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Effects of passive correction of scapular position on pain, proprioception, and range of motion in neck-pain patients with bilateral scapular downward-rotation syndrome☆

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ABSTRACT

The effects of passive correction of scapular position (PCSPT) on pain, proprioception, and range of motion (ROM) were investigated in neck-pain patients with bilateral scapular downward-rotation (SDR).

Fifteen neck-pain patients with bilateral SDR were recruited from a workplace based work-conditioning center. The intensity of pain felt was quantified using a visual analogue scale. Kinematic data for ROM and joint-position error (JPE) were analyzed using a 3-dimensional motion-analysis system. Differences in pain, JPE, and ROM with and without PCSPT were assessed using a paired *t*-test. PCSPT significantly decreased JPE and neck pain during active neck rotation and significantly increased neck-rotation ROM ($p < 0.05$).

These findings suggest that PCSPT results in decreased neck pain and improved neck-rotation ROM and proprioception during active neck rotation in neck-pain patients with bilateral SDR.

1. Introduction

Normal scapular alignment is required for optimal scapulohumeral motions. Scapular alignment is an indicator of possible changes in muscle length and joint position (Sahrmann, 2002). Bunch and Siegel (1993) described a standard for scapular alignment, which specifies that the vertebral border of the scapula is parallel to the spine and is positioned approximately 3 inches from the midline of the thorax. The scapula is situated on the thorax between the second and seventh thoracic vertebrae; it lies flat against the thorax and rotates 30° anterior to the frontal plane (Hoppenfeld, 1976; Magee, 1997; Sahrmann, 2002; Kendall et al., 2005).

Previous investigators have described how changes in alignment or movement in shoulder regions has the potential to alter the biomechanics of the cervical-spine and produce cervical pain (Griegel-Morris et al., 1992; Szeto et al., 2002). Impairments in scapular alignment are believed to be correlated with specific movement-related diagnoses and they provide clues on the cervicoscapular muscle length (Caldwell et al., 2007; William et al., 2010). Impaired alignment of the scapula may be classified as scapular downward-rotation (SDR), depressed, elevated, adducted, abducted, tilted, or winged (Kendall et al., 2005). SDR is defined as a downwardly rotated scapula with the inferior border being more medial than the superior border; the shoulder is lower and slopes downward at the acromial end. SDR can contribute to prolonged compressive loading of the cervical spine as a result of the transfer of the weight of the upper extremities to the cervical region through the attachments of the cervicoscapular muscles (upper trapezius and levator scapulae) (Van Dillen et al., 2007). Increased upper trapezius muscle length in SDR does not effectively transfer the weight of an upper extremity load to the sternoclavicular joint (Johnson et al., 1994), and increased levator scapulae muscle stiffness may contribute increased compressive load and shear force on the cervical spine during active neck movement (Szeto et al., 2002). Repetitive and excessive stress in the cervical structure has the potential to cause cumulative microtrauma to tissue in the cervical region, neck pain, and limited neck-rotation range of motion (ROM) (McDonnell et al., 2005; Van Dillen et al., 2007). Together with pain, a common feature of neck disorders is reduced ROM of the neck (Armstrong et al., 2005; Sterling et al., 2003).

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