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Detangling the Nerve: Neurodynamics

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Abstract

Neural mobilization is a treatment modality used in relation to pathologies of the nervous system. Neurodynamic testing has proven its effects as a diagnostic tool differentiating other pathologies and a mechanism through which one can observe if the underlying problem has a neurogenic effect. Some research has been made using mechanosensitivity of the nervous system, a normal protective mechanism that includes symptom production, increases in muscle tone, and subsequent reductions in range of motion in the lower limb. Some studies also adrees the use of neurodynamics as a means by which one can alter some muscle properties, for example tone and articular properties, such as flexibility. Results regarding the therapeutic effect of neurodynamics in clinical settings results are still spare and inconclusive and in need of more valuable, robust studies.

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Introduction

In manual therapy, the physical examination as a powerful tool for diagnosis, one must aim to determine the exact tissue that pain arises from to making the assessment very specific. One knows that if your neural tissue is impeded then pain or restriction of your nerve movement is a common result. Relationships between brain states, mental states, and behavioral states are at the core of cognitive neuroscience and neurodynamics (Atmanspacher & Rotter, 2008).

The adverse neural tension can result in nerve pain and limited motion. With an accurate assessment and treatment to the structure causing the adverse neural tension, there is the possibility of restoring the mobility of the nerve and reduction of pain. Ellis and Hing (2008) summarized the findings of ten randomized clinical trials (discussed in 11 retrieved articles) that discussed the therapeutic effect of neural mobilization. It highlighted the lack in quantity and quality of the available research. Qualitative analysis of these studies revealed that there is only limited evidence to support the use of neural mobilization. Future research needs to re-examine the application of neural mobilization with use of more homogeneous study designs and pathologies; in addition, it should standardize the neural mobilization interventions used in the study. (Ellis & Hing, 2008).

Coppieters., *et al*. (2005) add that a prerequisite for the use of sensitizing manoeuvres to identify neural involvement is that the addition of sensitizing manoeuvres has no impact on pain. Perception when the origin of the pain is non-neural. The authors highlight the ongoing debate over the contribution of neural and non-neural tissues to the elicited symptoms because many structures are affected by

these tests. Their study focused on the straight leg raising and slump test used for the assessment of mechanosensitivity of neural tissues. Coppieters., *et al*. (2005), in their study induced experimental muscle by injection of hypertonic saline in tibialis anterior or soleus in 25 asymptomatic, naïve volunteers. The intensity and area of experimentally induced muscle pain did not increase when sensitizing maneuvers were added to the SLR or throughout the successive stages of the slump test, therefore validating sensitizing manoeuvers.

Another study, a recent systematic review of SLR testing indicated a lack of standardization, including the use of various criteria for determining the test end point (Rebain., *et al*. 2002). The use of ankle dorsiflexion is an appropriate sensitizing maneuver for SLR neurodynamic testing and performing the test to the first onset of symptoms provides sufficient information to assist structural differentiation. This study was limited to individuals with no history of nerve injury and the use of precise instrumentation for assessing range of motion and muscle activity (Boyd., *et al*. 2009).

Structural differentiation is an important aspect that emphasizes the neural tissues as opposed to musculoskeletal tissues (Schacklock, 2005). Regarding other structures that can be involved in neurodynamics, Caballero., *et al*. (2004) tried to determine if an isolated neurodynamic sciatic sliding technique would improve hamstring flexibility to a greater degree than stretching or a placebo intervention in asymptomatic subjects with short hamstring syndrome (SHS). They concluded that these techniques improve hamstring flexibility in sports and may lead to a decreased incidence in injuries (Castellote-Caballero., *et al*. 2014). These results again, although promising need to be evaluated for a long-term interval and combined with other interventions. Muscle activity provoked during the sensitized SLR test is thought to provide a protective mechanism to restrict further movement and to help prevent overstretch nerve injuries (Hall.m., *et al*. 1998).

Neurodynamic testing can also produce increases in local muscle tone. This is consistent with findings in the upper limb, where passive neurodynamic testing has been shown to induce muscle activity from adjacent musculature. (Balster & Jull, 1997; Coppieters., *et al*. 2002; Coppieters., *et al*. 2003; Van der Heide., *et al*. 2001). Other studies conclude to the point that neurodynamic testing may serve as a valuable diagnostic tool in the assessment of neurogenic disorders form other pathologies. In that regard, Coppieters., *et al*. (2005) testing the upper extremity, evaluated in 8 different arm positions, pain intensity of the induced hand symptoms and size of the painful area. Because the induced symptoms had a non-neural origin, changes in symptom provocation with the neurodynamic test would have indicated poor specificity.

Taking into consideration the limitations of an experimental pain model, this study indirectly confirms the specificity of the neurodynamic test for the median nerve.

The evidence in support of neurodynamic tests being reliable is good in many cases (Coppieter s., *et al*. 2002). Schacklock (2005) regarding reliability assumes that when appropriate, reliability testing should be performed on all examiner s prior to experimental testing to verify that they can consistently produce a normal response in at least several asymptomatic subjects and, in that way standardize research in neurodynamics.

There aren´t many studies combining approaches to diagnosis for example, for lumbar radiculopathy due to disc herniation and when used in isolation they reveal poor diagnostic performance (van Der Windt., *et al*. 2010) with loss of sensitivity with pain deriving from harmstring tightness, for example (Scaia y., *et al*. 2012). In clinical settings, lumbar disc herniation is one disease that physical examination, symptoms, and findings on imaging technique do not always correlate with each other. SLR test as a primary test to diagnosis lumbar disc herniations is found to have high correlation with findings on operation since its sensitivity is high in only disc herniations leading to root compression (Majlesi., *et al*. 2008). Another study tried to compare the effects of two neurodynamic treatment doses on range of hip flexion (ROM HF) and electromyographic (EMG) activity of semitendinosus, at first onset of pain (P1). The authors found only positive effects in the ROM of hip flexors using oscillating SLR treatment.

Concluding, the dynamics of neuronal systems, briefly neurodynamics, has developed into a popular research subarea within neuroscience. The use of neurodynamic has still a durable journey to make although some results indicate that it can constitute a valuable tool for the diagnoses of more severe pathologies.

References

1. Atmanspacher H and Rotter S. "Interpreting neurodynamics: concepts and facts". *Cognitive Neurodynamics* 2.4. (2008): 297–318.
2. Balster SM and Jull G.A. "Upper trapezius muscle activity during the brachial plexus tension test in asymptomatic subjects". *Manual Therapy* 2.3 (1997): 144-149.
3. Boyd BS., *et al*. "Mechanosensitivity of the Lower Extremity Nervous System During Straight-Leg Raise Neurodynamic Testing in Healthy Individuals". *Journal of Orthopaedic and Sports Physical Therapy* 39.11 (2009): 780-790.
4. Ellis R F and Hing WA. "Neural Mobilization: A Systematic Review of Randomized Controlled Trials with an Analysis of Therapeutic Efficacy". *The Journal of Manual & Manipulative Therapy* 16.1 (2008): 8–22.
5. Castellote-Caballero Y., *et al*. "Immediate Effects of Neurodynamic Sliding versus Muscle Stretching on Hamstring Flexibility in Subjects with Short Hamstring Syndrome". *Journal of Sports Medicine* (2014) 1-8.
6. Coppieters MW., *et al*. "The impact of neurodynamic testing on the perception of experimentally induced muscle pain". *Manual Therapy* 10.1 (2005): 52-60.
7. Coppieters M., *et al*. "Reliability of detecting 'onset of pain' and 'submaximal pain' during neural provocation testing of the upper quadrant". *Physiotherapy Research International* 7.3 (2002): 146-156.
8. Coppieters MW., et al. "Aberrant protective force generation during neural provocation testing and the effect of treatment in patients with neurogenic cervicobrachial pain". *Journal Manipulative Physiology Therapy* 26.2 (2003): 99-106.
9. Coppieters MW., et al. "An Experimental Pain Model to Investigate the Specificity of the Neurodynamic Test for the Median Nerve in the Differential Diagnosis of Hand Symptoms". *Archives of Physical Medicine and Rehabilitation* 87.10 (2006): 1412-1417.
10. Hall T., *et al*. "Adverse mechanical tension in the nervous system? Analysis of straight leg raise". *Manual Therapy* 3.3 (1998): 140-146.
11. Hanney RN., *et al*. "The effects of neurodynamic straight leg raise treatment duration on range of hip flexion and protective muscle activity at P1". *Journal Manual Manipulative Therapy* 24.1 (2016): 14-20.
12. Rebain R., *et al*. "A systematic review of the passive straight leg raising test as a diagnostic aid for low back pain (1989 to 2000)". Spine (Phila Pa 1976) 27.17 (2002): E388-395.
13. Majlesi J., *et al*. "The sensitivity and specificity of the Slump and the Straight Leg Raising tests in patients with lumbar disc herniation. Journal of Clinical Rheumatology 14.2 (2008): 87-91.
14. Scaia V., *et al*. "The pain provocation-based straight leg raise test for diagnosis of lumbar disc herniation, lumbar radiculopathy, and/or sciatica: a systematic review of clinical utility". Journal Back Musculoskeletal Rehabilitation 25.4 (2012): 215-223.
15. Schacklock M. "Improving application of neurodynamic (neural tension) testing and treatments: A message to researchers and clinicians". *Manual Therapy* 10.3 (2005): 175–179.
16. van der Heide B., *et al*. "Pain and muscular responses to a neural tissue provocation test in the upper limb". *Manual Therapy* 6.3 154-162.