



Original Article

Strength Measurement of Scapular Retractors in Female IT Workers Through Dynamometer

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ABSTRACT

All the muscles should function properly whereas scapular muscles have a key role in the normal function and stability of upper extremity and cervical spine for proper position orientation and motion of the shoulder **Objective:** To determine the scapular retractors strength in female IT workers. **Methods:** A descriptive cross-sectional study was conducted on females IT workers working at Arfa Karim Tower, Lahore. A sample of 35 IT workers was selected using nonprobability convenience sampling. After signing an informed consent each subject was assessed for strength of scapular retractors using a handheld dynamometer. By using SPSS 22.0 we analyzed the provided data in which for the quantitative variables mean and standard deviation were used and for the qualitative data we use frequency and percentage. **Results:** The mean strength of Rhomboids Major, Rhomboids Minor and trapezius middle fibers was 14.72 ± 2.91 lbs., 12.38 ± 2.62 lbs and 13.22 ± 3.43 lbs respectively. The average strength of scapular retractors of the dominating hand was 14.72 ± 2.91 lbs with a strength of ranging between 10 lbs and 17 lbs from minimum to maximum. The average strength of scapular retractors of the non-dominant hand was 12.38 ± 2.62 lbs with a minimum strength of 7 lbs and a maximum strength of 14 lbs. **Conclusions:** It is concluded that the strength of Rhomboids Major, Rhomboids Minor and Trapezius middle fibers was lower in female IT workers.

INTRODUCTION

Shoulder muscles pathology in most patients occur due to muscle imbalance, tightness weakness, over activity or sometimes due to under activity [1]. It has been observed that over activity and stiffness of anterior muscles of shoulder in relation with weakness and insufficient activity of posterior muscles of shoulder joint ultimately leads to protraction, anterior tipping and downward rotation of shoulder [2]. A change in shoulder position is seen due to these muscle imbalance, i.e. rounded shoulder position, as a result of which kinematic change in the shoulder occur [3]. In studies many clinicians think about finding out ways to correct these interlinked pathologies [4]. In many literatures different ways of correction of positions have been examined by extending of tight muscles, reinforcing of weak and lengthened muscles or by using manual therapy [2,5].

The required and accurate task of every muscle of the shoulder girdle is critical in the position, orientation, and movement of the shoulder [6]. However, normal function of shoulder causes changes in shoulder kinematics [3]. Anterior muscles of the shoulder are more likely vulnerable to becoming tightened and over-active [7]. However shoulder stabilizers rhomboids, serratus anterior, and rotator cuff are also susceptible to becoming less active and deteriorating this is seen mostly in office jobs workers [8]. In different researches, it has been evaluated that change to kinematics of shoulder and inhibition of surrounding muscles occur due to fatigue, trauma to muscle and any painful condition which is due to length-tension relationship [9].

It has been observed in individual who works for more than 8 hours a day and involved in desk job are related to

overactive of tight anterior muscles of shoulder girdle the shoulder in protracted position [10]. Anterior tightness ultimately puts additional load on posterior musculature due to which they become weak or lengthened [7]. As a result of constant stretch and tightness of lengthened muscles commonly found in rounded shoulders it will cause a myofascial pain [11]. Smooth-edged shoulder position has often remained linked with shoulder pathology, which includes impingement due to reducing space in the sub-acromial joint, high risk of inter-scapular pain, and thoracic outlet syndrome. Also, many postural abnormalities like kyphosis, forward neck posture and scapular muscle tightness are associated with the rounded shoulders. In One study of 88 participants, it was observed that those subjects with prolonged sitting position have a high prevalence of interscapular pain and those with familiar head posture had various sort of body aches most probably intracapsular pain, cervical pain and headache [12]. The posterior musculature of the neck and back forced to continuously contract to develop in painful myofascial points due to this variation in muscle function increases pain frequency and leading to headaches [2]. Positional modifications may result functional changes that may be seen clinically as postural changes and may predispose someone to injury [12]. Remarkable alterations in scapular kinematics or resting position can be generally defined as rounded shoulder posture, with clinical symptoms of excessive scapular protraction, anterior tipping, and internal rotation [2]. The main aim of this study was to assess the scapular retractors' strength in female IT workers.

METHODS

A descriptive study was conducted and completed in a duration of 02 months after completion of the synopsis. A sample of 35 female IT professionals was enrolled in this study. Non-probability convenience sampling was used to enroll participants in this study. Healthy female IT workers between the ages 20-50 years were included. Women with any fracture, with any injury or postural deformity of the body, systemic disease, women with any postural deformity were excluded. Power of the scapular retractors (middle trapezius and rhomboids) was measured as elucidated by Kendall. The individuals were laid head down on a plinth with the shoulder abducted to the right angle and the humerus rotated laterally. Thumb projecting towards the roof. The location of the resistance force applied by the tester was modified whereby the dynamometer was placed on the spine of the scapula around 2/3 of the distance from the root of the spine to the posterolateral angle of the acromion. The modified orientation is to isolate the

measured forces to the scapulothoracic musculature and to avoid the involvement of other muscular forces (e.g., rotator cuff). Resistance was applied in an anterolateral direction in line with the humerus. Subjects were asked to retract the scapula and hold it for 5 seconds and the reading on the handheld dynamometer was recorded. This procedure was repeated three times and an average value was calculated. After taking informed written consent. Data was collected through a Questionnaire. Information was evaluated using SPSS. Mean and SD was calculated for quantitative variables whereas the qualitative data were presented in the form of frequency and percentage.

RESULTS

The mean age of the females was 28.14 ± 3.182 years with a minimum age of 22 years and a maximum age of 35 years. The mean strength of Rhomboids Major, Rhomboids Minor and trapezius middle fibers was 14.72 ± 2.91 lbs., 12.38 ± 2.62 lbs and 13.22 ± 3.43 lbs respectively. The mean strength of the scapular retractors of the dominant hand was 14.72 ± 2.91 lbs with a minimum strength of 10 lbs and a maximum strength of 17 lbs. The mean strength of scapular retractors of the non-dominant hand was 12.38 ± 2.62 lbs with a minimum strength of 7 lbs and a maximum strength of 14 lbs (Table 2).

Variables	Average Strength Rhomboids Major	Average Strength Rhomboids Minor	Average Strength Trapezius (Middle Fibers)
Mean	14.72	12.38	13.22
SD	2.91	2.62	3.43
Minimum	11.00	8.00	10.00
Maximum	19.00	15.00	18.00

Table 1: Average Strength of Scapular Retractors

Variables	Minimum	Maximum	Mean	SD
Average Strength Dominant Hand	10.00	17.00	14.72	2.91
Average Strength Non-Dominant Hand	7.00	14.00	12.38	2.62

Table 2: Average Strength of Scapular Retractors Dominant and Non-Dominant Hand

DISCUSSION

For the muscles of the shoulder girdle to best perform their roles optimally, they must have at least one stabilized attachment site. Muscles without a stabilized attachment site cannot produce apposite or maximal torque with a concentric contraction, thereby decreasing their strength and contributing to problems not only with strength production but also of muscular imbalance [13]. The stability of the scapula is especially important as it has been described as attaching to as many as eighteen muscles. Several studies have recorded scapular motion

alterations due to fatigue [14,15]. Though the results vary between these studies, due in part to the variety of fatigue tasks chosen, they consistently reflect changes in scapular kinematics. A previous set of studies in lab showed increases in scapular IR, decreases in scapular posterior tilting, and altered activation ratios in the serratus anterior, upper trapezius, and lower trapezius [16]. Ludewig and Cook reported improved upper and lower trapezius activation and reduced serratus anterior activation in addition to decreased posterior tilting during arm elevation in construction workers with subacromial impingement syndrome (SIS) [17]. Cools et al showed imbalances between the muscle activation ratios of the upper trapezius and serratus anterior in athletes with SIS [18]. Serratus anterior (SA) works in synergy with the upper trapezius and lower trapezius to upwardly rotate the scapula [19]. The SA and trapezius are the only muscles responsible for upward rotation of the scapula and no other muscle has an adequate line of action for this task. Together they form a force couple for controlled upward rotation of the scapula. This force couple provides a consistent motion regardless of the plane of elevation [19]. To do this activation ratios are altered, providing more activation to the muscles in the couple that provides optimal support for the given orientation. If SA were to fatigue this relationship would be altered and the trapezius would have to compensate via increased activations. In the case of abduction, the trapezius is the primary upward rotator in the force couple and has been shown to compensate well, allowing the scapula a full range of upward rotation, albeit with a decrease in strength. This is not the case in flexion, where the SA is the primary upward rotator and solely responsible for the anterior positioning of the scapula [20,21]. In flexion, without SA, not only is their loss of strength but also range of motion losses up to 50.

CONCLUSION

It is concluded that the strength of Rhomboids Major, Rhomboids Minor and Trapezius middle fibers was lower in female IT workers.

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