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Spinal palpatory diagnostic procedures utilized by practitioners of spinal manipulation: annotated bibliography of content validity and reliability studies

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Introduction

Professions that employ manual manipulative procedures use their own terminology to describe the diagnostic entity that responds to manipulation therapy.[1] Spinal neuromusculoskeletal dysfunction is the term used in our paper to encompass these various terms employed by the different disciplines. Spinal neuromusculoskeletal dysfunction refers to an alteration of spinal joint position, motion characteristics and related palpable paraspinal soft tissue changes. Spinal palpatory diagnostic procedures typically entail static palpation of anatomical landmarks for symmetry, palpation of spinal vertebral joints before, during and after active and passive motion tests, and spinal and paraspinal soft tissue palpatory assessment for abnormalities or altered sensitivity.

Outcomes and effectiveness of manipulative treatments rely partly on the validity and reliability of the palpatory procedures used to diagnose spinal neuromusculoskeletal dysfunction. Investigation of the validity and reliability of spinal palpatory diagnostic tests has been in progress for the past 70 years. A complete review and analysis of these studies is lacking. A preliminary evaluation reveals an inconsistency in the focus, methodology, palpatory procedures and statistical analysis used. Focused narrative reviews from this literature have been previously published.[2–10]

This paper is an annotated bibliography of primary research studies on the content validity and reliability of

M6 Beal MC, Goodridge JP, Johnston WL, McConnell DG. Inter-examiner agreement on long-term patient improvement: an exercise in research design. J Am Osteopath Assoc 1982; 81:322–328.
The stud, eBaluated long-term inter-e aminer reliabilit, on diagnosing aggraBation or improBement of musculoskeletal conditions of the spine. Three osteopathic ph, sician facult, speciali ing in manipulation performed unspecified spinal palpator, eBaluation and manual treatment procedures on 3 patients oBer 17 months. Palpator, eBaluation included regional and segmental motion testing and palpation of paraspinal soft tissue. Line graphs using a plus-minus scale demonstrated oBer-all agreement of findings on 2 out of 3 patients. The authors also stated that an improBement in palpator, test results correlated ith patients' reported s, mptomatic improBement.

M7 Johnston W, Hill J, Elkiss M, Marino R. Identification of stable somatic findings in hypertensive subjects by trained examiners using palpatory examination. J Am Osteopath Assoc 1982; 81:830–836.
The stud, eBaluated the inter-e aminer reliabilit, of spinal

inter-e aminer reliabilit, , the scores ere 0.19 to 0.17. There as poor inter-e aminer reliabilit, for all segments ith fair to moderate intra-e aminer reliabilit, at the L1 2 and the L4 5 segments.

M18 Leboeuf C, Gardner V, Carter A, Scott T. Chiropractic examination procedures: A reliability and consistency study. J Austral Chiropractor Assoc 1989; 19:101–104.

The stud, in estigated intra- and inter-e aminer reliabilit, for certain chiropractic tests: pain on spinous process palpation, interspinous ligament palpation and spinous process percussion, and motion palpation, sign of the rising thumb and resilienc, on e tension in the lumbar spine. T o chiropractic students e amined 39 subjects ith chronic lo back pain. The abilit, of e aminers to agree on the presence/absence of positi e findings in these

M28 Tuchin P, Hart C, Johnson C, et al. Inter-examiner reliability of chiropractic evaluation for cervical spine problems – a pilot study. Part 1: Graduates from one institution. Australian Chiropractic & Osteopathy 1996; 5:23–29.
The stud, e aluated the reliabilit, of e aminers in palpation of the cer ical spine. Eight e perienced chiropractors, using indi idual palpator, methods including static and/or motion palpation, and ertebral springing, e amined 53 as, mptomatic olunteer student subjects for cer ical spine d, sfunction. There as poor inter-e aminer agreement ith C6 being the segment of the highest disagreement.

M29 Phillips DR, Twomey LT. A comparison of manual diagnosis with a diagnosis established by a uni-level lumbar spinal block procedure. This study was presented in part at the 8th Biennial Conference of the MPAA in 1993. Manual Therapy 1996; 1:82–87.
This stud, in estigated the inter-e aminer reliabilit, and alidit, of lumbar spine manual palpation in the diagnosis of patients ith lo back pain using a randomi ed cross-o er design ith a prospecti e and retrospecti e part. T o manipulati e ph, siotherapists e aluated 63 s, mptomatic and 9 as, mptomatic olunteer subjects for abnormal quantit, and qualit, of passi e inter ertebral motion and ertebral response to digital pressure. The authors used percent agreement, Kappa and eighted Kappa anal, sis to determine inter-e aminer reliabilit, . There as poor intertherapist reliabilit, for motion ratings (eighted Kappa ranged from 0.15 to 0.32) and ertebral response to pressure (Kappa ranged from 0.16 to 0.28).

0.308 for inter-e aminer and intra-e aminer reliabilt, respectiBel, . The authors concluded that there as poor inter and intra-e aminer reliabilt, for the cranio-Bertebral side bending passiBe motion test.

M33 Maher CG, Latimer J, Adams R. An investigation of the reliability and validity of posteroanterior spinal stiffness judgments made using a reference-based protocol. Phys Ther 1998; 78:829–837.

The reliabilt, portion of this stud, assessed the agreement in stiffness estimates in the lumbar spine. T o blinded e perienced ph, sical therapists, e amined 40 as, mptomatic Bolunteers at L3, using their preferred palpation method. Interclass correlation coefficient (ICC) ith 95% confidence interBals as 0.5 0.62 ith a lo standard error of measurement.

M34 Hawk C, Phongphua C, Bleecker J, Swank L, Lopez D, Rubley T. Preliminary study of the reliability of assessment procedures for indications for chiropractic adjustments of the lumbar spine. J Manipulative Physiol Ther 1999; 22:382–389.

The stud, eBaluated inter- and intra-e aminer reliabilt, in assessing indications for chiropractic adjustment of the lumbar spine. Four licensed chiropractic e aminers (2 ith 20+ and 2 ith 3 or less , ears of e perience), e amined 18 (2 s, mptomatic and 16 as, mptomatic) Bolunteer subjects. E aminers ere trained in a standardi ed fle ion-distraction technique. The, also used manual assessment procedures used in eBer, da, clinical practice including 1) h, po or h, per mobilit, of each segment, 2) changes in tissue te ture or tension of the skin and underl, ing tissue, 3) palpable temperature changes, and 4) tenderness elicited on palpation. Intra-e aminer reliabilt, Kappa scores ranged from 0.17 to 0.85. For intra-e aminer reliabilt, there as considerable Bariation b, segment and among the four e aminers. Inter-e aminer reliabilt, scores ranged from 0.42 to 0.44. The authors

procedures. Overall, intra-examiner agreement on decision to manipulate ranged from 73 to 92 percent, with Kappa values of 0.13 to 0.73. Inter-examiner reliability was low at lower thoracic and lumbar spinal levels, with the mean percent agreement ranging from 48 to 83% and Kappa values ranging from 0.16 to 0.27.

e aminer reliabilit, bet een the t o trained e aminers as greater (93% agreement; Kappa = 0.85) than for either of these t o ith the (third) untrained e aminer, ho used his o n test procedures (82% and 84% agreements; Kappa = 0.57 and 0.61 respectiel,). Intra-e aminer reliabilit, for one of the trained e aminers as good (91% agreement; Kappa = 0.78).

Pain or sensitivity provocation procedures

P1 Waddell G, Main CJ, Morris EW, et al. Normality and reliability in the clinical assessment of backache. BMJ (Clin Res Ed) 1982; 284:1519–1523.
The stud, e aluated the inter-e aminer reliabilit, of histor, and ph, sical e amination procedures and clinical assessment in patients ith back pain. Fie e orthopedic surgeons e amined 810 patients ith backache. This included elicitation of lumbar tenderness b, spinal palpation. Most stud, groups compared t o e aminers. The un- eighted Kappa scores for reliabilit, of spinal palpation for tenderness on 8 patients as 1.0 (< 0.001). The un- eighted kappa scores for reliabilit, on ph, sical e am ranged from 0.41 to 1.0 and on ps, chological and behaioral assessment from 0.27 to 0.94 (< 0.05).

P2 DeBoer K, Harmon R, Tuttle C, Wallace H. Reliability study of detection of somatic dysfunctions in the cervical spine. J Manipulative Physiol Ther 1985; 8:9–16.
See M10

P3 Viikari-Juntura E. Inter-examiner reliability of observations in physical examinations of the neck Phys Ther 1987; 1526–1532.
The stud, assessed inter-e aminer reliabilit, of palpator, procedures of the cerical spine. A ph, sical medicine and rehabilitation specialist (ph, siatrist) and a ph, sical therapist e amined 69 consecuie s, mptomatic patients using a conentional neurological ealuation, palpation, and elocatie tests for pain, numbness and paresthesias. Agreement on palpation for tenderness as reported for 51 subjects using empirical alue of Kappa scores and proportion of significant agreement (p_s). The Kappa score as fair for upper spinous processes at 0.47 (p_s 0.56), as ell as for lo er spinous processes at 0.52 (p_s 0.67); ho ee er, as poor for right cerical paraspinal soft tissues at 0.24 (p_s 0.33). For left cerical paraspinal soft tissues the pre alence as less than 10% so Kappa as not used (p_s 0.00).

P4 Boline P, Keating J, Brist J, Denver G. Inter-examiner reliability of palpatory evaluations of the lumbar spine. Am J Chiropractic Med 1988; 1:5–11.
See M14

P5 Leboeuf C, Gardner V, Carter A, Scott T. Chiropractic examination procedures: A reliability and consistency study. J Austral Chiropractor Assoc 1989; 19:101–104.
See M18

P6M Keating JC, Jr. Bergmann TF, Jacobs GE, Finer BA, Larson K. Inter-examiner reliability of eight evaluative dimensions of lumbar segmental abnormality. J Manipulative Physiol Ther 1990; 413:463–70.
See M19

P7M Nice DA, Riddle DL, Lamb RL, Mayhew TP, Rucker K. Intertester reliability of judgments of the presence of trigger points in patients with low back pain. Arch Phys Med Rehabil 1992; 73:893–898.
The stud, e aluated inter-e aminer reliabilit, in assessing the presence of trigger points in the lumbar spine region. T el e e perienced ph, sical therapists e aluated 50 patients ith lo back pain using the Tra ell and Simon assessment e amination using pain as the endpoint. The Kappa score for inter-e aminer reliabilit, ranged from 0.29 to 0.38; percent agreement ranged from 76% to 79%; the obsered proportion of positie agreement ranged from 0.43 to 0.52. The authors concluded that there as poor inter-e aminer reliabilit, in the assessment of the presence of trigger points in patients ith lo back pain.

P8 Boline PD, Haas M, Meyer JJ, Kassak K, Nelson C, Keating JC Jr. Inter-examiner reliability of eight evaluative dimensions of lumbar segmental abnormality: Part II. J Manipulative Physiol Ther 1993; 16:363–374.
The stud, e aluated inter-e aminer reliabilit, using see eral measurements including lumbar spinal palpator, procedures. Three e perienced chiropractors e amined 28 s, mptomatic patients ith chronic lo back pain. Palpa-

tion for osseous pain produced percent agreement that ranged from 79% to 96% ith Kappa coefficients ranging from 0.48 to 0.98. Palpation for soft tissue pain produced percent agreement ranging from 75% to 93% ith Kappa coefficients ranging from 0.40 to 0.79. Good reliabilit as demonstrated for inter-e aminer pro ocati e palpator procedures for elicitation of both osseous and paraspinal soft tissue pain in the stud population.

P9 Richter T and Lawall J. Reliability of diagnostic findings in manual medicine. Manuelle Medizin, 1993; 31:1–11.
See M22

P10 Hubka MJ, Phelan SP. Inter-examiner reliability of palpation for cervical spine tenderness. J Manipulative Physiol Ther 1994; 17:591–595.
The stud e aluated the inter-e aminer reliabilit of palpation for cer ical spine tenderness using a ithin subjects (repeated measures) design. T o e perienced chiropractors e amined 30 patients ith mechanical neck pain. Inter-e aminer reliabilit as assessed b percent agreement as 76.6% ith a Kappa score of 0.68. The authors found that manual palpation of the cer ical spine for tenderness is a reliable e amination tool.

P11 Maher C, Adams R. Reliability of pain and stiffness assessments in clinical manual lumbar spine examination. Phys Ther 1994; 74:801–811.

P19 Schöps P, Siebert U, Schmitz U, Friedle AM, Beyer A. Reliabilität nichtinvasiver diagnostischer Untersuchungsmethoden zur Erfassung

cient (ICC) at the 95% confidence interval was calculated. Intra-examiner reliability was poor to moderate for both

tion. T o e perienced chiropractors e amined 42 as, mptomatic chiropractic students in the sitting and prone positions. The e aminers used a skin-marking pen to identif, the spinous processes. Intra-e aminer percent agreement at L1 ith the subject sitting Bs. prone as 55% for one e aminer and 39% for the other. At L4, intra-e aminer percent agreement for both e aminers as 62%. Inter-e aminer percent agreement as better at L4 (sitting 79%; prone 81%) than at L1 (sitting 55%; prone 69%) ith the subjects in either the sitting or prone positions.

L4 Binkley J, Stratford PW, Gill C. Inter-rater reliability of lumbar accessory motion mobility testing. Phys Ther 1995; 75:786–792.
See M24

L5 McKenzie AM, Taylor NF. Can Physiotherapists locate lumbar spinal levels by palpation? Physiother 1997; 83:235–239.
The stud, eBaluated intra-e aminer and inter-e aminer reliabilit, in locating lumbar spinal leBels b, palpation. Three ph, siotherapists (intra-e aminer) and 14 ph, siotherapists (inter-e aminer) e amined 10 Bolunteer subjects, using their preferred method of palpation. Kappa scores for intra-e aminer reliabilit, ere 0.61 to 0.90. Kappa scores for inter-e aminer reliabilit, as 0.28. There as good to e cellent intra-e aminer reliabilit, , but poor inter-e aminer reliabilit, hen palpating for lumbar spine leBels.

L6 Downey BJ, Taylor NF, Niere KR. Manipulative physiotherapists can reliably palpate nominated lumbar spinal levels. Man Ther 1999; 4:151–156.
The stud, assessed inter-e aminer reliabilit, in palpating n a l lumbar spine leBels. Three pairs of e perienced ph, sical therapists palpated 60 patients ith lo back pain, marking the mid-point of a randoml, nominated spinous process. Almost perfect oBerall agreement as achieBed among all three pairs in locating the nominated leBel (eighted Kappa = 0.92).

Unspecified types of tests

U1 McConnell DG, Beal MC, Dinnar U, et al. Low agreement of findings in neuromusculoskeletal examinations by a group of osteopathic physicians using their own procedures. J Am Osteopath Assoc 1980; 79:441–450.
The stud, e amined the inter-e aminer reliabilit, in neuromuscular e amination procedures, including spinal palpation. Si osteopathic ph, sicians speciali ing in manipulation using their (unspecified) customar, palpator, procedures e amined 21 s, mptomatic Bolunteers. Results reBealed lo inter-e aminer reliabilit, on segmental location and intensit, of findings. The authors inferred that inter-e aminer agreement ould likel, impro Be, if the e aminers first agreed upon the follo ing: a) the areas to be e amined; b) the test procedures to be used; c) the method of quantif, ing the intensit, of the findings; and d) the method of recording.

U2 Beal M, Dvorak J. Palpatory examination of the spine: a comparison of the results of two methods and their relationship to visceral disease. Man Med 1984; 1:25–32.
The stud, eBaluated inter-e aminer agreement using t o methods of spinal palpation: the conBentional American osteopathic and the Manual Medicine Societ, of S it erland methods. T o ph, sicians speciali ing in spinal ma-

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tion of painful upper cervical joint dysfunction. The findings of the chief investigator of the trial were compared with those of each of the other 6 experienced independent physiotherapists. The therapists examined 40 symptomatic (headache and neck pain) and asymptomatic volunteer subjects using their own personal test procedures. Additionally, some of the independent examiners were tested against each other. There was complete agreement (Kappa = 1.0) in six pairs of examiners and excellent agreement (Kappa = 0.78 and Kappa = 0.8) between two pairs. Percent agreement was 70% for inter-examiner reliability on the most dysfunctional joint in symptomatic patients.