

# Research Abstracts From the *Journal of Manipulative and Physiological Therapeutics*

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Agreement and Correlation Between the SLR and Slump Tests in Subjects With Leg Pain

*Jeremy Walsh MManipTher, Toby Hall, MSc*

**Objective:** The straight leg raise (SLR) and slump tests have traditionally been used to identify nerve root compression arising from disk herniation. However, they may be more appropriate as tests of lumbosacral neural tissue mechanosensitivity. The aim of this study was to determine agreement and correlation between the SLR and slump tests in a population presenting with back and leg pain.

**Methods:** This was an observational, cross-sectional study design. Forty-five subjects with unilateral leg pain were recruited from an outpatient Back Pain Screening Clinic at a large teaching hospital in Ireland. The SLR and slump tests were performed on each side. In the event of symptom reproduction, the ankle was dorsiflexed. Reproduction of presenting symptoms, which were intensified by ankle dorsiflexion, was interpreted as a positive test. An inclinometer was used to measure range of motion (ROM).

**Results:** There was substantial agreement between SLR and slump test interpretation ( $k = 0.69$ ) with good correlation in ROM between the 2 tests ( $r = 0.64$ ) on the symptomatic side. In subjects who had positive results, ROM for both tests was significantly reduced compared to ROM on the contralateral side and ROM in subjects who had negative results.

**Conclusions:** When the SLR and slump tests are interpreted as positive in the event of reproduction of presenting leg pain that is intensified by ankle dorsiflexion, these tests show substantial agreement and good correlation in the leg pain population. When interpreted in this way, these tests may be appropriate tests of neural tissue mechanosensitivity, but further criteria must be met before a definitive conclusion in relation to neural tissue mechanosensitivity may be drawn.

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Modulation of the Flexion-Relaxation Response by Spinal Manipulative Therapy

*Kim Lalanne, DC, MSc, et al.*

**Objective:** This study evaluated the effects of spinal manipulation on spatiotemporal flexion-relaxation phenomenon parameters in individuals with chronic low back pain.

**Methods:** Twenty-seven adults with chronic low back pain participated in this study and first performed a block of 5 complete trunk flexion-extensions. The experimental group ( $n = 13$ ) was then submitted to lumbar spine manipulation, whereas the control group ( $n = 14$ ) was placed in a side-lying control position for 10 seconds. All study participants performed thereafter a second block of 5 trunk flexion-extensions. Trunk and pelvis angles and surface EMG of erector spinae at L2 and L5 were

recorded during the flexion-extension tasks. Flexion angles corresponding to the onset and cessation of myoelectric silence, normalized EMG, and the extension-relaxation ratio were compared across experimental conditions.

Results: A significant reduction of EMG activity at full trunk flexion at the L2 erector spinae level was observed in the experimental group compared to the control group. No significant effect was seen at L5 in both groups. The experimental group presented a significantly increased postmanipulation FRR at L2, whereas the control group ratio did not vary after the "side-lying control position." No significant difference was seen at L5 in both groups. Flexion-relaxation phenomenon onset and cessation angle did not differ across groups or conditions.

Conclusions: This study shows that lumbar spine manipulation can, at least for a brief period, modulate stabilizing neuromuscular responses of the lumbar spine in a group of patients with low back pain.

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#### Interexaminer Reliability of a Leg-Length Analysis Procedure Among Novice and Experienced Practitioners

*Kelly Holt, BSc (Chiro), PGCertHSc, et al.*

Objective: The purpose of this study was to evaluate the interexaminer reliability of a leg length analysis protocol between an experienced chiropractor and an inexperienced chiropractic student who has undergone an intensive training program.

Methods: Fifty participants, aged from 18 to 55 years, were recruited from the New Zealand College of Chiropractic teaching clinic. An experienced chiropractor and a final-year chiropractic student were the examiners. Participants were examined for leg length inequality in the prone straight leg and flexed knee positions by each of the examiners. The examiners were asked to record which leg appeared shorter in each position. Examiners were blinded to each other's findings. *k* statistics and percent agreement between examiners were used to assess interexaminer reliability.

Results: Analysis revealed substantial interexaminer reliability in both leg positions and also substantial agreement when straight and flexed knee results were combined for each participant. *k* scores ranged from 0.61, with 72% agreement, for the combined positions to 0.70, with 87% agreement, for the extended knee position. All of the *k* statistics analyzed surpassed the minimal acceptable standard of 0.40 for a reliability trial such as this.

Conclusion: This study revealed good interexaminer reliability of all aspects of the leg length analysis protocol used in this study.

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#### Video Analysis of Sagittal Spinal Posture in Healthy Young and Older Adults

*Yi-Liang Kuo, et al.*

Objective: Changes in posture are of concern because of their association with pain or impaired physical function. Previous studies that have used computer-aided video motion analysis systems to measure posture have been compromised by the use of problematic models of skin marker placement. This study aimed to quantify and compare sagittal spinal posture in standing and sitting between young and older adults using a two-dimensional PEAK Motus system and a revised skin marker model.

Methods: Twenty-four healthy young adults and 22 healthy older adults volunteered for this study. The angles of the upper and lower cervical spine, thoracic spine, lumbar spine as well as the orientations of the head, neck, and pelvic plane with respect to an external reference were measured in the standing and sitting positions.

Results: Compared to young adults, healthy older adults demonstrated a forward head posture, with increased lower cervical spine flexion and increased upper cervical extension in both positions. Older adults also sat with significantly increased thoracic kyphosis and decreased lumbar spine flexion.

Conclusion: The angular relationship between adjacent spinal regions in the sagittal plane can be objectively quantified using image-based analysis. The concept that the anteroposterior tilt of the pelvis in standing dictates the lumbar and thoracic curves was supported by the correlations between these adjacent regions in both age groups. The model of skin marker placement used in this study can have a broader application as a clinical tool for image-based postural assessment.

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### Electromyographic Studies in Abdominal Exercises: A Literature Synthesis *Manuel Monfort-Pañego, PhD, et al.*

Objective: The purpose of this article is to synthesize the literature on studies that investigate electromyographic activity of abdominal muscles during abdominal exercises performance.

Methods: MEDLINE and Sportdiscus databases were searched, as well as the Web pages of electronic journal access sites, ScienceDirect and Swetswise, from 1950 to 2008. The terms used to search the literature were abdominal muscle and the specific names for the abdominal muscles and their combination with electromyography, and/or strengthening, and/or exercise, and/or spine stability, and/or low back pain. The related topics included the influence of the different exercises, modification of exercise positions, involvement of different joints, the position with supported or unsupported segments, plane variation to modify loads, and the use of equipment. Studies related to abdominal conditioning exercises and core stabilization were also reviewed.

Results: Eighty-seven studies were identified as relevant for this literature synthesis. Overall, the studies retrieved lacked consistency, which made it impossible to extract aggregate estimates and did not allow for a rigorous meta-analysis. The most important factors for the selection of abdominal strengthening exercises are (a) spine flexion and rotation without hip flexion, (b) arm support, (c) lower body segments involvement controlling the correct performance, (d) inclined planes or additional loads to increase the contraction intensity significantly, and (e) when the goal is to challenge spine stability, exercises such as abdominal bracing or abdominal hollowing are preferable depending on the participants' objectives and characteristics. Pertaining to safety criteria, the most important factors are (a) avoid active hip flexion and fixed feet, (b) do not pull with the hands behind the head, and (c) a position of knees and hips flexion during upper body exercises.

Conclusions: Further replicable studies are needed to address and clarify the methodological doubts expressed in this article and to provide more consistent and reliable results that might help us build a body of knowledge on this topic. Future electromyographic studies should consider addressing the limitations described in this review.

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