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Neck position accuracy, kinesthesia, kinematic impairment, motor control and pain: A randomized control trial study in patients with upper trapezius muscle trigger point before and after fatigue

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Aim: The aim of this work was to investigate the cervical position sense and Electromyography (EMG) responses of cervical muscles during head reposition movements in students with and without an upper trapezius muscle trigger point.Neck pain is a common condition in the general population and individuals with neck disorders often display decreased spatial control (cervical kinaesthesia) of the head and neck compared with healthy controls Altered cervical kinaesthesia has been suggested to be due to altered proprioceptive feedback from neck muscles which is in line with findings of altered proprioceptive function and muscle activity and atrophied neck muscles in neck pain populations. Furthermore, disturbed cervical kinaesthesia may cause a sensory mismatch when combining information from cervical proprioceptive afferents with other sensory sources (e.g. visual and vestibular system), which has been suggested as the underlying reason for clinical symptoms of decreased postural control , unsteadiness and dizziness as observed in neck pain populations. Particularly, altered cervical kinaesthesia within the horizontal plane has been suggested to be related with symptoms of dizziness, impaired balance, and self-reported pain and disability in people affected by neck pain.

One way of assessing cervical kinaesthesia is by testing head repositioning accuracy, either in the horizontal or vertical movement's planes, or by using more complex movement patterns also known as a test of joint positioning error. Interestingly, although sensory input from the muscles are thought to play an important role in cervical kinaesthesia, not many studies have actually investigated this directly. While several studies have found differences in head repositioning accuracy (HRA) in clinical neck pain compared to healthy participants this only shows that neck pain is linked to altered head repositioning accuracy, but cannot tell us if muscle pain is responsible for this discrepancy between groups. In fact, only one study by Maelstrom et al. has investigated HRA after experimental neck muscle pain (injection of hypertonic saline) in healthy participants and reported this to be decreased ipsilateral to the injection. While the literature suggests that the proprioceptive input from neck muscles plays a crucial role when testing head repositioning accuracy, nobody thus far has investigated the influence of a cognitive task. This would be of great interest as, in daily life, spatial control of the head/neck is commonly performed in a context with "disturbance" from cognitive tasks (e.g. work tasks, engaging in conversation, shopping etc.), but the specific effect of such "disturbances" on clinical tests are not known.

The aim of the present study was to investigate the effect of unilateral experimental neck pain, as well as the influence of a cognitive task, on HRA in healthy participants. It was hypothesised that experimental neck pain would decrease head repositioning accuracy, and that this would further deteriorate with the introduction of a cognitive task. It was expected that movements ipsilateral to the experimental pain would be most affected. Furthermore, it was hypothesised that those most accurate during the HRA test would be most impacted by pain when compared to the least accurate participants.

KEY WORDS: upper trapezius muscle, trigger point, fatigue, joint position sense error.

Introduction-

Fatigue of the neck musculature has been shown to alter the upper limb proprioception, motor patterns, and kinematics. The objective of this work was to investigate the cervical position sense and EMG responses of cervical muscles during head reposition movements in students with and without an upper trapezius muscle trigger point.

Method: The evaluations were performed with the patient seated comfortably in a chair with both feet flat on the digital balance, hips and knees flexed at 90°, buttocks positioned against the back of the chair and treated shoulder unclothed. Volunteers were asked to sit on a chair in an upright position with relaxed arms positioned at the sides of their body. The head was kept in the same position as the trunk and the vertebral column. During the test, the subjects were asked to look forward with no cervical and trunk rotation, extension or flexion. Such was the position of the subjects. Different receptors convey each somato sensory information which includes pain, temperature, and tactile sensations as well as conscious proprioception. The position sense test measures the accuracy of position replication and can be conducted actively (active position sense) or passively (passive position sense) in both open and closed kinetic chain positions. Furthermore, it had been suggested that the position sense decreased albeit the shortening muscle during the position sense measurement involved muscle fatigue. It ensures that the increase in Joint Position Sense (JPS) was really as a result of fatigue. In the absence of fatigue, there could be further improvement or no change in Joint Position Sense (JPS).

Result: The results of the present study showed that the fatigue of Trigger Points (TrPs) significantly improved the Range of Motion (ROM) of the thoracolumbar spine, PPT, and Visual Analogue Scale (VAS) when compared to compression at non-trigger point.Neck muscle fatigue had different effects on neck

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kinematics for each group. JPSE in neck side bending repositioning was significantly greater following the upper trapezius fatiguing protocol during a frontal plane.

Neck pain and myofascial trigger point alter cervical kinematics probably due to altered timing. As hypothesized, fatigue impacted cervical kinematics more in healthy participants, possibly because altered neck motor control in patients meant that this group was less able to compensate further in response to neck muscle fatigue. Significant increases in PPT were observed following fatigue applied to the pre-determined MTrP,

Conclusion: In general, the results of the included studies give an equivocal answer to the question of whether the Joint Position Sense Error (JPSE) is higher in people with cervical spine lesions caused by trauma and/or non-traumatic neck complaints than in controls. The increased accuracy was most pronounced for movements directed towards the activated side. Hence, prolonged unilateral neck contraction may increase the sensitivity of cervical proprioceptors. Cervical range of motionin side bending was the only variable associated with changes in neck pain.

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