

JMPT Abstracts for May 2008 Volume 31 - Issue 4

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Motor-Evoked Potentials Recorded From Lumbar Erector Spinae Muscles: A Study of Corticospinal Excitability Changes Associated With Spinal Manipulation

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Objective: The purpose of this study was to determine if high-velocity, low-amplitude spinal manipulation (SM) altered the effects of corticospinal excitability on motoneuron activity innervating the paraspinal muscles. In a previous study using transcranial magnetic stimulation (TMS), augmentation of motor-evoked potentials (MEPs) from the gastrocnemius muscle after lumbar SM was reported. To date, there is no known report of the effect of SM on paraspinal muscle excitability.

Methods: The experimental design was a prospective physiologic evaluation of the effects of SM on corticospinal excitability in asymptomatic subjects. The TMS-induced MEPs were recorded from relaxed lumbar erector spinae muscles of 72 asymptomatic subjects. The MEP amplitudes were evaluated pre-SM and post-SM for conditions involving pre-thrust positioning and joint loading or control.

Results: There was a transient increase in MEP amplitudes from the paraspinal muscles as a consequence of lumbar SM ($F[6,414] = 8.49$; $P < .05$) without concomitant changes after pre-thrust positioning and joint loading or in control subjects ($P > .05$). These data findings were substantiated by a significant condition x time interaction term ($F[12,414] = 2.28$; $P < .05$).

Conclusions: These data suggest there is a postsynaptic facilitation of α motoneurons and/or corticomotoneurons innervating paraspinal muscles as a consequence of SM. It appears SM may offer unique sensory input to the excitability of the motor system as compared to pre-thrust positioning and joint loading and control conditions.

Observer Agreement of Spine Stenosis on Magnetic Resonance Imaging Analysis of Patients With Cervical Spine Myelopathy

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Objectives: The purpose of this study was to measure the intraobserver and interobserver

reliability of magnetic resonance detection of cervical spondylotic myelopathy with and without operational guidelines.

Methods: Seven radiologists examined images from 10 patients with cord signal abnormalities and clinical signs of myelopathy. Radiologist examined films twice, with and without operational guidelines designed to define stenotic changes, while blinded to the clinical findings of the patients. Analyses included a Fleiss κ assessment of intraobserver and interobserver reliability.

Results: Results demonstrated high percentage of agreement and strong intraobserver reliability and variable Fleiss κ values for interobserver assessment. Operational guidelines did not improve the intraobserver or interobserver agreement.

Conclusion: Although the percentage of agreement was high in some cases, the κ agreement was low - most likely a result of the base rate problem of a κ analysis. Sample bias toward severe degenerative changes resulted in highly prevalent selections and κ adjusted values. Nonetheless, the results do suggest substantial intraobserver κ agreement and a wide range of interobserver κ agreement exists among trained radiologists during detection of stenotic changes associated with cervical spondylotic myelopathy.

Force-Displacement Relationship During Anteroposterior Mobilization of the Ankle Joint
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Objective: The purpose of this study was to determinate the correlation between force and displacement during passive anteroposterior mobilization of the talus and the effect of this treatment technique on ankle dorsiflexion range of motion (ROM).

Methods: This is an exploratory, methodological study. Maitland grades III and IV mobilization were applied on the right ankle of 25 healthy subjects (mean age \pm standard deviation, 25.08 ± 3.01 years) by two randomized raters (A and B). Applied forces were measured using a small force plate and displayed for the rater on a computer monitor. Linear displacement of the ankle joint was quantified by a motion analysis system. Synchronization of these two systems was obtained by software. Dorsiflexion active ROM, before and after mobilization, was assessed using a biplane goniometer. Statistical analysis was performed using the Pearson correlation coefficient for force and displacement variables and the paired t test to compare dorsiflexion ROM mean values.

Results: A fair positive correlation was found between force range and displacement ($r = 0.370$; $P = .049$, 1-tailed), and a fair negative correlation was found between minimum forces and displacement ($r = 0.404$; $P = .035$, 1-tailed), only for rater A data. A significant increase in dorsiflexion was found in the right ankle ($P = .035$), comparing ROM before and after mobilization, which did not occur in the left ankle.

Conclusions: These data do not support a linear force-displacement relationship during Maitland grades III and IV passive joint mobilization, although they confirmed an increase in ankle dorsiflexion ROM immediately after joint mobilization. The use of visual feedback may increase interrater reliability of forces applied during ankle joint mobilization.

Intertester Reliability and Diagnostic Validity of the Cervical Flexion-Rotation Test
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Objective: This article evaluates reliability and diagnostic validity of the cervical flexion-rotation test (FRT) to discriminate subjects with headache because of C1/2 dysfunction. In addition, this study evaluates agreement between experienced and inexperienced examiners.

Methods: These were two single-blind comparative measurement study designs. In study 1, two experienced blinded examiners evaluated the FRT in 10 asymptomatic controls, 20 subjects with cervicogenic headache (CeH) where C1/2 was the primary dysfunctional level, and 10 subjects with CeH but without C1/2 as the primary dysfunctional level. In study 2, two inexperienced and one experienced blinded examiner evaluated the FRT in 12 subjects with CeH and 12 asymptomatic controls. Examiners were required to state whether the FRT was positive and also to determine range of rotation using a goniometer. An analysis of variance with planned orthogonal comparison, single measure intraclass correlation coefficient (2,1), and Bland-Altman plot were used to analyze FRT range of rotation between the examiners. Sensitivity, specificity, and examiner agreement for test interpretation were analyzed using cross tabulation and κ .

Results: In study 1, sensitivity and specificity of the FRT was 90% and 88% with 92% agreement for experienced examiners ($P < .001$). Overall diagnostic accuracy was 89% ($P < .001$) and $\kappa = 0.85$. In study 2, for inexperienced examiners, FRT mobility was significantly greater than for experienced examiners, but sensitivity, specificity, agreement, and κ values were all within clinically acceptable levels.

Conclusions: The FRT can be used accurately and reliably by inexperienced examiners, and may be a useful aid in CeH evaluation.

Issues in Conducting Research in Chiropractic College Clinics
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Objective: This study surveyed and interviewed faculty and staff at chiropractic colleges to investigate issues related to conducting clinical research in teaching clinics.

Methods: This was a descriptive study using qualitative research methods. The study was conducted from May 2007 to August 2007 by means of an electronically administered survey using purposive sampling of faculty and administrators at North American chiropractic colleges.

Results: Fifty-eight total surveys were e-mailed to research directors, faculty, and staff at 16 colleges; two surveys were returned as undeliverable. Of the 56 successfully delivered surveys, 34 (61%) completed surveys were returned, representing 13 colleges. Not having a separate research clinic was seen by some respondents as positive and by others as negative. Of the 34 respondents, 32 felt there were advantages associated with conducting research within the college's teaching clinics rather than exclusively in a separate research clinic; 33 respondents described challenges to implementing the integration of research into their institution's clinics. The primary themes that emerged as challenges to conducting research in the institutions' teaching clinics were related to administration and policy, resources/facilities, faculty issues, and student issues. Respondents described strategies they had developed to address these challenges, primarily focusing on the challenges related to faculty and students rather than administration and resources.

Conclusion: In most chiropractic institutions, the challenges of integrating research into teaching clinics are being addressed primarily by individuals using focused, situation-specific strategies rather than at the level of institutional policy.

