

Does the region of pain influence the presence of sensorimotor disturbances in neck pain disorders?

Treleaven J, Clamaron-Cheers C and Jull G (2011) Does the region of pain influence the presence of sensorimotor disturbances in neck pain disorders? *Manual Therapy* 16: 636-640. (Abstract prepared by Ricky Bell)

Objective

To determine whether sensorimotor impairment was greater in individuals suffering pain from the upper cervical spine compared to the lower cervical region, while factoring in the presence or absence of trauma.

Methods

Sixty-four participants aged between 18 and 55 years with persistent neck pain (traumatic or insidious onset) of greater than three months duration, and a Neck Disability Index (NDI) score of at least 10/100 were recruited from a University Whiplash Research Unit. Based on clinical examination, participants were divided into four groups: upper (n=21) or lower (n=15) cervical region, non-traumatic; and upper (n=13) or lower (n=15) cervical region, traumatic. Measures such as NDI, smooth pursuit neck torsion (SPNT; evaluation of eye movement while following a moving laser light), cervical joint position error (JPE; measure of blindfolded participants neck reposition sense following extension and rotation), and balance tests performed in narrow stance (eyes open and eyes closed) were compared between groups.

Results:

Significantly smaller deficits ($p < 0.03$) were evident in the lower region non-traumatic group in SPNT, and when measured against both trauma groups, less total energy of sway was evident on the eyes open balance tests ($p < 0.05$). Significantly larger deficits ($p < 0.04$) in JPE were only demonstrable in the upper region traumatic group after rotation to the right when measured against both lower groups. A post-hoc analysis with NDI as a co-variate demonstrated significant differences ($p < 0.05$) between both non-traumatic groups in SPNT and both trauma groups for JPE rotation right; no differences were seen for balance tests.

Conclusions

Participants with non-traumatic lower cervical region pain generally showed less sensorimotor impairment. However, there were no significant differences in balance and JPE measures between both non-traumatic groups. Similarly, there were no significant differences in any of the sensorimotor tests between the upper non-traumatic group and both trauma groups. In conclusion, despite anatomical and physiological evidence to imply that cervical afferents from the upper cervical region make a greater contribution to sensorimotor control than the lower cervical region the proposition that upper cervical region pain generates greater dysfunction cannot be verified.

Commentary

This research is the first to ascertain whether any differences exist in impairments of eye movement control, joint position sense or balance in individuals with a disorder clinically attributable to the upper cervical region compared to those with a disorder to the lower cervical region.

Although conducted by a respected group of researchers, the findings of this study were not categorical and contrast to previous beliefs about increased sensorimotor deficits in the cervical spine when trauma is involved (Field et al 2008, Sjölander et al 2008). Nonetheless, it still contributes to the knowledge base and body of evidence with regard to sensorimotor function in the cervical spine.

The authors readily identify that the hypothesis being investigated may be more of a theoretical rather than clinical concept, as it was difficult to identify individuals with discreet upper or lower cervical spine disorders (meaning that the number of participants in each group was smaller than anticipated). As is the case for the majority of neck pain patients, particularly when trauma is involved, pain is often generated from multiple sources confined not only within the upper or lower cervical spines but also other regional structures. Subsequently, although the methodology of this study was of sound quality, it was inadequately powered which may have limited the ability to identify certain trends and comprehensively answer the research question.

Current research and clinical experience suggests that altered sensorimotor function in the cervical spine might be a significant contributing or maintaining factor in some patients with neck pain, regardless of the aetiology of symptoms. It could be advocated that assessment and management of abnormal cervical somatosensory input and sensorimotor control in neck pain patients is an integral part of the rehabilitative process as it is in lower limb proprioceptive retraining following an ankle or knee injury (Treleaven 2008). In the research arena it is sometimes easier to detect a difference than it is to explain it, hence questions of mechanism, as is the case with altered sensorimotor function in the cervical spine, is more difficult to interpret. Subsequently, the findings of this study and previous research suggest that the key components contributing to sensorimotor disturbances and persisting pain states in the cervical spine may be processes involved with the pain system and centrally mediated mechanisms rather than structural anomalies or peripheral processes (Field et al 2008).

From a practical perspective, with the exception of the balance measures, the sensorimotor tests used in this study are not readily reproducible or accessible in a typical clinical setting. Nevertheless, although low in the hierarchy of evidence, a previous single case study by one of the authors showed some positive results utilising more clinically applicable methods based purely on a tailored sensorimotor control programme (Treleaven 2010). This suggests that sensorimotor retraining protocols need not be exhaustive or technical to be efficacious and can be used with those patients who present with persisting neck pain without the need for expensive apparatus.

In summary, although the results of this study were not definitive, sensorimotor testing and re-training may have relevance in the management of those with persisting neck pain and play a role in reducing the incidence of ongoing pain and dysfunction. As is the case with most musculoskeletal presentations, cervical pain is a multi-factorial event involving many different systems and it is the clinician's role to determine the main causative or maintaining factor. Hopefully this study will stimulate further research in this area in order to improve the management strategies of this common problem.

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