

CORRELATION OF THORACO-LUMBAR SPINE RANGE OF MOTION WITH SCAPULAR DYSKINESIA IN PACED CRICKET BOWLERS

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ABSTRACT

Background: Cricket is a universally loved sport and played all over the world, Fast bowling is one of the most well regarded skill which involves high impact shoulder and spine mobility. Injuries to Shoulder and Spine are the most common ones.

Study Purpose: Shoulder and Back injuries are the two most common injuries in paced bowlers. Improper and incoordinated movements at these joints could be one of the attributing cause for the injuries. Thereby, this study was taken into consideration to find out whether there exists any correlation between thoraco-lumbar spine range of Motion and scapular dyskinesia in paced cricket bowlers.

Study Design: Crosssectional Study design.

Method: A research was conducted among paced bowlers training in an academy in Pune of Age 13-25 playing for more than a year. After taking consent from the player, scapular dyskinesia was measured with lateral scapular slide test and thoraco-Lumbar ROM was measured by dual inclinometer (flexion, extension, lateral flexion dominant and non dominant side, lateral rotation dominant and non dominant side) Both the readings were compared and analyzed by pearsons test using SPSS 16 software.

Results: It was found that, there was a moderate negative correlation between scapular dyskinesia and thoracolumbar lateral flexion ROM on non dominant side ($r = -0.568$ and $p = 0.001$) and there was a substantial negative correlation of scapular dyskinesia and lateral rotation ROM on the non dominant side ($r = -0.645$ and $p = 0.001$), while there was no correlation of scapular dyskinesia and thoracolumbar flexion, extension ROM and lateral flexion, lateral rotation ROM to the dominant side.

Conclusion: Thus, there exists a negative relationship between scapular dyskinesia and thoracolumbar lateral flexion and rotation on the non dominant side. Thus a good bowling technique which is coordinated and biomechanical correct at scapula and thoracolumbar spine might cause lesser injuries

KEY WORDS: Paced bowlers: Cricket, Scapular dyskinesia, Thoracolumbar ROM.

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INTRODUCTION

Fast bowling is one of the two main approaches

to bowling in the sport of cricket, the other being spin [1]. In fast paced bowling there is a

run up of around 30 yards and in stride before the delivery the bowler arches his back into full extension and rotation to the same side and shoulder goes into complete flexion and external rotation. In next step- delivery- the bowler strides rapidly by flexing and rotating the back to other side and adducting and internal rotating the shoulder i.e. in follow through phase [2]. While bowling a player must absorb vertical and horizontal components of the ground reaction force that are approximately five and two times body weight at front-foot and rear-foot impact, respectively. Attenuated forces are transmitted to the spine through the lower limb. Hence back injuries are common in cricketers. Also because a lot of bowling speed is generated by trunk and momentum of the hand shoulder injuries are also very common [3]. It was identified by Burnett et al., 1998, Foster et al. that there is a predisposition of bowlers with large amounts of shoulder counter-rotation to adopt a hyperlordotic or laterally flexed posture at front foot contact during bowling, also it was found that there is link between lower back injury and excessive shoulder counter-rotation (i.e. a mixed action) the most widely reported relationship between technique and injury in fast bowlers The biomechanically correct upper body configuration and spine counter-movements improves efficiency and length of bowling. Therefore it is necessary to have an adequate range of movement at spine and shoulder complex including scapula to prevent injuries.

MATERIAL AND METHODOLOGY

The study which was conducted was a Cross sectional Study. For the study, 41 Samples were recruited from a training centre in Pune, India of average age of players 19.5years and training for average 3.4years. Volunteers were included if they were members of a district and/ or state junior cricket squad and classified as fast or fast-medium bowlers by their coaches. They were excluded if they had any symptomatic present complains for shoulder and spine pathology such as impingement, tendinopathy, adhesive capsulitis, cuff contusions, PIVD, stenosis, spondylolisthesis, ankylosing spondylosis, stress fractures etc. at the time of testing. After taking approval from the ethical committee of the institution and all participants (and their

guardians,) were given a written consent after being informed of the study requirements after which players were assessed for the study. Scapular dyskinesia was measured with lateral scapular slide test. Readings were taken at 3 degree of shoulder Abduction i.e. 0°, 90° and 180° and distance was measured from superior border of scapula till T2 spinous process, middle border of scapula to T4 spinous process, Inferior border to T7 spinous process for both the sides of scapula. Difference was taken out of the readings of both the side for each level, an average was taken out if these readings. If the average reading was more than 1.5 cm the player was categorized into group of Scapular dyskinesia group, while those whose average was lesser than 1.5 cm were categorized into group of non Scapular dyskinesia. Second component of the study was thoracolumbar range of motion; it was measured by dual inclinometer. Ranges measured were for thoracolumbar flexion, thoracolumbar extension, and thoracolumbar lateral flexion on dominant and non dominant side and thoracolumbar Lateral rotation on dominant and non dominant side. For measuring thoracolumbar ROM by Dual Inclinometer, one of the inclinometer was placed at T1 spinous process and other was placed on S1 spinous process, the bowler was asked to do the movement and the reading from both the inclinometer were subtracted to get the ROM for that particular movement.

The figures depict method in which scapular dyskinesia was measured with lateral scapular slide test in Fig 1: Shoulder at 0° abduction; Fig 2: Shoulder at 90° abduction, Fig 3: Shoulder 180° abduction.

Thoracolumbar ROM was measured by dual inclinometer

Fig 4: Positioning of dual inclinometer, Fig 5: Thoracolumbar lateral flexion ,Fig 6: Thoracolumbar lateral rotation.

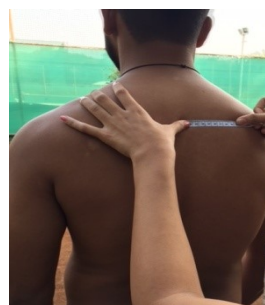


Fig. 1: Shoulder at 0 degree Abduction

Fig. 2: Shoulder at 90 degree Abduction

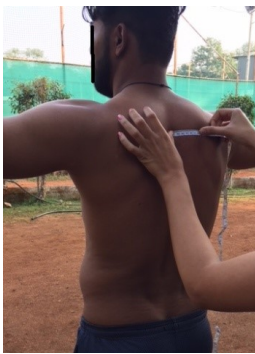


Fig. 3: Shoulder at 180 degree Abduction



Fig. 4: Positioning of dual inclinometer



Fig. 5: Thoracolumbar lateral flexion

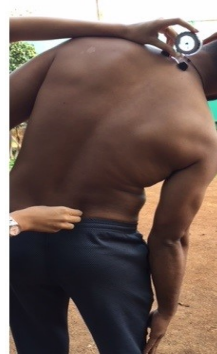
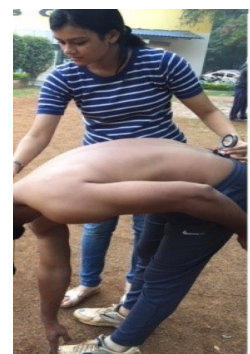


Fig. 6: Thoracolumbar lateral rotation



Statistical Analysis: All statistical analyses were performed using the SPSS 16 software. Pearson correlation coefficient was used to determine the relationships between scapular dyskinesia and thoracolumbar ROM. Statistical significant was set at $p < 0.05$.

The magnitude of correlation (r) was rated as follows:

Poor ($0.00 < |r| < 0.20$),

Low ($0.21 < |r| < 0.40$),

Moderate ($0.41 < |r| < 0.60$),

Substantial ($0.61 < |r| < 0.80$),

and almost perfect ($0.81 < |r| < 1.00$).

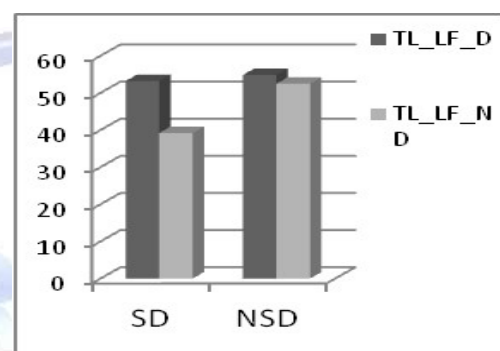
RESULTS

It was seen that out of 41 players, 21 players had scapular dyskinesia and 20 did not have scapular dyskinesia i.e. prevalence of scapular dyskinesia was 48% in paced bowlers. Further it was seen that there was moderate negative correlation of scapular dyskinesia and thoracolumbar lateral flexion on non dominant side with $r = -0.568$ and $p = 0.001$. There was a substantial negative correlation of scapular dyskinesia and lateral rotation on the non dominant side $r = -0.645$ and $p = 0.001$. On the other hand there was no correlation of scapular dyskinesia and thoracolumbar flexion, extension, lateral flexion and lateral rotation on the dominant side.

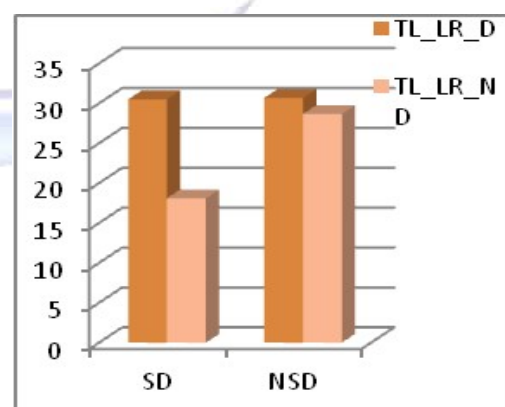
It was seen that those players who had scapular dyskinesia had reduced thoracolumbar lateral flexion and rotation on the non dominant side compared to dominant side, while those who didn't have scapular dyskinesia had no much difference in thoracolumbar lateral flexion and lateral rotation dominant and non dominant ranges. There was no significant change in ranges of Thoracolumbar Flexion, extension, lateral flexion and lateral rotation on

the dominant side in both the groups.

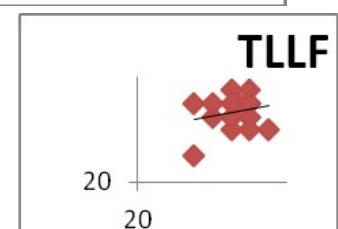
Graph 1: Thoracolumbar Lateral Flexion ROM of dominant and non dominant side of bowlers having scapular dyskinesia and non scapular dyskinesia.



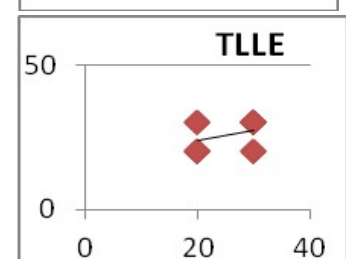
Graph 2: Thoracolumbar Lateral Rotation ROM of dominant and non dominant side of bowlers having Scapular dyskinesia and non Scapular dyskinesia.



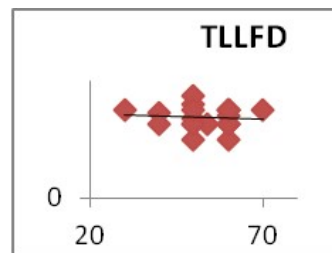
Scatter diagram 1: Scapular dyskinesia with thoracolumbar flexion.



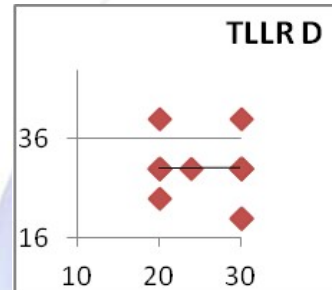
Scatter diagram 2: Scapular dyskinesia with thoracolumbar extension.



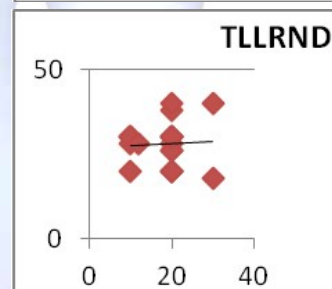
Scatter diagram 3:
Scapular dyskinesia with thoracolumbar lateral flexion dominant side.



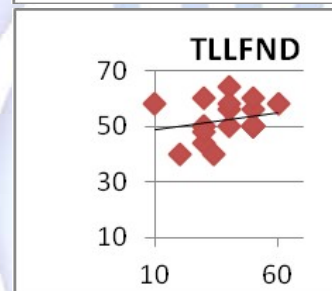
Scatter diagram 4:
Scapular dyskinesia with thoracolumbar lateral flexion non dominant side.



Scatter diagram 5:
Scapular dyskinesia with thoracolumbar lateral rotation dominant side.



Scatter diagram 6:
Scapular dyskinesia with thoracolumbar lateral rotation non dominant side.



DISCUSSION

This was a study to find out whether there exists any correlation between scapular dyskinesia and thoracolumbar ROM in paced bowlers. It was seen that out of 41 players 39 were right dominant and 2 were left dominant. It was found that out of 41 bowlers, 23 bowlers had no history of any injury, 6 bowlers gave history of injury to back, 2 gave history of injury to shoulder, 2 players gave history of injury to Shoulder and back both, 8 players gave history of injury to other parts like calf, wrist, ankle, elbow, hand. In this study it was found that out of 41 individuals 20 had scapular dyskinesia and 21 did not i.e. prevalence of scapular dyskinesia was 48% among bowlers. This study reveals that, those players who had scapular dyskinesia had reduced thoracolumbar lumbar lateral flexion and lateral rotation on non dominant side compared to dominant side, while those who

didn't have scapular dyskinesia had no significant change in thoracolumbar ROM for lateral flexion and lateral rotation on dominant and non dominant side. No significant difference in thoracolumbar flexion and extension ROM were seen between both the groups.

In this study, there was moderate negative correlation of scapular dyskinesia and thoracolumbar lateral flexion on non dominant side was seen and substantial negative correlation of scapular dyskinesia and lateral rotation on the non dominant side was seen. The negative correlation suggests that prevalence of scapular dyskinesia in bowler attributed to reduced thoracolumbar lateral flexion and lateral rotation on the non dominant side.

In a similar study conducted by Helen Crew et al⁵ to find relationship between shoulder counter rotation (SCR) and lumbar mechanics in fast bowlers, they found a significant correlation between lateral flexion and rotation and SCR. Also another study by Burnett et al⁹, states players with larger SCR use larger lumbar flexion, extension and lateral flexion range during delivery stride which is thought to cause injuries in spine like spondylolysis.

In this study results obtained state that those players had dyskinesia had an average thoracolumbar lateral flexion on dominant side 53.2° and non dominant side of 39.2° which was significantly reduced compared to the dominant side, while those who didn't have scapular dyskinesia their ranges for thoracolumbar lateral flexion on dominant side and on non dominant side were 54.8° and 52.4° respectively which were almost equal (Graph 1: Thoracolumbar Lateral Flexion ROM of dominant and non dominant side of bowlers having scapular dyskinesia and non scapular dyskinesia.). Similarly, those players who had dyskinesia had an average thoracolumbar lateral rotation on dominant side 30.5° and non dominant side 18.1° which was significantly reduced compared to the dominant side, while those who didn't have Scapular dyskinesia their ranges for thoracolumbar lateral rotation on dominant side and on non dominant side were 30.7° and 28.6° respectively which were almost equal (Graph 2: Thoracolumbar lateral rotation ROM of dominant and non dominant side of bowlers

having scapular dyskinesia and non scapular dyskinesia). Average thoracolumbar flexion ROM in bowlers having scapular dyskinesia was 72.6° and not having scapular dyskinesia was 73.3° and thoracolumbar extension was 26° in bowlers having scapular dyskinesia and 26.2° in bowlers not having Scapular dyskinesia which did not show significant difference.

The mechanism for the reduced ranges is still unclear but could be attributed to bowling patterns and biomechanically incorrect movements occurring at scapula and spine both. Phases of bowling involve run up, delivery stride and follow through phase. Movements occurring at scapula and spine are synchronized in a stride. Before the delivery of the ball, the bowler arches his back into full extension and rotation to the same side and shoulder goes into complete flexion and external rotation. In next step- delivery- the bowler strides rapidly by flexing and rotating the back to other side and adducting and internal rotating the shoulder i.e. in follow through phase. During this process, if the movement at the shoulder is not biomechanically correct, the player might over compensate by his scapula which ultimately might lead to scapular dyskinesia. Excessive movement at the scapula of the bowling arm might alter the mobility of the spine as the bowler will tend to lateral flex and rotate more on the dominant side leading to over activity of these lateral flexor and rotator muscles and might restrict lateral flexion and rotation on the non dominant side as seen in this study. Thus any excess movement at scapula can cause reduction in thoracolumbar spine mobility or vice versa.

The limitation to this study is that we could not analyze the ranges in a dynamic while the player was in action. Kinematics and movements during each phase of bowling at scapula and spine can also be considered in further studies.

CONCLUSION

Thus, the results of the study suggests that there exists a negative relationship between scapular dyskinesia and thoracolumbar lateral flexion and rotation on the non dominant side. Thus a bowling technique which is coordinated and biomechanical correct at scapula and

thoracolumbar spine might cause lesser injuries.

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ABBREVIATIONS

SD - Scapular dyskinesia.

TL_LF - Thoracolumbar flexion.

TL_LE - Thoracolumbar extension.

TL_LF_D - Thoracolumbar lateral flexion dominant.

TL_LF_ND - Thoracolumbar lateral flexion non dominant.

TL_LR_D - Thoracolumbar lateral rotation dominant.

TL_LR_ND - Thoracolumbar lateral rotation non dominant.

NSD - Non scapular dyskinesia

Conflicts of interest: None

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