The effects of thoracic manipulation on heart rate variability: a controlled crossover trial.

Brian Budgell, DC, PhD; Barbara Polus, PhD

Objective: The objective of this study was to measure the effects of thoracic spinal manipulation on heart rate variability (HRV) in a cohort of healthy young adults.

Methods: A controlled crossover trial that was conducted on 28 healthy young adults (23 men and 5 women; age range, 18-45 years; mean age, 29 ± 7 years) measured HRV before and after a sham procedure and a thoracic spinal manipulation.

Results: In healthy young adults, thoracic spinal manipulation was associated with changes in HRV that were not duplicated by the sham procedure. The ratio of the powers of the low-frequency and high-frequency components increased from 0.9562 ± 0.9192 to 1.304 ± 1.118 (P = 0.0030, Wilcoxon signed rank test). In subjects undergoing sham spinal manipulation, there was no statistically significant change in the low-frequency or the high-frequency component of the power spectrum; neither was there any in the ratio of the two regardless of whether the comparison was made using the paired t test or the Wilcoxon signed rank test.

Conclusion: High-velocity and low-amplitude manipulation of the thoracic spine appears to be able to influence autonomic output to the heart in ways that are not duplicated by a sham procedure or by other forms of somatic/physical therapies.

Variability of force magnitude and force duration in manual and instrument-based manipulation techniques.

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Objective: The goal of this study was to compare the variation of manipulative forces produced by instruments and a manual technique.

Methods: Four operators (2 experts and 2 novices) used 4 different mechanical instruments to apply force to a uniaxial load cell. A different group of 2 expert and 2 novice operators used a traditional manual technique to apply force to a sensor mat. Two primary outcome variables were obtained from each sensor system: peak-to-peak force magnitude (N) and peak-to-peak force duration (millisecond). Multiple analyses were performed to determine the absolute differences and variation in each variable.

Results: Force-producing instrumentation exhibited less variation in absolute force and force duration compared to manual techniques. However, the same instrument in the hands of different operators often produced significantly different values of absolute force and force duration. Although absolute values of force magnitude generally differed between operators, intraoperator variation was equal for instruments and the manual technique. Conversely, for force duration, significant differences in interoperator variability were observed for the manual technique and for one of the instruments.

Conclusions: Force-producing instruments reduce absolute variation in force magnitude and duration. However, this reduction does not eliminate significant differences in absolute force parameters observed to occur between some operators using the same instrument. Given these observations, claims of instrument superiority that do not account for interoperator variability should be considered with caution.

Coping and back problems: a prospective observational study of Danish military recruits.
Kristian Larsen, PT, MPH; Charlotte Leboeuf-Yde, DC, MPH, PhD

Objective: The aim of this study was to investigate if Antonovsky’s coping questionnaire ("sense of coherence" [SOC]-13) can be used to predict self-reported low back pain (LBP) and associated leg pain in young men subjected to the first 3 months of military service; and to challenge such a link with a number of biosocial variables.

Methods: A prospective observational study of a fixed cohort consisting of 357 military conscripts was completed. Data were collected at baseline and after 3 months of military service. The outcome variables were self-reported LBP and leg pain at any time during those 3 months. The main independent (predictor) variable was coping. Covariables were biological (age, height, weight, fitness, strength, and a history of previous problems) and social (type of work, years of education, and social support). The clinical usefulness
was shown for the best model, with each outcome variable in relation to sensitivity/specificity,
positive/negative predictive value, numbers correctly classified, and the area under the receiver operating
characteristics curve.

Results: The SOC-13 questionnaire could successfully predict leg pain (odds ratio [OR] 3.3), but only 1 of
its 13 items predicted LBP (OR 2.0). For leg pain, the strongest predictor was age (OR 4.5), and for LBP,
the strongest predictor was previous LBP (OR 6.7). The receiver operating characteristics curves of the final
models were 0.85 and 0.79, respectively.

Conclusions: In these young Danish conscripts, coping or elements of coping (as defined with the help of
the SOC-13 questionnaire) could predict LBP and leg pain occurring during a 3-month period. Biological
and psychological variables dominated the final models, but none of the social vari-ables could significantly
predict LBP or leg pain.

The effect of an alternative medical procedure upon low-frequency oscillations in cutaneous blood
flow velocity.

Kenneth E. Nelson, DO; Nicette Serqueef, PhD; Thomas Glonek, PhD

Objective: Compression of the fourth ventricle (CV-4) is a manual, noninvasive procedure that reportedly
affects the cranial rhythmic impulse, a phenomenon recognized by practitioners of cranial manipulation, that
is concomitant with low-frequency Traube-Hering (TH) oscillations in blood flow velocity. This study
examines the CV-4 and its effect upon blood flow velocity.

Methods: Human subjects were paired with 28 individual physicians for application of the CV-4, and the
duration of the application was recorded. Flowmetry records tracking the course of the procedure were
obtained, 20 of which were useable for intergroup comparisons. Segments of these records (control,
treatment, response) were Fourier-transformed; the Fourier-transformed spectra were subtracted from one
another and the resultant difference-spectra compared.

Results: The mean CV-4 procedure length was 4.43 ± 2.22 minutes. The mean frequency of the TH
waveform visible in the blood flowmetry record was 7.10 ± 2.07 cpm. The CV-4 procedure specifically
affected the low-frequency oscillations in blood flow velocity. After application, the amplitude of the TH,
0.10 Hz, frequency wave increased (relative area units: control minus treatment [0.08010 units] compared
with control minus response [-0.03358 units]; P = .011).
Conclusions: This study showed that CV-4 has an effect on the TH frequency component of blood flow velocity. The practitioners of cranial manipulation who participated in this study affected their subjects in a quantifiable manner with the application of the CV-4 procedure.

Classification by McKenzie mechanical syndromes: a survey of McKenzie-trained faculty.

Stephen May, MSc

Objective: The purpose of this survey was to identify the percentage of patients with spine pain who can be classified by McKenzie-trained faculty as having derangement, dysfunction, or postural syndromes.

Methods: McKenzie Institute International faculty members in 20 countries, who are highly trained and are experienced users of the classification system, recorded details on 15 consecutively discharged patients.

Results: Responses were received from 57 therapists in 18 countries (89% of potential sample), and details were collected on 607 patients with spine pain. Eighty-three percent were classified in one of the mechanical syndromes; derangement was the most common syndrome. Therapists recorded a mechanical classification in a mean of 82% (SD, 15.1; range, 44%-100%) of their patients with spine pain.

Conclusions: For this study, the McKenzie mechanical syndromes were commonly diagnosed in a large consecutive group of patients at multiple sites by experienced therapists. This classification system may have valuable clinical use in managing patients with spine pain.

Canadian chiropractors’ perception of educational preparation to counsel patients on immunization.

H. Stephen Injeyan, DC, PhD; Margaret L. Russell, MD, PhD; Marja J. Verhoef, PhD; Donatus Mutasingwa, MD

Objective: This study describes the prevalence and correlates of perceptions of Canadian doctors of chiropractic regarding the adequacy of their undergraduate (UG) and postgraduate (PG) educational preparation to counsel patients about immunization/vaccination, and explores their preferences for continuing education (CE) in this area.

Methods: A cross-sectional population-based postal survey of Alberta chiropractors was conducted in the summer of 2002.
**Results:** The response rate was 78.2%. Forty-five percent perceived that their formal UG chiropractic education prepared them adequately to counsel people on immunization, compared with 64% who agreed that their self-directed PG education prepared them adequately. College of graduation was significantly associated with perceptions related to UG but not PG education. Those who felt prepared to counsel on immunization by UG education used different immunization information sources than those who felt prepared by PG or both UG and PG education. Use of specific sources and perception of preparedness to counsel on immunization were both associated with antivaccination behaviors. Those who felt prepared by PG or both UG and PG education were more likely to engage in antivaccination behavior than others. Most respondents indicated interest in CE on immunization.

**Conclusion:** The proportion of doctors of chiropractic who perceive themselves adequately prepared to counsel on immunization varies by type of education considered and is related to vaccination behavior. Many are interested in some form of CE related to immunization/vaccination.

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**The presence and impact of local item dependence on objective structured clinical examinations scores and the potential use of the polytomous, many-facet Rasch model.**

*Douglas M. Lawson, DC, BSc; Carlos Brailovsky, MD, MA (Ed)*

**Objective:** The purpose of this research project was to extend the research on the robustness of the dichotomous Rasch model to violations of the local independence assumption to the polytomous many-facet Rasch model (MFRM). Candidate scores from oral examinations and objective structured clinical examinations (OSCEs) have been shown to contain variance due to rater error/bias. If the MFRM is robust to local item dependence (LID), then the MFRM could theoretically be applied to medical OSCEs.

**Methods:** Five OSCEs were used in the study: 3 chiropractic licensure OSCEs and 2 nursing licensure OSCEs. Items were assigned to split-halves based on common stimulus. Split-half correlations were compared with Spearman-Brown estimates of reliability based on Cronbach $\alpha$ with all items contributing. Two- and 3-facet MFRM analyses were performed, first with individual items contributing and second with station totals contributing. Correlations were estimated between the 2 MFRM estimates.

**Results:** Cronbach $\alpha$ estimates with all items contributing were all very high ($>.87$). Spearman-Brown estimates were all considerably higher than split-half correlations. Correlations between MFRM by items and by stations were all very high ($>.993$).
Conclusions: The research project provided evidence that OSCEs violate the local item independence assumption. The project also showed that the MFRM is quite robust to such violations. The authors recommend that the MFRM be applied to OSCEs by station totals for estimates of candidate ability, and by items for item performance measures and quality control programs.

Chiropractic treatment of lower extremity conditions: a literature review.
Wayne Hoskins, MChiro; Andrew McHardy, MChiro; Henry Pollard, Grad DC, PhD; Ross Windsham, MChiro; Rorey Onley, MChiro

Objective: The purpose of this study was to document the quantity and type of research conducted on the chiropractic management of lower extremity conditions.

Methods: A review of the literature was conducted using the CINAHL, MEDLINE, MANTIS, and Science Direct databases (each from inception to December 15, 2005). Search terms included chiropractic, hip, knee, ankle, foot, with Medical Subject Heading terms for each region. Inclusion criteria included studies with a lower extremity diagnosis, and the treatment was performed by doctors of chiropractic. Articles were excluded if pain was referred from spinal sites and if there was a duplicate publication; articles published in non-peer-reviewed literature and abstracts in conference proceedings were also excluded. Of the articles identified, an analysis was conducted assessing those including peripheral and/or spinal treatment. Clinical trials were assessed for quality using the Physiotherapy Evidence Database scale.

Results: There was a total of 1,652 citations. Of these, 76 were deemed relevant; 24 were related to the foot, 10 to the ankle, 25 to the knee, and 17 to the hip. Twenty-nine citations included spinal treatment, 47 solely peripheral, and 2 solely spinal. Ten citations were clinical trials and scored on the Physiotherapy Evidence Database scale.

Conclusions: Literature on the chiropractic management of lower extremity conditions has a large number of case studies (level 4 evidence) and a smaller number of higher-level publications (level 1-3 evidence). The management available in the peer-reviewed literature is predominantly multimodal and contains combined spinal and peripheral components. Future chiropractic research should use higher-level research designs, such as randomized controlled trials.
Ependymoma of the spinal cord presenting in a chiropractic practice: two case studies.

Arthur G. Lensgraf, DC; Kenneth J. Young, DC

Objective: The purpose of this study is to discuss the cases of 2 patients with previously undiagnosed primary spinal cord tumors presenting in a private chiropractic clinical setting. An overview of treatment and outcome for an ependymoma at T12-L1 and L1-L2 is discussed.

Clinical Features: One patient was a 46-year-old Hispanic woman with 3 to 4 years of intermittent backache that usually resolved with conservative care, but failed to do so during an acute episode. Lower motor neuron signs, including bowel and bladder dysfunction, were revealed upon clinical assessment. The second patient, a 38-year-old white man under routine treatment, had no lower motor neuron signs or symptoms.

Intervention and Outcome: Both patients were referred, one to a local hospital emergency department and the other directly to a neurosurgeon. Both underwent surgery. Upon returning home, the first patient received follow-up treatment primarily consisting of radiation therapy. Follow-up telephone interviews (3, 6, 12, 24, and 40 months) revealed the patient doing well. The second case did not require radiation therapy and was doing well at 4, 10, 12, and 18 months; the patient returned for unrelated treatment 1 year after the surgery.

Conclusion: These cases show that with a careful history and patient examination, enough clinical data may be gathered to make an accurate health care determination under various conditions. It also illustrates the importance of interprofessional cooperation for various disciplines of health care providers regardless of training or specialty.

Intracranial hypotension causing headache and neck pain: a case study.

Gary. A. Knutson, DC

Objective: The purpose of this study is to discuss the presentation, examination, diagnosis, and treatment of a case of intracranial hypotension presenting to a chiropractic office as acute severe headache and neck pain.

Clinical Features: Flexion injury during a weight lift resulted in a severe postural headache and upper cervical spine pain in a 51-year-old man. The patient presented with unusual symptoms, but normal palpatory findings and a lack of postural distortion.
**Intervention and Outcome:** Based on the history, symptoms, and examination findings, the patient was referred for an emergency medical evaluation. A diagnosis of intracranial hypotension was made, and a dural leak was confirmed by radioisotope cisternography. The patient made a complete recovery.

**Conclusions:** Intracranial hypotension can cause headache and neck pain that may appear to be musculoskeletal in nature. The key symptom is the orthostatic nature of the headache.

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