

MANUAL AND INSTRUMENT APPLIED CERVICAL MANIPULATION FOR MECHANICAL NECK PAIN: A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

Objective: The purpose of this study was to compare the effects of 2 different cervical manipulation techniques for mechanical neck pain (MNP).

Methods: Participants with MNP of at least 1 month's duration ($n = 65$) were randomly allocated to 3 groups: (1) stretching (control), (2) stretching plus manually applied manipulation (MAM), and (3) stretching plus instrument-applied manipulation (IAM). MAM consisted of a single high-velocity, low-amplitude cervical chiropractic manipulation, whereas IAM involved the application of a single cervical manipulation using an (Activator IV) adjusting instrument.

Preintervention and postintervention measurements were taken of all outcomes measures. Pain was the primary outcome and was measured using visual analogue scale and pressure pain thresholds. Secondary outcomes included cervical range of motion, hand grip-strength, and wrist blood pressure. Follow-up subjective pain scores were obtained via telephone text message 7 days postintervention.

Results: Subjective pain scores decreased at 7-day follow-up in the MAM group compared with control ($P = .015$). Cervical rotation bilaterally (ipsilateral: $P = .002$; contralateral: $P = .015$) and lateral flexion on the contralateral side to manipulation ($P = .001$) increased following MAM. Hand grip-strength on the contralateral side to manipulation ($P = .013$) increased following IAM. No moderate or severe adverse events were reported. Mild adverse events were reported on 6 occasions (control, 4; MAM, 1; IAM, 1).

Conclusion: This study demonstrates that a single cervical manipulation is capable of producing immediate and short-term benefits for MNP. The study also demonstrates that not all manipulative techniques have the same effect and that the differences may be mediated by neurological or biomechanical factors inherent to each technique. (J Manipulative Physiol Ther 2016;39:319-329)

Key Indexing Terms: Manipulation; Spinal; Chiropractic; Cervical Vertebrae; Neck Pain; Randomized Controlled Trial

The annual prevalence of neck pain is estimated to range from 30% to 50%, with reports of lifetime and point prevalence values approaching those of low back pain.¹⁻⁶ Mechanical neck pain (MNP) is defined as nonspecific pain of nonpathological origin occurring in

the cervical spine.^{7,8} A common approach to managing MNP includes cervical spine manipulation.^{8,9} Although high-velocity, low-amplitude (HVLA) cervical manipulation has been shown to be effective for treating MNP^{9,10} and is included in several clinical practice guidelines,¹¹⁻¹³ the optimal manipulative technique for treating this condition remains ambiguous.¹⁴ HVLA manipulation can be delivered manually (manually applied manipulation [MAM]) or by instrument (instrument-applied manipulation [IAM]). However, there is no clear evidence to support one approach over the other.^{9,15-23} MAM is commonly used and involves the manual application of a force aimed at moving a joint beyond its physiological range of motion (ROM) without exceeding the anatomical limit.^{16,24} By contrast, the delivery of a manipulative force in an IAM does not rely on moving a joint beyond its physiological ROM to achieve an effect.²⁵

This difference in approach has not been adequately reflected in reports of change following spinal manipulation.²⁶⁻³⁰ Three

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studies comparing the effectiveness of MAM and IAM for the treatment of MNP reported both approaches to be equally effective.^{31–33} However, the quality of these studies was poor with inadequate sample sizes, lack of a control group, and heterogeneous methodologies, detracting from the validity and generalizability of the results.³⁴ This is in contrast to the findings of the largest study to date comparing MAM, IAM, and usual care for the treatment of low back pain which reported that, in a population of 107 participants, MAM provided greater short-term reductions in self-reported disability compared with IAM and usual care.³⁵

Remote effects following HVLA spinal manipulation, that is, effects which occur in tissues not directly related to the area where the intervention was applied, have also been reported in the literature.^{36,37} The hypothesis that there is a connection between the response of the autonomic nervous system and pain perception following spinal manipulation has been investigated by a number of researchers.^{36,38,39} Reports of changes in skin conductance, respiratory rate, blood pressure, and heart rate in healthy populations following mobilization or manipulation of specific areas of the spine support this hypothesis.^{39,40}

In addition to responses generated by the autonomic nervous system, cervical spine manipulation has also been associated with changes in the somatic nervous system.^{41,42} Studies investigating the effect of cervical manipulation on lateral epicondylalgia have described an increase in hand grip-strength,^{43–45} whereas other studies have reported excitatory effects on motor activity.^{46–48}

The aim of this study was to determine whether a single application of HVLA cervical manipulation (MAM or IAM) affected MNP and, if so, whether the effect was the same for both types of manipulation.

METHODS

The study was designed as a randomized controlled trial with 1 control and 2 intervention groups. Volunteers aged 18 to 35 years with a history of MNP of greater than 1 month were screened for contraindications to cervical spinal manipulation. Contraindications included history of a connective tissue disorder, cervical pain which was not due to mechanical dysfunction or did not originate from the lower cervical spine, current use of anticoagulant therapy, history of recent surgery and/or neck trauma, facial or intraoral anesthesia or paresthesia, visual disturbances, dizziness, and/or vertigo. In addition to this, a person was excluded if they were pregnant or had received cervical mobilization or manipulation within the preceding 1 month. A volunteer who met the inclusion criteria, passed the screening stage, and provided written consent to participate was enrolled in the trial and randomly allocated to 1 of 3 groups. Allocation was achieved using a computer-generated random number sequence created by an administrative officer

not otherwise associated with the trial. Group 1 (control) received a standardized active muscle stretching routine (S); group 2 (MAM) received the same active muscle stretching routine (S) plus a single MAM; and group 3 (IAM) received the same active muscle stretching routine (S) plus a single IAM. The trial was conducted at Macquarie University's Chiropractic Outpatient and Research Clinic in Sydney, Australia, between August and September 2014. The trial was approved by Macquarie University's Human Research Ethics Committee (approval no.: 5201400281) and registered with the Australian and New Zealand Clinical Trials Registry (ACTRN: 12614000804684).

All outcome assessments were performed by a single assessor. The primary outcome assessment was neck pain evaluated using subjective measures: visual analogue scale (VAS), numerical pain rating scale (NPRS), and pressure point threshold (PPT). Secondary outcome measures included cervical ROM, hand grip-strength, and wrist blood pressure. Subjective pain levels (VAS) were recorded first, followed by wrist blood pressure, hand grip-strength, PPT, and finally cervical ROM. This order was selected to minimize the effect of one measurement on any other. All outcome measurements were taken immediately preintervention and postintervention. Subjective pain levels (NPRS) were also measured 7 days postintervention by telephone text message. The NPRS used 7 days postintervention was similar to the VAS used preintervention and immediately postintervention.

All MAMs were administered by a single practitioner with 30 years clinical experience in manual manipulation, whereas all IAMs were administered by a different practitioner with 29 years of clinical experience in instrument manipulation.

All participants performed the same stretching routine (S) which involved flexion, extension, bilateral lateral flexion, and rotation of the cervical spine to end-range, with each position maintained for 30 seconds and repeated 3 times. The use of stretching as a standardized active control ensured that each participant had the potential for improvement, as the benefit of exercise for MNP has been previously reported in the literature.^{8,14,49} Each participant in the MAM and IAM groups received a single application of the relevant manipulation. The choice of which level of the cervical spine to address was at the discretion of the clinician following static palpation. To maintain consistency in blinding, all participants were informed that each intervention was a recommended treatment for MNP.^{9,14}

All MAMs were administered using the same technique—a lateral flexion thrust manipulation (Fig 1). In this technique, the side contacted by the hand delivering the thrust will be referred to as the *ipsilateral side*, whereas the opposite side is referred to as the *contralateral side*.^{50,51} All IAMs were administered using an Activator IV instrument on a setting of “2” with the manipulative force delivered to the pedicle-lamina junction of the involved segment in an anterior, superior, and slightly medial line of drive (Fig 2). In this trial, the instrument was

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