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To Study the Prevalence of Scapular Dyskinesia in Gymers and Non Gymers

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Abstract: ***Aim: To assess the prevalence of scapular dyskinesia in gymers as compared to non gymers. Methodology: The study design was case control study which was done on 100 subjects. The sampling method used was purposive sampling. Fifty gymers and fifty matched non gymers were assessed for scapular dyskinesia using Lateral Scapula Slide Test (LSST). Result: Result concluded that scapular dyskinesia is absent in gymers as compared to the non-gymers is rejected and hypothesis scapular dyskinesia is present in gymers as compared to non- gymers accepted based on the results of statistical analysis. Conclusion: As the study has been proved significant, the gym protocols can be revised to include strengthening of the scapular muscles, thus preventing incidences of shoulder pain in gymers.***

Keywords: scapular dyskinesia; gymers; non- gymers

1. Introduction

Scapular dyskinesia is defined as visible alterations in scapular positions & motion patterns & is believed to occur as a result of changes in activation of scapular stabilizing muscles [1].Hence, the repetitive muscular fatigue may directly affect the scapulohumeral rhythm, resulting in compensatory increased rotation or destabilization of scapula [2].These alterations in scapular positions have implications for reduction in muscle function thus leading to shoulder injuries [3]. The key scapular muscles for scapular stability &mobility are the upper & lower trapezius muscles &serratus anterior muscle. The muscular factors for scapular dyskinesia are lower trapezius &serratus anterior weakness & lower trapezius hypertrophy [4].

The protocol followed by the gyms these days promote strengthening of mostly the following muscles: deltoid,pectoralis minor,upper trapezius,lattisimusdorsi, biceps brachii& triceps.No much focus is given on strengthening of the scapular stabilizers that are lower trapezius,serratus anterior, rhomboids major and minor & the important shoulder rotators that play a major role in stabilizing the shoulder joint[5].Hence there is an imbalance in training of the various muscle groups.As the arm is raised, the generally accepted pattern of motion at the shoulder is as follows; the scapulaupwardly rotates, posteriorly tilts, and externally rotates the clavicle elevates and retracts and thehumerus elevates and externally rotates[6].

This coordinated motion is important for normal function of the shoulder girdle and is dependent upon capsulo-ligamentous structures and neuromuscular control[7]. Due to the important role that the shoulder musculature has in producing and controlling shoulder motion, impairments of these muscles could alter the motion of the scapula, clavicle, and/or humerus[8]. Altered scapular kinematics have been identified in individuals with impingement syndrome, rotator cufftears, and glenohumeral instability[9]. Several variables have been identified as risk factors for the development of shoulder pain and include highly repetitive use of the arm, work with the arm in elevated position[10].One of the potential biomechanical mechanisms that may explain this association is altered scapular and humeral kinematics secondary to shoulder girdle muscle fatigue.

Shoulder girdle muscle fatigue has been shown to alter scapulothoracic kinematics [11]. However, it is not clear whether muscle fatigue results in increased or decreased scapular upward rotation [12]. A more complete understanding of the effects that Muscle fatigue has on scapulothoracic and glenohumeral kinematics could provide insight into underlying mechanisms of shoulder injuries.

2. Subjects and Methods

The study design was case control study which was done on 100 subjects. The sampling method used was purposive sampling. Fifty gymers and fifty matched non gymers were assessed for scapular dyskinesia using Lateral Scapula Slide Test (LSST).

The subjects going to the gym for more than 6 months between the age group of 18 to 40 years regularly and then on gymers of same age group were chosen who did not go to the gym. Both males and females were included in the study. Subjects whose purpose of attending gym was to maintain fitness and strength training only were included. Also the subjects who had any history of shoulder, scapula thoracic or acromio clavicular joint injuries or back injuries due to some other primary cause were also excluded. A clearance from the ethical committee was taken and a written consent from the participants was taken prior to the evaluation and the procedure of assessment was explained. Total duration for assessment of both gymers and non gymers are 4 days. Duration for assessment of gymer group is 2 days. Duration for assessment of non gymers group is 2 days. All the subjects were assessed for scapular dyskinesia. Scapular dyskinesia was assessed using the Lateral Scapular Slide Test. This test is done to determine the stability of the scapula during glenohumeral motion. All the subjects were asked to expose adequately to allow accurate readings. The subjects were asked to stand with their arms resting at the side of the body. The superior angle, spine of scapula and the inferior scapula were marked with the pen on both the sides. Then the distance from the base of the spine of

scapula to the spinous process of T2 or T3 (most common) from the inferior angle of the scapula to the spinous process of T7- T9, or from T2spinous process to the superior angle of the scapula. The same assessment is carried out with the patients arms kept at the waist, thumbs posteriorly (45°shoulder abduction).Arms kept at 90° shoulder abduction with medial rotation.

The assessment of scapular dyskinesia in the gymers was done prior to the gyming session to maintain uniformity.

3. Discussion

In this study, scapular dyskinesias were assessed in gymers. It was found that at superior angle 0°shoulder abduction on the right and the left side the p value for scapular dyskinesia is 0.00 which is significant. This means that there is a prevalence of scapular dyskinesia in gymers as compared to normal individuals at superior angle at 0°of shoulder abduction. During this phase scapula seeks a position of stability in relation to the humerus. Hence, it is called setting phase. Due to lack of strengthening of the scapular stabilizers and over strengthening of shoulder abductors in the gym leads to instability of scapular stabilizers to work efficiently and hence leading to presence of scapular dyskinesia.

Similarly, at superior angle 45° for right and left side there is a significant p value of 0.00 and 0.01 respectively. At 45° angle, there is abduction of the arm and the scapular movement starts. During this movement, stability is improved by the interaction of the static and dynamic factors, due to weakness of scapular stabilizers and over strengthening of the shoulder mobilizers leads to scapular dyskinesia. The P value is again significant with 0.005 on the right side and 0.007 on the left side.

Kibler WB, McMullen (2010) aimed to find out scapular dyskinesia & its relation to shoulder pain. Scapular dyskinesia is an alteration in the normal position or motion of scapula during couple scapulohumeral movements [3].

Scapular dyskinesia is an alteration in the normal position or motion of scapula during coupled scapulo-humeral movements. Types of scapular dyskinesis include interior angle prominence(type I) indicating presence of weak muscles (serratus anterior, lattisimusdorsi, lower trapezius), medial border prominence (type 2) including winging of scapula, superior angle prominence (type 3) indicating over activity of levator scapulae and upper trapezius along with imbalance of the upper and lower trapezius force couple associated with impingement and rotator cuff lesions, symmetric scapula motion (type 4) there both scapula move symmetrically upward with the inferior angles rotating laterally away from the midline indicating scapular control muscles are not stabilizing the scapula[6]

According to Kendall, McCreary, Provance et al(2005**)** mild serratus anterior weakness is prevalent than generally realized, and weakness tends to be more on the left than on the right, regardless of handedness. Hence, the presence of scapular dyskinesia is more evident on the left side as compared to the right side. When weakness exists, it can be aggravated by attempting strenuous exercises, such as pushups. Serratus anterior muscle is the primary stabilizer of the interior angle and medial border of scapula to the thorax. Serratus anterior is the only muscle capable of producing simultaneous upward rotation, posterior tipping and external rotation. Also rhomboid major and minor muscles help in serratus anterior function to stabilize he scapula and the upward rotation of scapula [4, 5]. Due to overuse injury during gyming, main stabilizing muscle of inferior angle of scapula i.e. serratus anterior may undergo weakness .Hence leading to scapular dyskinesia at the inferior angle [5].

Whereas, in our study it was found that at the position of spine of scapula, on the right and the left side the p values are insignificant with 0.337 on right and significant with P value 0.05 on the left side. At 45°, at spine of scapula the p values are 0.93 right which is insignificant and 0.015 on left which is significant. At 90° it is again significant with p value of 0.292 on the right and 0.275 on the left. But in study, at the inferior angle 0°shoulder abduction on the right side, the p value is 0.667 and 0.260 on the left. Both are insignificant values.At inferior angle 45°shoulder abduction on the right, the p value is 0.088 and on the left p value is 0.081 stands insignificant, for significance p value to be more than 0.05. At 90°, the p value is 0.001 and 0.003 on the left and the right side respectively which is less 0.05, hence it is highly significant.

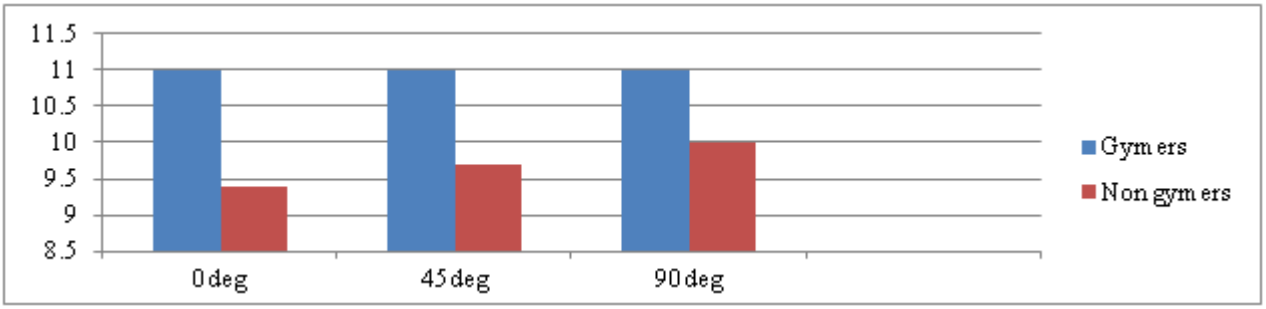
4. Results

Demographic data

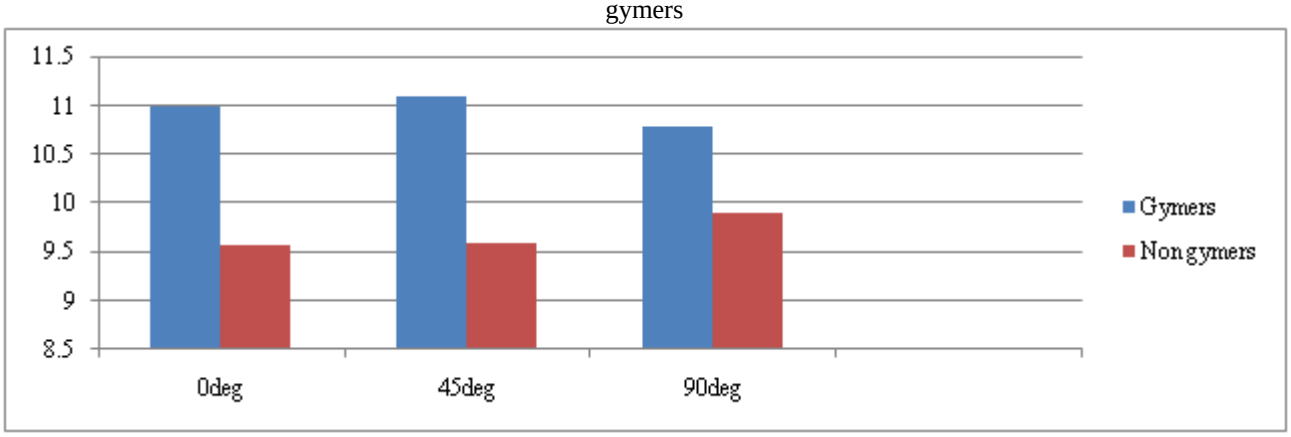
Parameters	Gymers (Mean+SD)	Non gymers (Mean+SD)
Age	28±6.3	28±6.3
Sex	Male-31 Female-19	Male- 31 Female-19

Table 1: Showing the comparison of mean and ±SD of Left and Right side at the position of superior angle of scapula in gymers and non- gymers

Subjects	0°		45°		90°	
	Mean±SD		Mean±SD		Mean±SD	
	Left	Right	Left	Right	Left	Right
Gymers	11±2	11.1±5.8	11±2.1	11.1±1.68	11±2	10.8±1.73
Non-gymers	9.4±1.6	9.58±1.37	9.7±1.6	9.6± 1.5	10 ±1.6	9.9± 1.4
P value	0.00*	0.000*	0.001*	0.000*	0.007*	0.005*



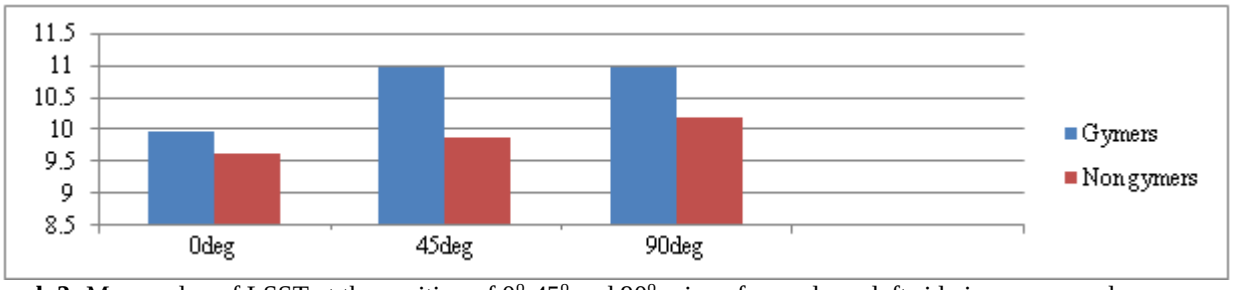
Graph 1- Mean value of LSST at the position of $0^{o,}$ 45^{o} and 90^{o} Superior angle of scapula on left side in gymers and non gymers



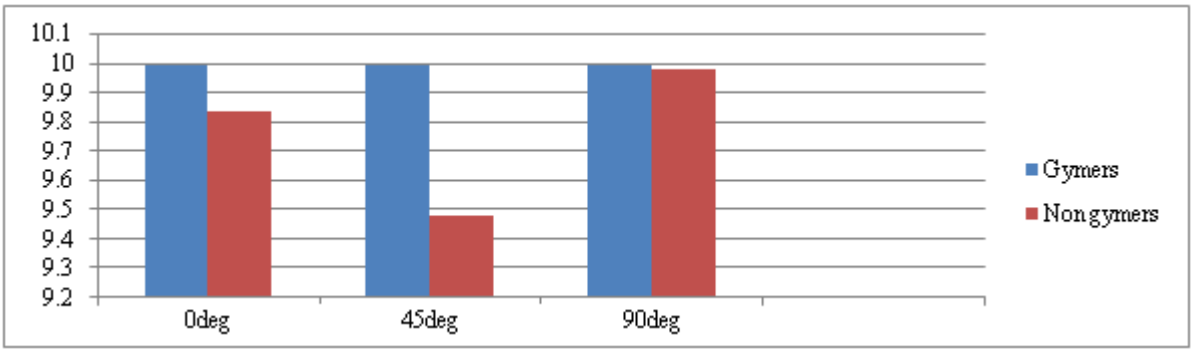
Graph 2: Mean value of lateral scapular slide test (LSST) at the position of $0^{o,}$ 45^{o} and 90^{o} Superior angle of scapula on right side in gymers and non gymers

Table 2: showing the comparison of mean value and SD of Left and right side at the position of spine of scapula in gymers and non- gymers

Subjects	0^{o}		45^{o}		90^{o}	
	Mean±SD		Mean±SD		Mean±SD	
	Left	Right	Left	Right	Left	Right
Gymers	10± 1.7	10± 1.4	11± 1.8	10±1.6	11± 2.2	10± 2
Non-gymers	9.64± 2.07	9.84± 1.87	9.88 ±1.62	9.48± 2.14	10.2± 1.93	9.98± 1.74
P value	0.05*	0.33	0.01*	0.09	0.27	0.29



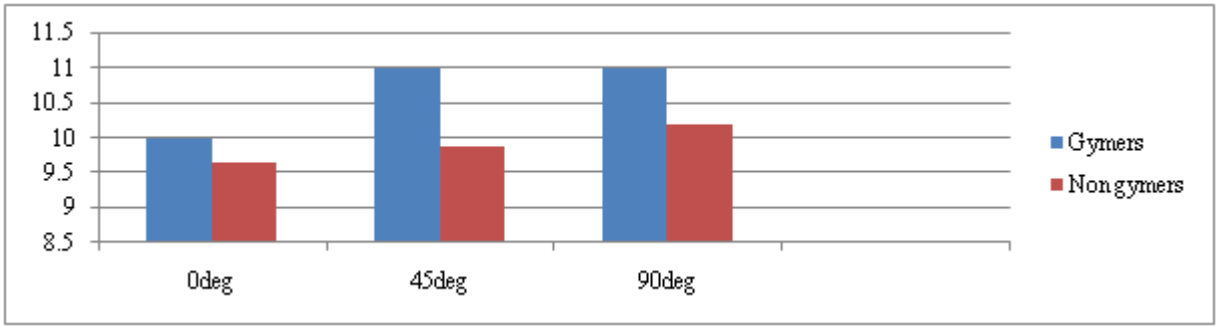
Graph 3: Mean value of LSST at the position of $0^{o,}$ 45^{o} and 90^{o} spine of scapula on left side in gymers and non gymers.



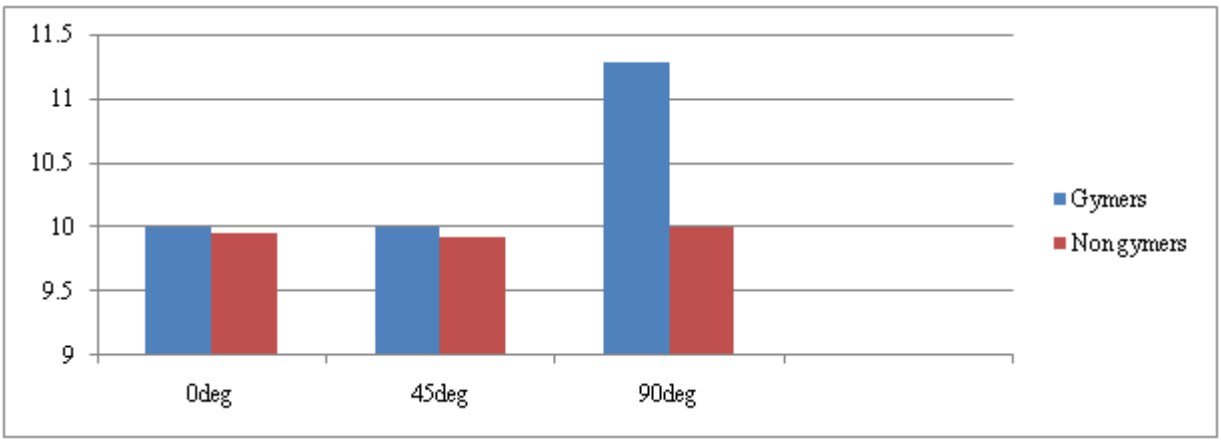
Graph 4: Mean value of LSST at the position of $0^{o,}$ 45^{o} and 90^{o} spine of scapula on right side in gymers and Non gymers

Table 3: Showing the comparison of mean value and SD of Left and right side at the position of inferior angle of scapula in gymers and non- gymers.

Subjects	0^o		45^o		90^o	
	Mean±SD		Mean±SD		Mean±SD	
	Left	Right	Left	Right	Left	Right
Gymers	10 ±1.8	10± 1.7	11 ±1.7	10 ±1.8	11 ±1.9	11.3 ±1.74
Non-gymers	9.8 ±1.9	9.96± 1.96	10± 1.5	9.92± 1.14	10± 1.6	10±1.6
P value	0.26	0.66	0.08	0.08	0.003*	0.001*



Graph 5: Mean value of LSST at the position of 0^o, 45^o and 90^o inferior angle of scapula on left side in gymers and non gymers.



Graph 6: Mean value of LSST at the position of 0^o, 45^o and 90^o inferior angle of scapula on right side in gymers and non gymers

At Superior angle of scapula:
It was found that at superior angle 0^oshoulder abduction on the right and the left side the p value for scapular dyskinesia is 0.00 which is significant. At 0^oshoulder abduction, p value is less than 0.05,so it shows that scapular dyskinesia is present between group A and group B.At superior angle 45^o, for right and left side there is a significant p value of 0.00 and 0.01 respectively.At 45^oshoulder abduction, p value is less than 0.05,so it shows that scapular dyskinesia is present between group A and group B.Atsuperior angle 90^0, the P value is again significant with 0.05 on the right side and 0.007 on the left side.At 90^oshoulder abduction, p value is less than 0.05, so it shows that scapular dyskinesia is present between group A and group B.

At Spine of Scapula:
At the position of spine of scapula, 0^o position on the right and the left side the p values are insignificant with 0.337 on right and significant with P value 0.05 on the left side.At 45^o, at spine of scapula the p values are 0.093 right, which is insignificant and 0.015 on left which is significant.At 45^oshoulder abduction, p value is less than 0.005, so it shows that scapular dyskinesia is present between group A and group Bon the right side.At 90^o it is with p value of 0.292 on the right and 0.275 on the left.

At Inferior Angle of Scapula:
At the interior angle 0^o, on the right side, the p value is 0.667 and 0.260 on the left. Both are insignificant. At interior angle 45^o on the right, the p value is 0.088 and on the left p value is 0.081.At 90^o, the p value is 0.001 and 0.003 on the left and the right side respectively.At 90^oshoulder abduction, p value is less than 0.05, so it shows that scapular dyskinesia is present between group A and group B.

Result conclude that Null hypothesis is scapular dyskinesia is absent in gymers as compared to the non-gymers is rejected and hypothesis scapular dyskinesia is present in gymers as compared to non-gymersis accepted based on the results of statistical analysis.

5. Conclusion

In the present study it was found that scapular dyskinesia is seen in gymers as compared to non gymers. As the study has been proved significant, the gym protocols can be revised to

include strengthening of the scapular muscles, thus preventing incidences of shoulder pain in gymers.

From present study we can conclude that Scapular dyskinesia is present in gymers as compared to the non gymers. In the current study we have checked scapular dyskinesia with LSST in the selected patient pool. Statistical analysis of the results is done by unpaired t test.

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