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A positive scapular assistance test is equally present in various shoulder disorders but more commonly found among patients with scapular dyskinesis

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ABSTRACT

Objective: Assess the frequency of a positive scapular assistance test (SAT) in different shoulder disorders and establish its association with scapular dyskinesis.
Design: Cross-sectional.
Setting: Shoulder clinic.
Participants: Seventy-four patients.
Main outcome measures: The SAT and visual assessment of scapular movement were performed by a physical therapist. An orthopaedic surgeon classified participants into 4 diagnostic categories: rotator cuff disease, superior labrum anterior posterior lesion (SLAP), shoulder instability, and other.
Results: Twenty-seven (36.5%) participants presented with a positive SAT. The SAT was positive among 9 of 28 participants (32.1%) with rotator cuff disease, 7 of 23 participants (30.4%) with SLAP lesions, 9 of 21 participants (42.9%) with shoulder instability, and 2 of 2 participants (100.0%) with other pathologies. The frequency of a positive SAT did not differ between the various diagnostic categories ($P = 0.64$). The SAT was more frequently positive among participants with scapular dyskinesis (48.5% versus 26.8%, $P = 0.05$).
Conclusions: The SAT is found similarly positive among patients with various common shoulder disorders. Although associated with scapular dyskinesis, the SAT was positive in less than half of those demonstrating scapular dyskinesis suggesting the SAT may help identify patients in whom altered scapular movement is contributing to shoulder pain.

1. Introduction

Shoulder disorders such as subacromial impingement syndrome, rotator cuff disease, and shoulder instability, are often associated with altered scapular kinematics (Illyes & Kiss, 2006; Laudner, Myers, Pasquale, Bradley, & Lephart, 2006; Ludwig & Cook, 2000; Ludwig & Reynolds, 2009; Lukasiewicz, McClure, Michener, Pratt, & Sennett, 1999; Ogston & Ludewig, 2007; Paletta, Warner, Warren, Deutsch, & Altchek, 1997; Struyf, Nijs, Baeyens, Mottram, & Meeusen, 2011; Warner, Micheli, Arslanian, Kennedy, & Kennedy, 1992). These kinematics, which typically consist of decreased or increased angular and/or linear motion of the scapula in the various planes of motion, are collectively referred to as scapular dyskinesis. Although 3-dimensional motion analysis can be used to assess scapular dyskinesis, this type of analysis is not feasible in clinical practice, where clinicians often rely on visual observation to determine the presence or absence of altered scapular movement.

Different methods for visually assessing scapular movement have been previously described (Kibler et al., 2002; McClure, Tate, Kareha, Irwin, & Zlupko, 2009; Odom, Taylor, Hurd, & Denegar, 2001; Shadmehr A Sarfaraz, Heidari Blooki, Jalaie, & Morais, 2016; Shadmehr, Bagheri, Ansari, & Sarafraz, 2010). These methods typically rely on the amount of lateral movement of the

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scapula from the spine during shoulder elevation (Odom et al., 2001; Shadmehr A Sarfaraz et al., 2016; Shadmehr et al., 2010), the degree of prominence of the medial border and/or inferior angle from the upper back, the amount of scapular elevation (shrug), or the overall smoothness of scapular motion during shoulder elevation (Kibler et al., 2002; McClure et al., 2009). One factor limiting the interpretation of these tests is the relatively high frequency of abnormal findings among healthy individuals. In fact, several previous studies found a similar rate of abnormal findings among healthy individuals and patients with shoulder disorders (Odom et al., 2001; Plummer, Sum, Pozzi, Varghese, & Michener, 2017; Shadmehr A Sarfaraz et al., 2016; Shadmehr et al., 2010). Furthermore, as some alterations in scapular motion are thought to be compensatory rather than contributing to shoulder pain (McClure, Michener, & Karduna, 2006; Wassinger, Sole, & Osborne, 2013), clinicians may be left with no clear indication for the need to address abnormal scapular movement when this is observed.

Given the limitations of visual assessment (McClure et al., 2006; McClure et al., 2009; Odom et al., 2001; Plummer et al., 2017; Shadmehr A Sarfaraz et al., 2016; Shadmehr et al., 2010; Wassinger et al., 2013), alternative methods for assessing the role of scapular movement in shoulder disorders seem warranted. Symptom alteration tests possess one such alternative (McClure, Greenberg, & Kareha, 2012; Struyf et al., 2012), as instead of gauging the adequacy of scapular movement, they aim to determine whether shoulder symptoms are affected by modifications in scapular orientation (Kibler, 1998; Tate, McClure, Kareha, & Irwin, 2008). The scapular assistance test (SAT) is one such test that includes manual assistance to upward rotation and posterior tilt of the scapula during arm elevation (Kibler, 1998; Rabin, Irrgang, Fitzgerald, & Eubanks, 2006). The test is considered positive when pain associated with arm elevation subsides with assisted scapular movement. According to Kibler (Kibler, 1998), a positive SAT suggests inadequate acromial elevation due to inhibition of the serratus anterior and lower trapezius (Kibler, 1998). Subsequent research found increased scapular upward rotation, posterior tilt, and a greater acromiohumeral distance during the application of the SAT, thus providing some support to Kibler's claim (Seitz et al., 2012a, 2012b). The SAT has also been previously shown to possess adequate interrater reliability (Kopkow, Lange, Schmitt, & Kasten, 2015; Rabin et al., 2006).

Unlike the great body of work concerning the association of scapulothoracic kinematics and shoulder pathology, [5, 11 – 14, 20, 21, 31, 35] very little is known about the association of the SAT with different shoulder pathologies (Kopkow et al., 2015; Rabin et al., 2006), or its association with visually-observed scapular dyskinesis. Given the unique information potentially provided by the SAT, we aimed to further explore this test by comparing its frequency among patients with different shoulder disorders, as well as by determining its association with visually-observed scapular dyskinesis. We hypothesized the SAT would be rated positive more frequently among patients with rotator cuff disease as well as among patients demonstrating scapular dyskinesis.

2. Methods

The study was approved by the Institutional Review Board of XXXXXXXXXX, and all participants signed a consent form prior to participating in any of the procedures of the study.

2.1. Participants

Consecutive patients referred to an outpatient shoulder surgery unit within a large medical center were recruited for this study. Participants were included if they complained of shoulder pain (proximal arm and/or peri-acromial area), if they were able to actively flex their shoulder 135° or more, if their symptoms were reproduced by active shoulder flexion, and if they underwent a magnetic resonance imaging (MRI) study of their shoulder within the 6 months prior to participation in the study. Exclusion criteria included involvement of the cervical spine, as evidenced by symptom provocation with neck movement, a previous history of shoulder surgery or fracture, as well as a history of rheumatoid arthritis, or fibromyalgia.

2.2. Examiners

Two examiners collected data for this study. One examiner, a board-certified orthopaedic surgeon with over 21 years of experience in shoulder surgery, determined the diagnosis of all participants, while the other examiner, a physical therapist with over 19 years of experience in managing musculoskeletal conditions, performed visual rating of scapular movement as well as the SAT. The examiner performing the SAT was involved in a previous study establishing the inter-rater reliability of this test (Rabin et al., 2006), and has been using this test routinely during clinical practice for over 10 years. In order to minimize rater bias, assessment of scapular movement, which is based on rater perception, was performed before the SAT, which is rated based on participant's pain response.

2.3. Procedure

Following informed consent, participants provided demographic information and completed an 11-point (0–10) Numeric Pain Rating Scale (NPRS) which averages the current, worst and minimal intensity of pain over the preceding 24 h, as well as the quick DASH (Disabilities of the Arm Shoulder and Hand) questionnaire. Participants then underwent visual assessment of scapular motion and the SAT by a physical therapist, immediately followed by evaluation of an orthopaedic surgeon. Neither examiner (physical therapist or orthopaedic surgeon) had knowledge of the results of the other examiner while performing his assessment.

Assessment of scapular movement: the examiner stood behind the participant and observed scapular motion while the participant was asked to flex both shoulders 5 times simultaneously. The examiner classified scapular movement into one of 4 patterns based on a modification of a previously described classification: (Kibler, 1998) 1.) pattern 1 - excessive prominence of the inferior angle; 2.) pattern 2 – excessive prominence of the entire medial border; 3.) pattern 3 - excessive upward translation of the scapula; 4.) pattern 4 - normal scapular movement (i.e. none of the previous 3 patterns) (Kibler, 1998). Participants demonstrating patterns 1–3 were subsequently classified as having scapular dyskinesis, while participants exhibiting pattern 4 were classified as having normal scapular movement (Uhl, Kibler, Gecewich, & Tripp, 2009). In contrast to the original classification which relied on asymmetry of scapular motion (Kibler, 1998), we classified scapular movement independent of the presence or absence of asymmetry. This is because relying on asymmetry will often lead to a normal rating (pattern 4) in the presence of clear scapular movement