A Pilot Investigation of Expert and Novice Intraexaminer and Interexaminer Reliability of Durometer Analysis Of The Cervical Spine

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Abstract

Introduction: The foundation of chiropractic is based on locating and correcting joint dysfunction, i.e., subluxations and fixations. Chiropractic tests used to determine the need for and site of spinal manipulative therapy (SMT) have been the subject of considerable empirical study. The conclusions of this body of literature are equivocal, with few studies finding acceptable reliability or validity for the methods used to identify joint dysfunction. The consensus of the majority of studies and systematic reviews is that chiropractic tests used to locate joint dysfunction have unacceptable reliability and/or validity, including: Motion palpation, static palpation, diagnostic imaging (x-ray, video fluoroscopy), orthopedic tests, neurological tests, leg length inequality, visual observation, and pain description. The poor to fair reliability of these chiropractic tests creates a number of problems: 1. Chiropractic researchers, educators, practitioners and students lack a scientifically supported means of determining "where to adjust"; 2. Political, economic, and legal concerns with legislation, reimbursement, and litigation; 3. Scientific issues of identifying joint dysfunction determining the effects of SMT without adequate objective measures. The Pro-Adjuster System (PAS) is an FDA approved chiropractic-specific instrument used for spinal analysis and treatment. The PAS consists of a computer, software, and a piezoelectric durometer instrument, with protocols for analysis and treatment of disorders related to vertebral motion anomalies. In scan (analysis) mode, the instrument is placed against the spinous process of a vertebrae and the instrument head engages when a preload of 6 pounds has been applied. In scan mode the instrument functions as a durometer, emitting a single impulse, which measures the vertebrae's resistance to movement. Durometers are widely used in industry and, as engineering hardware, measure the resistance of any material with nearly flawless precision. Properly used, the PAS instrument is claimed to accurately measure a vertebrae's resistance to movement in the posterior to anterior plane which, if true, would be reliable by definition. Thus, the only error in this measurement of fixation/joint dysfunction would be due to operator variables.
Objective: The current study is the first to assess intra and inter-examiner reliability of PAS scans of the cervical spine for expert and novice examiners.
Method: This study was approved the Logan College of Chiropractic (LCC) Institutional Review Board. Design: Intra and inter examiner reliability study designed to test the hypotheses that for all cervical vertebrae: 1. PAS cervical spine scan reliabilities for all expert and novice comparisons would not be significantly different (a priori $p > .05$) and 2. Interclass correlations (ICCs) for all expert and novice combinations would be > .6. Participants: Sixty-four asymptomatic male and female consenting volunteers (age range 22-54, mean age 28.3) were selected from the LCC student body. Exclusion criteria

were: Systemic illness, skin or other malignancy, local infection or injury, analgesic or muscle relaxant use within 48 hours, and chiropractic manipulation within 48 hours. Examiners: The two experts were licensed DCs certified in PAS with 10 and 7 years PAS experience respectively. The two novices were senior chiropractic interns certified in PAS with less than 6 months of PAS experience. Procedure: Participants received two consecutive cervical PAS scans by each examiner in a counter-balanced order. Masked examiners rotated between two examination stations at which participants were seated in a standard PAS chair with seat height, thoracic and head positions adjusted by the first examiner according to participant size. Patients were instructed to remain "very still" during the examination procedure and remained stationary until all exams were complete. Data Analysis: Scan data for each cervical vertebrae were automatically stored by the PAS computer software and subsequently transferred into Excel files. SPSS was used to calculate t-tests for expert-expert, novice-novice and novices-experts comparisons; and interclass correlations (ICCs) for each examiner individually, expert-expert, novice-novice, experts-novices, and experts and novices combined.

Results: All data sets were complete with no drop-outs. Both hypotheses were supported: 1. T-tests for expert-expert, novice-novice and experts-novices were all > .05, indicating that there were no significant differences between the group comparisons for PAS cervical spine scans. 2. ICCs for each examiner, expert-expert, novice-novice, experts-novices and experts and novices combined ranged from .67 to .86 (good to excellent) for all PAS cervical spine scans.

Conclusion: In this pilot study the reliabilities for the Pro-Adjuster System scans of the cervical spine were in the good to excellent range for all examiners and all combinations of examiners for all cervical vertebrae. These reliabilities are among the highest reliability/agreement/concordance findings reported in the literature for chiropractic tests of joint dysfunction. These results, although encouraging, must be considered preliminary pending further investigation. Continued study is warranted with asymptomatic and symptomatic participants and repeated measures designs.

Key Words: Chiropractic, physical examination, reproducibility of results, palpation, motion assessment, reliability, validity, agreement, specificity, sensitivity, observer variation.