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Comparison of static scapular position in cricketers and healthy individuals

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Abstract
Cricket is a global non-contact sport which requires physical fitness, skill and strategy. Scapular control is a requisite for the mobility and stability of the shoulder complex and to optimize the performance of a cricketer. The aim of this study was to compare the static scapula position in cricketers and healthy age-matched controls. A cross-sectional comparative study was conducted in 130 participants. Of which, there were sixty-five male cricketers and sixty-five healthy age matched males in the age group of 18 to 25 years. Cricketers who are currently playing for more than 1 year without any upper extremity or spine pain or injury, history of any shoulder surgery or current illness were recruited. Scapula position was measured using Lateral scapular slide test in both cricketers and healthy individuals. Statistical analysis was done using SPSS Statistics version 16.0. The mean age of male cricketers and healthy males was 20.11 ± 3.88 and 23.05 ± 4.27 years respectively. The comparison of mean values of scapula position between male cricketers and healthy males evaluated using unpaired t test was statistically significant ($p = 0.000$) in all the three test positions of Lateral scapular slide test. It was noted that the mean value was higher in cricketers as compared to the normal subjects. Static scapula position was impaired in male cricketers as compared to healthy individuals. Scapular stabilization exercises should be incorporated in cricketers during the training phase to prevent any musculoskeletal injury.

Keywords: Cricket, scapula position, modified lateral scapular test

Introduction
Cricket, a global and demanding non-contact sport, necessitates a blend of physical fitness, skill and strategy. It needs upper extremity strength, hand grip, eye to hand co-ordination and the synchronized movements of the upper kinetic chain. Overuse and impact injuries are very common since players are involved in a varied array of physical activities like running, throwing, batting, bowling and fielding. A prospective study of 95 professional cricket players in India reported that 16.8% upper limb injuries occurred in a time frame of 1 year [1]. A study among English players found that 23% of players sustained a shoulder injury during a single season, with 63% of fielders and 35% of bowlers reporting that injury has a negative impact on their performance [2]. An Australian injury surveillance data from 1995 to 2001 revealed that the prevalence of shoulder injury among batsmen, fast bowlers and spin bowlers was 0.3%, 0.9%, and 1.1%, respectively [3]. Playing cricket involves repeated forceful ballistic arm movements which lead to increased eccentric load on the rotator cuff muscles of the shoulder joint predisposing them to injuries [4]. The mechanics of bowling is a major causative factor for cricket injuries with 38% to 47.4% of schoolboy bowlers sustaining injuries in cricket [5].
The glenohumeral joint is inherently unstable joint due to its bony configuration and the degrees of freedom of movement. It is primarily dependent upon the interaction between the muscular, ligamentous and capsular structures to maintain joint congruency and produce coordinated movements between the glenohumeral and scapulothoracic articulations [6]. The scapula facilitates optimal shoulder complex function to produce efficient movement [7].Alteration of scapular position results not only in decreased neuromuscular performance but also may predispose the individual to shoulder injury [8]. In overhead sports, high physical demands are placed on the shoulder which may lead to abnormal scapular kinematics [9]. The abnormal scapular mechanics occur as a result of dysfunction creating imbalance between agonist and antagonist muscles and further predispose the shoulder to injuries [10].

Lateral scapular slide test (LSST) was used to clinically measure static scapular position. Kibler stated that the injured side would demonstrate increased scapular distance as compared to the normal side. A bilateral difference of 1.5 cm (15 mm) is noted as the threshold for presence of scapular asymmetry [11]. The primary purpose of the present study was to compare the static scapula position in cricketers and healthy age-matched controls.

Materials and Methods

The study was conducted after obtaining approval from the Institutional Research Review Committee (IERC). It was a cross-sectional comparative study conducted in 130 participants. There were two groups formed - sixty-five male cricketers and sixty-five healthy age matched males in the age group of 18 to 25 years. Cricketers who are currently playing for more than 1 year were recruited. Exclusion criteria included any upper extremity or spine pain or injury within the previous 6 months, history of any shoulder surgery or current illness or disease process affecting physical performance. 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 taken from the subjects who were willing to participate in the study. The study protocol was completed in one session for each subject.

Scapula position was measured using Lateral scapular slide test (LSST) in both cricketers and healthy individuals. 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. The inferior angle of the scapula on both sides was marked. The spinous process nearest to the inferior angle of the scapula was identified and marked. 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 two reference points i.e. the inferior aspect of the inferior angle of the scapula and 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 [6, 11 -13].

Statistical analysis

Statistical analysis was done using SPSS Statistics version 16.0. Descriptive statistics was used to calculate mean and standard deviation for continuous variables and frequencies and percentages for categorical variables. Comparison of mean values of scapular position in all three positions between cricketers and normal subjects was evaluated using unpaired t test. A p value less than 0.05 was considered as statistically significant.

Results

In this study, there were total 130 subjects, comprising of 65 male cricketers and 65 healthy males in the age group of 18 to 25 years. The mean age of male cricketers and healthy males was 20.11 ± 3.88 and 23.05 ± 4.27 years respectively (Table 1). The comparison of mean values of scapula position between male cricketers and healthy males evaluated using unpaired t test was statistically significant (p = 0.000) in all the three test positions of Lateral scapular slide test. It was noted that with mean value was higher in cricketers as compared to the normal subjects (Table 2).

Table 1: Demographic profile of cricketers and healthy individuals

Variables	Male Cricketers (N = 65)		Healthy Males (N = 65)	
	Mean	Std. Deviation	Mean	Std. Deviation
Age (in years)	20.11	3.88	23.05	4.27
Body mass index (kg/m^2)	21.03	2.89	20.71	2.73

Table 2: Comparison of scapular position between male cricketers and healthy individuals.

Variables	Male Cricketers (N = 65)		Healthy Males (N = 65)		t value	p value
	Mean	Std. Deviation	Mean	Std. Deviation		
LSST Test position 1	7.16	4.42	2.96	2.51	6.669	0.000
LSST Test position 2	7.31	4.48	3.19	2.63	6.387	0.000
LSST Test position 3	8.02	6.27	2.98	2.52	6.023	0.000

* p value is significant at < 0.05.

Discussion

The study showed that scapula position was altered in male cricketers as compared to the normal subjects in all the three test positions of Lateral scapular slide test. In overhead athletes, the kinetic energy and force created in the lower limbs, pelvis and trunk is channeled through the shoulder joint complex including the glenohumeral, scapulothoracic, acromioclavicular, and sternoclavicular articulations which result in distal upper extremity segmental velocity required for optimal performance. The upper extremity chain – shoulder girdle, glenohumeral joint, elbow, wrist and hand provide the fine tuning required in order to direct the produced energy into a definite action [14].

A harmonized association between the glenohumeral and scapulothoracic articulations is necessary to bring about optimal shoulder elevation which is termed as scapulohumeral rhythm [15]. The activation of serratus anterior, middle and lower trapezius muscle along with the flexibility of the pectoralis muscle is crucial for adequate upward rotation of the scapula during elevation of arm [16]. Biomechanical analyses have revealed that normal scapulohumeral rhythm occurs at a 2:1 ratio with two degrees of glenohumeral movement for every 1 degree of scapular movement during shoulder elevation [17].

Abnormal scapulohumeral rhythm leads to imbalances in length tension relationship of the shoulder girdle musculature further leading to shoulder impingement and injuries[18,19]. Scapular dyskinesis is defined as "an observable alteration of

the position and motion of the scapula relative to the thoracic cage" [6, 11]. Sports like cricket require persisted overhead and end range movements with extreme positioning of the joint which in turn places heavy burden on the soft tissues resulting in imbalance and impaired muscle performance predisposing an individual to shoulder injuries. Impairments like pain, reduced muscle strength, inhibition or loss of motor control lead to shoulder dysfunction. This inhibition may be demonstrated by lack of scapular control and abnormal firing patterns with reduction in ability to exert torque and stabilize the scapula during elevation [19]. There are multi-factorial causes of shoulder pain in cricketers which include anterior capsule laxity [20] and posterior capsule tightness of the glenohumeral joint [21]. In cricket players, it is observed that there is large distraction force imposed on the posterior structure of the shoulder joint during the deceleration phase of bowling [22]. In order to counteract these distraction forces, scapular retractor muscles, shoulder abductors and external rotators contract eccentrically [21]. These posterior capsular adaptations change the kinematics of the joint and hence predispose the athlete to labral and rotator cuff injuries [23]. In overhead athletes, the scapula position is altered and associated with scapula anterior tilting, downward rotation and internal rotation [24]. Identifying scapular dyskinesis at a primary level allows for early therapeutic intervention which can improve shoulder function and decrease the risk of further shoulder injury [25].

Conclusion

This study showed that there is a difference in static scapular position between male cricketers and healthy individuals with altered scapula position observed in cricketers. Hence, scapula position should be included during assessment of a cricketer which will provide a holistic and multimodal approach towards the understanding, planning and enhancement of management of any shoulder injury.

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