouched that is the relationship between shoulder performance and scapular positions in recreational cricket bowlers. These athletes are not trained rather just mere youngsters playing in the field without any proper training and warmup. This inturn makes them more prone to shoulder injuries due to lack of technique involved in their bowling and lack of stability in the scapula. Moreover, identifying scapular dyskinesia at a primary level in such players will allow for early therapeutic intervention which can improve shoulder function and decrease the risk of further shoulder injury in recreational cricket bowlers.

The study was undertaken to understand fully how UQYBT is related to scapular positions. It is possible that the correlation between scapular positions and UQYBT may differ from person to person

## 2. Materials and Methods

The study was conducted after obtaining approval from the Institutional ethical committee. It is a cross-sectional study conducted with 46 Recreational Cricket Bowlers who had participated in Cricket club Mangalore, India. Convenience sampling was adopted for the selection of individuals for the study. The inclusion criteria included male recreational cricket bowlers between ages of 20-25 years with minimum of 2-3 hours' practice per week. Players with history of orthopaedic surgery of upper and lower quadrant or spine, history of pain in these regions interfering with sport participation within 6 months and history of neurological, musculoskeletal disorders were excluded from the study. All the subjects were asked to fill a Pro -forma that included age, weight, height, dominance of upper extremity and playing hours (minutes/day; days/week). After initial assessment each subject will be asked to do LSST and UQYBT.

### 2.1. Outcome Measures

#### 2.1.1. Measurement of Scapular positions by lateral scapular slide test (LSST)

Subjects were explained about the purpose and nature of the study in the language best understood by them. A duly signed written informed consent was obtained from the subjects who were willing to participate in the study. The protocol was completed in one session for each subject. Scapula position was measured using LSST. The starting position for the test was standing. The participants were instructed to fix their eyes on an object in the examination area so as to maintain consistent posture during all the test positions. For test position 1 of the LSST, participants were instructed to keep their upper limbs in a relaxed position at their sides. The distance between the inferior aspect of the inferior angle of the scapula to the closest spinous process was measured bilaterally with a tape measure.

These measurements were taken bilaterally, both dominant and non-dominant side. The value of difference between side to-side measurements was calculated. These measurements were recorded thrice and the mean value of difference was noted. This procedure was repeated for test positions 2 and 3. For test position 2, the patient was instructed to actively place

both hands on the ipsilateral hips so that the humerus was positioned in medial rotation at 45° of abduction in the coronal plane. In test position 3, participants were instructed to actively extend both elbows and to elevate and maximally internally rotate ("thumbs down") both upper extremities to 90° in the coronal plane as shown in figure 1.

#### 2.1.2 Upper Quarter Y-Balance test (UQYBT)

UQYBT is a comprehensive valid and reliable field tool that measures stability and mobility of upper extremity in closed kinetic position. To measure upper limb length, the subject was asked to stand in an anatomical position and C7 vertebrae was identified. After C7 was identified, instruction to the subject was given to abduct the right limb to shoulder height (90degree). The distance from the C7 spinous process to the most distal tip of the right middle finger (in centimetres) was measured by using measuring tape. The UQYBT was performed with the bowler in push up position with feet shoulder width apart. Closed kinetic chain motor control was measured by reaching in the following three directions: medial, inferolateral, and superolateral as shown in figure 2. Following a warm up trial, the best of three attempts were recorded for each reach direction. The composite score was calculated by taking the sum of all three reach directions, dividing by the upper extremity limb length and multiplying by 100.

### 2.3 Statistical Analysis

Statistical analysis was done using SPSS statistics version 25.0 Descriptive statistics was used to calculate mean and standard deviation for continuous variables and frequencies and percentage of categorical variables. Relationship of shoulder performance and difference in scapular positions were evaluated using Karl Pearson correlation co-efficient. A p value less than 0.05 was considered as statistically significant

### 3. Results

In this study, a total of 46 recreational cricket bowlers with mean age of 23.13 years. The mean age of 23.13 years were recruited in the study. The mean values of UQYBT and scapular positions are showed in Table 1. The correlation between UQYBT and LSST are given in Table 2. Statistically significant negative correlation found between UQYBT and LSST at 0°, 45° and 90°

**Table 1:** The mean and standard Deviation value of UQYBT and LSST at 0°, 45°, 90°

N= 46	Mean ±SD
UQYBT Right side	76.22±3.77
Left side	72.52±3.61
LSST test position 1	1.88±.4856
position 2	2.18±.4606
position 3	2.22±.3538

**Table 2:** Statistically significant negative Correlation found between UQYBT and Scapular positions at 0°, 45°, 90°. Where p<0.05

	N	correlations	Difference at 0°	Difference at 45°	Difference at 90°
UQYBT right	46	r	-0.376	-0.438	-0.439
	46	p	0.010	0.002	0002
UQYBT left	46	r	-.236	-.346	-.297
	46	p	0.013	0.019	0.045



**Fig 1:** Lateral scapular slide test at 0°, 45° and 90°



**Fig 2:** UQYBT, Medial reach, Superoateral reach, Inferolateral reach

#### 4. Discussion

The role of the scapula is important and the scapula has a significant effect on shoulder movements because since it is directly attached to the humerus [10]. The function of the hand is required to perform various kinds of daily activities involving skilled movements. Shoulder joint motion is complex and involves the synchronous movement of the scapula and humerus [11]. Position and control of the scapula on the thorax play an important role in the normal function of the shoulder. Scapular motions on the thorax can align the glenoid fossa with the humeral head maximizing joint congruency and providing a stable base for humeral motion [12]. Alterations in normal motion of the shoulder have been associated with shoulder pathologies such as shoulder impingement [13, 14]. When there is weakness or dysfunction of the scapular musculature, the normal scapular positioning, stability and mechanics of the shoulder may be altered [15, 16]. The present study shows there is a negative correlation between shoulder performance and scapular positions in recreational cricket bowlers. As difference in scapular position increases, the shoulder performance of a cricket bowler decreases due to lack of stability in the scapula. On an average, the participants achieved the highest scores during medial reach, followed by inferolateral reach and lowest scores during superolateral reach. Reduced shoulder performance was noted on both sides, since the subjects were recreational bowlers. Explosive power alters the scapular positions in this population. It is noted that the recreational cricket bowlers lack shoulder performance which may lead to shoulder injuries. The throwing 'kinetic chain' involves a coordinated motion which progresses from toes to fingertips. Throwing athletes in cricket (both bowlers and fielders) are prone to shoulder injuries secondary to the large amount of forces generated owing to the resultant high velocities and the repetitive nature of throwing action [16]. Energy generated from lower body is transmitted to the scapula, then to the arm and hand and subsequently to the ball. Any condition that alters the components of kinetic chain may result in dysfunction or painful shoulder [17]. Cricket bowlers require continuous overhead motions with end range movements with

positioning of the joint which in turn provides load on soft tissues resulting in imbalance, impaired performance and injuries [18, 19]

RA Green *et al* found that consistent downward rotated scapula in young cricketers with shoulder problems may predispose ongoing injury through impingement and also through increased load on the rotator cuff muscles acting at the glenohumeral joint during throwing [20]. Myers *et al* discussed that the scapula position was found to be more upwardly rotated, internally rotated and retracted in throwing athletes as an adaptive mechanism to decrease likelihood of impingement. Due to lack of techniques involved in bowling, dysfunction of the scapula can lead to changes in the tension of each muscle, adversely affecting stability in the joint [21].

Huang T S *et al*. argued that alterations in scapular positioning can have an effect on shoulder function. Furthermore, scapular positioning is hypothesized to bear a direct relationship to scapular stability and the generation of muscular forces, because coordinated muscle patterns are believed to be necessary for normal glenohumeral joint function and muscle force production [22].

Priya S *et al* concluded that there is a strong positive correlation between shoulder performance and scapular muscle strength among college students. It's obvious that the GH joint and scapula cannot function independently. The function of the scapula and surrounding musculature is vital to the normal function of the GH joint. Increase in scapular muscle strength will lead to an increase in shoulder performance. For any activities involving the upper extremity, scapular muscle strength plays a major role and both can be used for overhead activities like bowling and throwing [23].

There is a large distraction force imposed on the posterior aspect of shoulder during deceleration phase of the bowling [24] to counteract these forces scapular retractors, shoulder abductors and external rotators act eccentrically [25]. These adaptations change the kinematics of the joint and leads to scapular dyskinesia, labral and rotator cuff injuries [9]. Identifying scapular alteration and lack of stability at the beginning and rehabilitation will improve shoulder performance and reduces the risk of injury.



## 5. Conclusion

The present study concluded that there is a relationship between shoulder performance and scapular positions in recreational cricket bowlers. The increased difference in the scapular position due to lack of stability in the scapula leads to reduced performance in the shoulder. Scapular muscles training in cricket bowlers has proven to improve shoulder performance. Hence dynamic balance specific training should be added in training protocols along with scapular strength training to enhance the performance of the recreational cricket bowlers

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