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Effect of Pain Relief on Lumbar Muscle Function and Activation

Jonathan Williams, PhD, et al.

Objective: The aim of this study was to use an experimental pain relief model to determine the effect of pain relief on lumbar muscle function in people with low back pain.

Methods: A test-retest design was used with all data collection being completed within a therapy setting. Twenty people with acute and 20 with chronic low back pain were recruited from general practitioner and therapist referrals. Participants completed spinal movements and lifting. Electromyography (EMG) was used to measure the pattern of muscle activity, onset of muscle activation, and peak activation of bilateral lumbar multifidus and iliocostalis. Movements were investigated before and after pain relief, through the self-administration of oral analgesia.

Results: Electromyography profiles and peak values were reliable across three trials, and EMG profiles correlated well with kinematic profiles. Specific EMG profiles were commonly associated with specific kinematic values, and on the whole, the EMG profiles were unaffected by pain relief. Muscle onset times and peak muscle amplitudes were not affected by pain relief in either acute or chronic low back pain.

Conclusion: This study showed that the EMG activities from the lumbar region, including lumbar multifidus and iliocostalis, are reliable, and specific EMG profiles are identifiable. Pain relief as achieved in this study did not affect the pattern of EMG activity, onset of muscle activation, or peak activation values.

Effects of Thrust Amplitude and Duration of HVLA Spinal Manipulation

Dong-Yuan Cao, PhD, et al.

Objective: Mechanical characteristics of high-velocity, low-amplitude spinal manipulations (HVLA-SMs) can vary. Sustained changes in peripheral neuronal signaling due to altered load transmission to

a sensory receptor's local mechanical environment are often considered a mechanism contributing to the therapeutic effects of spinal manipulation. The purpose of this study was to determine whether variation in an HVLA-SM's thrust amplitude and duration alters the neural responsiveness of lumbar muscle spindles to either vertebral movement or position.

Methods: Anesthetized cats (n = 112) received L6 HVLA-SMs delivered to the spinous process. Cats were divided into six cohorts depending upon the peak thrust force (25%, 55%, 85% body weight) or thrust displacement (1, 2, 3 mm) they received. Cats in each cohort received eight thrust durations (0-250 milliseconds). Afferent discharge from 112 spindles was recorded in response to ramp and hold vertebral movement before and after the manipulation. Changes in mean instantaneous frequency (ΔMIF) during the baseline period preceding the ramps (ΔMIFresting), during ramp movement (ΔMIFmovement), and with the vertebra held in the new position (ΔMIFposition) were compared.

Results: Thrust duration had a small but statistically significant effect on ΔMIFresting at all six thrust amplitudes compared with control (0-millisecond thrust duration). The lowest amplitude thrust displacement (1 mm) increased ΔMIFresting at all thrust durations. For all the other thrust displacements and forces, the direction of change in ΔMIFresting was not consistent, and the pattern of change was not systematically related to thrust duration. Regardless of thrust force, displacement, or duration, ΔMIFmovement and ΔMIFposition were not significantly different from control.

Conclusion: Relatively low-amplitude thrust displacements applied during an HVLA-SM produced sustained increases in the resting discharge of paraspinal muscle spindles regardless of the duration over which the thrust was applied. However, regardless of the HVLA-SM's thrust amplitude or duration, the responsiveness of paraspinal muscle spindles to vertebral movement and to a new vertebral position was not affected.

Immediate Effects of Upper Thoracic Manipulation on Cardiovascular Response

John Ward, DC, MA, MS, et al.

Objective: The aims of this study were (1) to determine if there were statistically significant immediate effects of anterior upper thoracic chiropractic manipulative therapy on cardiovascular response in normotensive individuals; and (2) to quantify responses if any were found.

Methods: Thirty-six chiropractic college students (age, 26.8 ± 4.6 years; height, 1.71 ± 0.12 m; body mass, 75.6 ± 20.0 kg; mean ± SD) were equally randomized into a single-blind, controlled trial involving three study groups: anterior thoracic manipulation of T1-4, Activator-based placebo manipulation, or a "no T-spine contact" control. Outcome measures were electrocardiogram, bilateral pulse oximetry, and bilateral blood pressure measurement performed at baseline, post 1-minute intervention, post 10-minute intervention, and post 24-hour (±1 hour) intervention. Between-group dependent variables were analyzed through one-way analysis of variance at each of the four time points. Within-group dependent variables were analyzed through two paired-samples t tests comparing baseline to post 10 minutes and again between baseline to post 24 hours (±1 hr).

Results: No statistically significant difference was shown among any between-group or within-group cardiovascular dependent variables in this study.

Conclusions: The results of this study suggest cardiovascular physiologic responses are not affected in

the short term by anterior upper thoracic spine chiropractic manipulative therapy in young, normotensive individuals.

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