



Lower back pain sufferers found to have poor sensorimotor control, remedied by local muscle vibration

Summary

Studies have shown that those suffering lower back pain have inhibited sensory feedback and control. This lack of control is thought to be a contributing factor to the back pain. The premise is that this inhibits coordination, creating abnormal stress upon the joints and other tissues. A recent study investigated one aspect of this sensorimotor control, the ability to accurately judge force applied by muscles. It was shown to be much poorer in those with lower back pain, and to become more normal following the application of localised vibration. The authors recommended that this could be incorporated as part of rehabilitation. As a provider of vibration massage devices this would normally be very exciting. It does give us some guidance, but there are serious issues with what the authors suggest.

The research

Outline

To coordinate the muscle activity required for both dynamic and static spinal stability the central nervous system requires accurate feedback from the sensors that provide information on things such as joint position, the tension on connective tissues and the force applied by muscles. It has been speculated that inaccurate such information affects the central nervous system's ability to coordinate this stability and is a causative and perpetuating factor in many pain syndromes. This study investigated one such parameter- the ability to accurately judge and control muscular force. They compared those with lower back pain to normal controls, plus investigated the effect of fatigue and the application of localised vibration to the muscles.

The testing

Subjects were tested using a high tech exercise machine designed to exercise the lumbar extensor muscles. The subjects were able to practice developing a force equal to 60% of maximum while monitoring their effort on the gauge. Once this was done subjects were asked to reproduce this force using their judgement alone, with several tests done to assess variation. This was repeated again testing the effects of fatigue and of the application of vibration to the lumbar erector spinae muscles.

The results

Those with no back pain were able to reproduce this force quite accurately, with minimal variation between measurements. On the other hand, those with lower back pain were far less accurate and had greater variation between attempts. When vibration was applied to those with back pain they became far more accurate and less varied. Fatigue was shown to reduce accuracy in both controls and those with low back pain. As occurred with non-fatigue testing, vibration was shown to improve accuracy.

Implications

The study shows that those with pain syndromes have abnormal sensory feedback impairing the ability of the central nervous system to provide the accurate control of muscles needed for the coordination of movement and stability. This is likely an important cause and perpetuating factor in pain syndromes. This is a serious consideration with regard to the prescription of rehabilitation exercises. Do we really want clients/patients performing rehabilitation exercises with the same abnormal coordination that causes problems in the first place??? However, there are serious issues with the solution suggested by the author.

Short term only

The post vibration testing was done immediately after the application of 30 seconds of vibration. Indeed, when further testing was done after 30 seconds of no vibration the results were back to where they were previously. If the vibration protocol used was implemented as suggested by the authors it would mean those undergoing rehabilitation would need to have the vibration applied immediately before each set of exercises, which is highly impractical.

It was only a "neurological trick"

In a previous study the authors tested the same vibration protocol on normal subjects. Rather than help them it made their sensory motor function less accurate. Why would such vibration make those with inaccurate control more normal, while making those who are normal become less accurate? This is what this author believes happened. The vibration frequency used was 80hz. 100 Hz is used by TENS machines and mechanical vibration to interfere with nerve transmission to create a pain block.

- In those with lower back pain feedback from sensors providing inaccurate information was interfered with. With inaccurate information removed control improved.
- When accurate information from the sensors in normal subjects was interfered with control worsened.

Some clinical guidance

There is no real clinical benefit from playing a neurological trick that lasts for 30 seconds. However, the trial results did confirm the reduction in sensorimotor control in those suffering lower back pain, implicating abnormal sensory information. To restore sensorimotor control we really need to look at correcting whatever is causing this sensory information to be abnormal. As discussed elsewhere in this manual two likely issues would be:

- trigger points
- articular dysfunction correctable by adjustments/manipulation

Reference

Boucher J-A, Abboud J, Nougarou F, Normand MC, Descarreaux M (2015) The Effects of Vibration and Muscle Fatigue on Trunk Sensorimotor Control in Low Back Pain Patients. PLoS ONE 10(8): e0135838. doi:10.1371/journal.pone.0135838

Further information

For further information we have a large number of usage guides and research summaries on our website www.drgraeme.com If you are a practitioner interested in trying vibration massage please contact us directly for further information, practitioner rate massagers and possibly a sample massager.

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