

IMMEDIATE EFFECTS OF ACTIVE VERSUS PASSIVE SCAPULAR CORRECTION ON PAIN AND PRESSURE PAIN THRESHOLD IN PATIENTS WITH CHRONIC NECK PAIN

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ABSTRACT

Objective: The purpose of this study was to investigate the effect of active vs passive scapular correction on pain and pressure pain threshold at the most symptomatic cervical segment in patients with chronic neck pain.

Methods: Twenty-three volunteers with chronic, idiopathic neck pain were recruited (age, 38.9 ± 14.4 years; sex [man/woman], 3/20; Neck Disability Index, $28.1\% \pm 9.9\%$). Subjects were randomly allocated to 2 groups: active scapular correction or passive scapular correction. Pressure pain threshold and pain intensity rated on a numerical rating scale during a posteroanterior glide over the most symptomatic cervical segment were measured before and immediately after the active or passive scapular intervention.

Results: Only the active scapular correction produced a reduction in pain (pre, 6.3 ± 1.2 ; post, 3.7 ± 2.4 ; $P < .05$) and increase in pressure pain threshold (pre, 8.7 ± 4.2 kg/cm²; post, 10.1 ± 3.8 kg/cm²; $P < .05$) at the most painful cervical segment.

Conclusions: An active scapular correction exercise resulted in an immediate reduction of pain and pressure pain sensitivity in patients with chronic neck pain and scapular dysfunction. (*J Manipulative Physiol Ther* 2014;37:660-666)

Key Indexing Terms: Neck Pain; Exercise; Scapula; Intervention; Randomized Trial

Clinical theory contends that aberrant scapular posture and associated changes in axioscapular muscle activity may contribute to or exacerbate painful neck disorders by adversely affecting mechanical stress on pain sensitive cervical structures.¹ For instance, it has been suggested that a depressed scapula may lead to thoracic outlet syndrome with stress on muscle tissue (eg, overstretching of the upper trapezius) and compression of the neurovascular bundle of the upper limb.² Consequently, scapular postural correction strategies have been advocated as a component of the intervention for patients

with neck pain who display an alteration of scapular orientation.³⁻⁵

Correct scapular position at rest and during movement depends on appropriate coordination between axioscapular muscles such as the serratus anterior and all 3 divisions of the trapezius muscle.³ A scapular postural correction exercise has been shown to be effective at altering the pattern of activity of the middle and lower fibers of the trapezius muscle in patients with neck pain to better reflect that displayed by healthy individuals.⁶ However, most studies assessing scapular orientation and scapular control

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with movement have been conducted in patients with shoulder pain and dysfunction.^{7,8} Little is known about the consequence of altered scapular orientation on neck pain or the effect of axioscapular muscle exercise on neck pain symptoms.

The purpose of this study was to investigate the immediate effects of an active scapular correction exercise on pain and pressure pain thresholds (PPTs) over the most cervical symptomatic segment in patients with chronic neck pain and scapular dysfunction. The active intervention was compared with a passive scapular correction to evaluate the importance of the active component of scapular correction on neck symptoms.

METHODS

Participants

Volunteers aged between 18 and 60 years with chronic idiopathic neck pain were invited to participate in the study. Recruitment was performed during the year 2012 by notices distributed in different universities and hospitals of Valencia (Spain). Data collection was performed at the University CEU Cardenal Herrera, Valencia, Spain. Besides presenting with a history of neck pain lasting 3 months or more over the last year, patients were required to have a score of greater than or equal to 5/50 on the Neck Disability Index (NDI), the minimal score required to reflect the presence of at least a mild neck pain disorder.⁹ The Spanish validated version of NDI was used.¹⁰ To justify the application of a scapula correction strategy, the presence of scapular dyskinesis was also required (for details see below). *Scapular dyskinesis* is a term used to refer to impairment of scapula position or movement.¹¹

Subjects were excluded if they had previous cervical spine or shoulder surgery, cervical radiculopathy, presence of a severe systemic disease (ie, diabetes), fibromyalgia, or other widespread musculoskeletal pain syndromes (ie, chronic fatigue syndrome) or had participated in an exercise program for the neck or scapular muscles in the 6 months preceding the study. Patients were also advised to avoid consumption of stimulants (caffeine and nicotine) or analgesic drugs for at least 8 hours before the study.

The study was approved by the Ethics and Research Committee of the University CEU Cardenal Herrera, Valencia, Spain. Procedures were conducted according to the Declaration of Helsinki. All subjects provided consent to participate in this study.

Study Design

Patients were randomly allocated to 2 groups using a computer-generated sequence of numbers by an indepen-

dent researcher. In the active group, the patients were instructed to perform an active exercise to correct their scapula position to a neutral position, whereas the scapula was passively positioned in a neutral position in the other group. Because the 2 interventions (active/passive) involved therapist facilitation, the patients were blinded to the intervention type. Surface electromyography (EMG) was detected from the lower trapezius during both interventions (active/passive), and the absence of muscle activity during the passive correction was confirmed. A second investigator, blinded to the intervention type, performed the outcome measures before and immediately after scapula correction. This included PPTs over the most symptomatic cervical segment and over the tibialis anterior muscle ipsilateral to the side of intervention. Moreover, pain intensity was rated on a numerical rating scale (NRS) by the patient as the investigator performed a posteroanterior glide over the most symptomatic cervical segment (same location as the PPT measurement).¹²

Procedure

Volunteers for the study were firstly screened to confirm the presence of scapular dyskinesis. This assessment was performed by a physical therapist with 10 years of experience of assessing patients with neck pain for scapular dysfunction. In addition, the same therapist determined the most symptomatic cervical segment on manual examination of the cervical spine and pain intensity on an NRS during a grade IV unilateral posteroanterior glide on this most painful segment was determined. This cervical segment was then marked for the PPT assessment.

Pressure pain threshold at the same site was then measured by another investigator blinded to the group allocation of each patient (active or passive). Upon completion of the intervention and after a rest period of 60 seconds, measurement of pain intensity during a grade IV unilateral posteroanterior glide on the same painful segment and PPT measures was repeated.

Assessment of Scapular Dyskinesis. Assessment of scapular dyskinesis was performed using the Scapular Dyskinesis Test.¹³ This test has shown good reliability and validity¹⁴ for the identification of scapular dyskinesis. Briefly, each patient was required to do 5 repetitions of active shoulder flexion and abduction, bilaterally, while holding a weight with their hands (1.4 kg for patients weighting <68.1 kg and 2.3 kg for patients weighing >68.1 kg). The patients were asked to elevate their upper limbs as far as possible while keeping their thumbs pointing upwards and then return to neutral. Each cycle of upper limb elevation and return to the start position lasted 6 seconds (3 seconds per phase). A therapist was positioned ~2 m behind the patient to evaluate the presence of aberrant mobility of the scapula. The presence of scapular dyskinesis was confirmed by visual observation of any of the following movement anomalies:

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