List of Studies, with Quotations, about the effect of

Thrust Techniques

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Physiological changes following thrust techniques

Blood-perfusion changes following thrusting


"Twelve nonsmoking subjects, who received a successful HVLAT manipulation, showed a significant increase (P < .001) in blood perfusion, both ipsilaterally and contralaterally. Six smokers responded with a significant decrease in blood flow ipsilaterally (P < .01) and contralaterally (P < .001) after HVLAT manipulation. "The results from this study support previous published hypotheses that spinal adjustments outside the region of the sympathetic outflow result in an increase in cutaneous blood flow."

Changes to muscle-spindle responsiveness


"Intervertebral mobility at a single segmental level alters paraspinal sensory response during clinically relevant high-velocity, low-amplitude SM thrust durations (≤ 150 milliseconds). The relationship between intervertebral joint mobility and alterations of primary afferent activity during and after various manual therapy interventions may be used to help to identify patient subpopulations who respond to different types of manual therapy and better inform practitioners (eg, chiropractic and osteopathic) delivering the therapeutic intervention."

Changes to range of motion


"The aim of this case series was to describe the immediate changes of inter-vertebral motion at an identified dysfunctional cervical segment, as measured by functional X-rays in lateral flexion, following a supine cervical rotation manipulation in patients presenting with mechanical neck pain."

"Fifteen patients who presented with mechanical neck pain and who exhibited inter-vertebral joint dysfunction at C3–C4 or C4–C5 levels were recruited to participate in this case series. The radiological distance between the transverse process of the identified hypomobile vertebra and the transverse process of the subjacent vertebra, was measured pre- and 5 min post-
manipulation during contralateral side flexion."
"Analysis of the pre-post-intervention radiographs showed a significant increase (P = 0.01) of the distance between the transverse process on the dysfunctional side following cervical manipulation. The mean pre-manipulative inter-vertebral radiological measurement was 18.9 mm (SD 2.1), and 20.6 mm (SD 2.1) at the post-manipulative assessment."
"These preliminary results demonstrated a trend toward an increase in inter-vertebral motion at the hypomobile segment, measured by functional radiography."

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"These results demonstrate a significant amelioration in atlanto-axial (p<.01) and cervical spine (p<.02) rotation assymetry immediately post manipulation."

Pupil-cycle time

"Edge Light Pupil Cycle Time (ELPCT) is a measure of the pupillary light reflex mediated via the autonomic nervous system (ANS). ELPCT is a measurable constant, unaffected by eye measured (i.e. left versus right eye), gender, visual acuity, refractive error, eye colour and pupil size. Previous research suggests that spinal manipulation techniques can produce distant effects mediated in part by the ANS."
"Thirty participants (mean age = 23.8) without eye, central or autonomic nervous system pathology had their ELPCT measured in both eyes pre- and post- manipulation. The manipulation technique used was a high velocity low amplitude (HVLA) rotatory thrust, with the applicator localised to the atlanto-axial joint on the left (n = 10) or right (n = 10) determined randomly. All HVLA manipulations were associated with audible cavitation. The control group (n = 10) underwent the same protocol, including pre-positioning for the manipulation, but without the thrust. "ELPCT measures demonstrated a significant decrease between groups (P = 0.004) and between groups according to eye measured (P = 0.022). Significant decreases between pre- and post-manipulation measures of ELPCT indicated an association between side manipulated and eyes, with right-sided manipulation producing a decrease in ELPCT in the right eye (P = 0.001) and a left-sided manipulation producing a decrease in the left eye (P = 0.013). No other significant changes were observed."
"ELPCT, mediated via the ANS, is directly influenced by HVLA manipulation with cavitation to the atlanto-axial joint. The ANS changes observed in this study demonstrated a unilateral response to HVLA manipulation."

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Pain reduction following thrust techniques


"Background and Objectives: High velocity low amplitude thrust manipulation and mobilisation are commonly used by manual therapists to relieve spinal pain and improve mobility. The aim of this controlled, single blinded study was to investigate the effect of manipulation and mobilisation on pressure-pain thresholds in the thoracic spine in an asymptomatic population.¶Methods: Subjects (n=96) were screened for tender thoracic segments, and pressure-pain threshold measurements were made using an electronic pressure algometer immediately before and after treatment intervention. Subjects were randomly allocated into three intervention groups, and received either a single high velocity extension thrust, thirty seconds of extension mobilisation, or thirty seconds of sham treatment (control) consisting of simulated 'laser acupuncture'. Analysis: Within-group pre- and post-intervention pressure-pain threshold values were analysed using dependent t-tests, revealing significant changes in the mobilisation (P<0.01) and manipulation (t=0.04) groups, but not the sham treatment group (P=0.88). Analysis of mean group changes using a one-way analysis of variance and post-hoc analysis revealed a significant difference between the mobilisation and control group (P=0.01), but no significant difference between the manipulation and control group (P=0.67). Pre-post effect sizes in the mobilisation group were medium to large (d=0.72), small to medium for manipulation (d=0.32), and small in the control group (0'=0.02)

Conclusion: Both manipulation and mobilisation produced significantly increased pressure-pain thresholds (decreased sensitivity to pressure) in the thoracic spine, whereas the sham treatment did not. Mobilisation appeared to be more effective than manipulation for increasing pressure-pain thresholds when applied to the thoracic spine in asymptomatic subjects.¶"


"Studies have shown that mobilisation to the spine can decrease pain. The optimum treatment dose for achieving this has not so far been investigated. Previous studies that demonstrate the pain relieving effects of mobilisations have used large amplitude of oscillations. The importance of amplitude on pain relief has not been established. The current study aims to: a) Investigate the importance of amplitude as part of the treatment dose. b) To explore the extent of any pain relieving effects seen following mobilisations."

"Results demonstrated a significant increase in PPT [an increase in pressure pain threshold means a decrease in pain sensitivity] following lumbar mobilisations (p = 0.013) at all measured sites. However, no significant difference was found between amplitude conditions (p = 0.864). This study
suggests that in asymptomatic subjects a systemic hypoalgesic response is caused by lumbar mobilisation regardless of amplitude."

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"Although the effectiveness of mobilization and manipulation of the cervical spine has been well documented, the small inherent risks associated with these techniques has led clinicians to frequently utilize manipulation directed at the thoracic spine in this patient population. It is hypothesized that thoracic spine manipulation may elicit similar therapeutic benefits as cervical spine manipulation while minimizing the magnitude of risk associated with the cervical technique. The purpose of this randomized clinical trial was to investigate the immediate effects of thoracic spine manipulation on perceived pain levels in patients presenting with neck pain. The results suggest that thoracic spine manipulation results in immediate analgesic effects in patients with mechanical neck pain."

Clinical outcomes of thrusting as a single technique


"Physical therapy notes for the first two sessions were examined. Patients were categorized as having received thrust manipulation, nonthrust manipulation, or no manipulation. Pain intensity and disability were recorded at initial and final sessions. The number of sessions, length of stay, and costs of physical therapy were recorded. Comparisons were made between patients receiving manipulation versus no manipulation, and between those receiving thrust versus nonthrust manipulation."

"Two hundred fifteen patients were included (mean age 35.9 [±10.1] years, 67.9% male). Thrust manipulation was received by 107 (49.8%) patients; 36 (16.7%) received nonthrust manipulation and 72 (33.5%) received no manipulation. Patients receiving manipulation (thrust or nonthrust) experienced greater reductions in pain and disability with treatment. Patients receiving thrust manipulation had fewer sessions, a shorter length of stay, and lower costs in physical therapy than patients receiving nonthrust manipulation."

"The evidence supporting superior clinical outcomes with the use of manipulation for a subgroup of patients was corroborated by this retrospective review of patients with occupational low back pain. The use of thrust manipulation appeared to be more efficient than the use of nonthrust manipulation for these patients."
"Objective. To investigate in acute nonspecific low back pain (LBP) the effectiveness of spinal high-velocity low-amplitude (HVLA) manipulation compared with the nonsteroidal anti-inflammatory drug diclofenac and with placebo.

Summary of Background Data. LBP is an important economical factor in all industrialized countries. Few studies have evaluated the effectiveness of spinal manipulation in comparison to nonsteroidal anti-inflammatory drugs or placebo regarding satisfaction and function of the patient, off-work time, and rescue medication.

Methods. A total of 101 patients with acute LBP (for <48 hr) were recruited from 5 outpatient practices, exclusion criteria were numerous and strict. The subjects were randomized to 3 groups: (1) spinal manipulation and placebo-diclofenac; (2) sham manipulation and diclofenac; (3) sham manipulation and placebo-diclofenac. Outcomes registered by a second and blinded investigator included self-rated physical disability, function (SF-12), off-work time, and rescue medication between baseline and 12 weeks after randomization.

Results. Thirty-seven subjects received spinal manipulation, 38 diclofenac, and 25 no active treatment. The placebo group with a high number of dropouts for unsustainable pain was closed praecox. Comparing the 2 active arms with the placebo group the intervention groups were significantly superior to the control group. Ninety subjects were analyzed in the collective intention to treat. Comparing the 2 intervention groups, the manipulation group was significantly better than the diclofenac group (Mann-Whitney test: P = 0.0134). No adverse effects or harm was registered.

Conclusion. In a subgroup of patients with acute nonspecific LBP, spinal manipulation was significantly better than nonsteroidal anti-inflammatory drug diclofenac and clinically superior to placebo."

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"Patients in the spinal manipulation group were treated twice weekly for 6 wk. Each therapy session typically lasted 20 min. The spinal manipulation group received spinal manipulation of a type described as short-lever, low-amplitude, high-velocity thrust techniques. At each visit, the treating doctor determined, by manual palpation, the cervical, thoracic or lumbar spinal segments to be manipulated. The investigative team thought that the greatest therapeutic effect would be achieved by paying particular attention to the upper three cervical segments. In preparation for the spinal manipulation, an average of 5-10 min of moist heat and 2 min of light massage were administered to the cervicothoracic musculature. "
"The results of this study show that spinal manipulative therapy is an effective treatment for tension headaches. Amitriptyline therapy was slightly more effective in reducing pain at the end of the treatment period but was associated with more side effects. Four weeks after the cessation of treatment, however, the patients who received spinal manipulative therapy experienced a sustained therapeutic benefit in all major outcomes in contrast to the patients that received amitriptyline therapy, who reverted to baseline values. The sustained therapeutic benefit associated with spinal manipulation seemed to result in a decreased need for over-the-counter medication."


"The authors present a case of a 24-year-old woman with left foot pain that began after an inversion injury obtained while running. The pain minimally improved with nonsteroidal anti-inflammatory medications. Clinical examination revealed a relatively normal foot with palpable changes in the bony structures at the midfoot consistent with a tarsal subluxation. Cuboid reduction was performed using high-velocity, low-amplitude manipulation, after which the patient reported immediate and near-complete pain relief. The authors also review mechanisms of injury, clinical findings, and treatment modalities for patients with tarsal subluxation."


"Previous studies have shown that dysmenorrhea produces low-back pain and an electromyographic (EMG) pattern typical of trauma-induced low-back pain. To determine the effects of high-velocity low-amplitude osteopathic manipulative treatment (OMT) on this type of low-back pain, 12 dysmenorrheic subjects were assigned to a group receiving OMT or to a group not receiving OMT (or both). Eight subjects participated in both groups, the other four being equally distributed between groups. Osteopathic manipulative treatment significantly decreased EMG activity during extension of the lumbar spinae erector muscles and abolished the spontaneous EMG activity. These EMG changes coincided with the patient's report of alleviated low-back pain and menstrual cramping."


"Headaches of cervical origin are often treated with mobilization. Mobilization of the upper cervical spine, occiput-C3, and effect on frequency, duration, and intensity of cervical headaches were studied utilizing an A-B-A single case design. Ten subjects who met the operational criteria of cervical headaches completed the study. A headache log was used to document headache frequency, duration, and intensity throughout all three phases (A-B-A). The baseline phase (A) lasted approximately 1 month, and no intervention was performed. The intervention phase (B) consisted of 9-12 treatment sessions, two times per week for 3-4 weeks. Visual analysis of data plots revealed a
decrease in headache frequency, duration, and intensity from the baseline phase to the treatment phase. This improvement continued through the second A phase for frequency but leveled off for both duration and intensity. A one-way analysis of variance supported the findings from the visual analysis. In these 10 subjects, mobilization had a therapeutic effect on cervical headaches.


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"Seventy patients with mechanical neck pain (25 males and 45 females, aged 20-55 years) participated in this study. The lateral gliding test was used to establish the presence of an intervertebral joint dysfunction at the C3 through C4 or C4 through C5 levels. Subjects were divided randomly into either an experimental group, which received an HVLA thrust, or a control group, which received a manual mobilization procedure. The outcome measures were active cervical range of motion and neck pain at rest assessed pretreatment and 5 minutes posttreatment by an assessor blinded to the treatment allocation of the patient. Intragroup and intergroup comparisons were made with parametric tests."

"Within-group changes showed a significant improvement in neck pain at rest and mobility after application of the manipulation (P < .001). The control group also showed a significant improvement in neck pain at rest (P < .01), flexion (P < .01), extension (P < .05), and both lateral flexions (P < .01), but not in rotation. Pre-post effect sizes were large for all the outcomes in the experimental group (d > 1), but were small to medium in the control mobilization group (0.2 < d < 0.6). The intergroup comparison showed that the experimental group obtained a greater improvement than the control group in all the outcome measures (P < .001). Decreased neck pain and increased range of motion were negatively associated for all cervical motions: the greater the increase in neck mobility, the less the pain at rest."

"Our results suggest that a single cervical HVLA manipulation was more effective in reducing neck pain at rest and in increasing active cervical range of motion than a control mobilization procedure in subjects suffering from mechanical neck pain."

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"Seven patients with mechanical neck pain (2 men, 5 women), 20 to 33 years old, were included. All patients received a single thoracic manipulation by an experienced manipulative therapist. The outcome measures of these cases series were neck pain at rest, as measured by a numerical pain rating scale;
active cervical range of motion; and neck pain at the end of each neck motion (eg, flexion or extension). These outcomes were assessed pre treatment, 5 minutes post manipulation, and 48 hours after the intervention. A repeated-measures analysis was made with parametric tests. Within-group effect sizes were calculated using Cohen d coefficients."

"A significant (P < .001) decrease, with large within-group effect sizes (d > 1), in neck pain at rest were found after the thoracic spinal manipulation. A trend toward an increase in all cervical motions (flexion, extension, right or left lateral flexion, and right or left rotation) and a trend toward a decrease in neck pain at the end of each cervical motion were also found, although differences did not reach the significance (P > .05). Nevertheless, medium to large within-group effect sizes (0.5 < d < 1) were found between preintervention data and both postintervention assessments in both active range of motion and neck pain at the end of each neck motion."

"The present results demonstrated a clinically significant reduction in pain at rest in subjects with mechanical neck pain immediately and 48 hours following a thoracic manipulation. Although increases in all tested ranges of motion were obtained, none of them reached statistical significance at either posttreatment point. The same was found for pain at the end of range of motion for all tested ranges, with the exception of pain at the end of forward flexion at 48 hours. More than one mechanism likely explains the effects of thoracic spinal manipulation. Future controlled studies comparing spinal manipulation vs spinal mobilization of the thoracic spine are required."
administered prior to starting treatment with OMM. Initially, she had scored 19 (maximum score: 50) on the DHI and at the conclusion of treatment, her score had decreased to 4, suggesting an overall improvement in her symptoms.


"Objective: To determine the quantity and characteristics of OMT [Osteopathic Manipulative Treatment] performed in a single, community academic ED that houses an osteopathic emergency medicine residency."

"Main Outcome Measures: Medical record data were analyzed to determine patient demographics; treatment characteristics including number of procedures and patients per physician, OMT techniques used, night vs day procedure variation, and financial implication of future billing for OMT; chief complaints; primary discharge diagnoses; and length of stay in the ED."

"Results: Patients were aged 0 to 95 years (mean, 39 years) and were predominately female (1260 [60.69%]) and white (1300 [62.62%]). A mean of 0.74 patients received OMT per day, and a mean of 29.65 procedures were performed per physician. When data for residents were looked at separately, the mean was higher at 40.32 procedures per physician. The top 3 discharge diagnoses were low back pain (189 patients [9.10%]), muscle spasm (106 patients [5.11%]), and spasm: muscle, back (93 patients [4.48%]). Eleven different OMT techniques were recorded, with myofascial release being used most frequently (1150 of 2868 procedures [40.09%]), followed by muscle energy (672 [23.43%]). The average length of stay in the ED was 206 minutes. A total of 1663 OMT procedures (80%) were performed during the day, whereas 413 (20%) were performed at night. Potential procedural billing for all OMT performed during the study period was $33.09 per day.

Conclusion: In contrast to perceptions that OMT use is declining, the authors found that OMT is being performed on a near daily basis in the ED. Additional research is needed to fully understand the impact of OMT in the ED."

"Technique¶Balanced Ligamentous Tension Counterstrain¶Facilitated Positional ReleaseHigh-Velocity, Low-Amplitude Lymphatic Pump¶Muscle Energy¶Myofascial Release¶Myofascial Unwinding¶Osteopathic Cranial Manipulative Medicine Trigger Point¶Visceral Manipulation¶No. (%)a¶261 (9.10) 213 (7.42) 86 (2.99) 185 (6.45) 80 (2.78)¶672 (23.43) 1150 (40.09) 97 (3.38) 34 (1.18)¶62 (2.16) 25 (0.87)¶ORIGIN AL CONTribution¶=A total of 2868 procedures were performed on 2076 patients during the study period (2005-2013)." "Osteopathic manipulative treatment has an active presence in the ED and is being incorporated by DOs in the treatment of patients of nearly all ages, sexes, and races, via myriad techniques."

"Briefly, the OMTh techniques were focused on correcting osteopathic dysfunctions found during the initial evaluation; structural (including myofascial release and high-velocity, low-amplitude), visceral, and craniosacral techniques were performed as appropriate."

"The OMTh [osteopathic manipulative therapy] group had a significant reduction in headache frequency over time that persisted 1 month (approximate reduction, 40%; P<.001) and 3 months (approximate reduction, 50%; P<.001) after the end of treatment. Moreover, there was an absolute difference between the 2 treatment groups at the end of the study, with a 33% lower frequency of headache in the OMTh group (P<.001)."

"This feasibility study demonstrated the efficacy of OMTh in the management of frequent episodic TTH [tension type headaches], compared with sham therapy in a control group. Osteopathic manipulative therapy may be preferred over other treatment modalities and may benefit patients who have adverse effects to medications or who have difficulty complying with pharmacologic regimens."

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"A pragmatic randomized controlled trial was conducted among a sample of women with a history of pregnancy-related LBP [low back pain] for at least 3 months after delivery."

"During 8 weeks, OMTh [osteopathic manipulative therapy] applied 4 times led to clinically relevant positive changes in pain intensity and functional disability in women with post-partum LBP."

"At each visit, OMTh was applied only to those structures with relevant osteopathic findings. Standard OMTh techniques were applied, including direct (high-velocity, low-amplitude; muscle energy; and myo-fascial release), indirect (functional techniques and balanced ligamentous tension), visceral, and cranial techniques. No predefined, standardized OMTh protocol was implemented; each osteopath was free to decide which techniques to use. Participants were not allowed to receive any additional treatment (ie, medication, physical therapy, or other sources of pain relief) during the study period. Participants in the control group did not receive OMTh, nor were they evaluated for somatic dysfunctions during the 8-week study period. At the first visit, control participants were required to fill out the VAS and ODI. The osteopath then told them that they would be placed on a waiting list for OMTh to be scheduled 2 months later. At 2 months, the control participants filled out the VAS and ODI for the second time. During the study period, participants were not allowed to receive any additional treatment for pain relief (eg, medication, physical therapy, or other sources of pain relief). After study completion, they were offered 2 free appointments for OMTh."
"During 8 weeks, OMTh applied 4 times led to clinically relevant positive changes in pain intensity and functional disability in women with post-partum LBP."


"Our data synthesis suggests that recommendations can be made with some confidence regarding the use of SMT (spinal manipulation therapy) and/or MOB (mobilisation) as a viable option for the treatment of both low back pain and NP."

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"One hundred and twenty nine RCTs of spinal manipulation were identified; 12 had adequately reported psychological outcomes. Six trials with a verbal intervention comparator were combined in a meta-analysis, and found a mean benefit from spinal manipulation equivalent to 0.34 of the population standard deviation (S.D.) [95% confidence interval (CI) 0.23–0.45] at 1–5 months; 0.27 of the S.D. [95% CI 0.14–0.40] at 6–12 months. Eight trials with a physical treatment comparator were combined in a meta-analysis and found a mean benefit of 0.13 of the S.D. [95% CI 0.01–0.24] in favour of manipulation at 1–5 months; 0.11 of the S.D. [95% CI −0.02 to 0.25] at 6–12 months."

"There was some evidence that spinal manipulation improved psychological outcomes compared with verbal interventions."