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| **Centralisation** | | |
| Aina A, May S, Clare H. The centralization phenomenon of spinal symptoms - a systematic review. Man Ther; Aug;9(3):134-143, 2004.  Systematic review of 14 studies into centralisation. Prevalence 70% in 731 sub-acute back pain patients and 52% in 325 chronic back pain patients. Centralisation was reliably assessed (kappa values 0.51 to 1.0). Centralisation was consistently associated with good outcomes, and failure to centralise with poor outcomes. Association was confirmed by high quality studies. |  |  |
| Broetz D, Hahn U, Maschke E, Wick W, Kueker W, Weller M; Lumbar disc prolapse: response to mechanical physiotherapy in the absence of changes in magnetic resonance imaging. Report of 11 cases. NeuroRehab; 23.289-294, 2008.  11 patients with MRI confirmed disc prolapse with over half having weakness and sensory loss were treated with repeated end-range movements and re-evaluated after 5 treatment sessions. Centralisation occurred in 8 of 11 and all patients showed improvements in signs and symptoms, but no changes in MRI features. |  |  |
| New!Broez D, Burkard S, Weller M ; A prospective study of mechanical physiotherapy for lumbar disk prolapse: five year follow-up and final report. NeuroRehab; 26.155-158, 2010.  Follow-up of previous study in which patients with lumbar herniations and demonstrating centralisation predicted good long-term outcome in the majority of patients. |  |  |
| Bybee F, Olsen D, Cantu-Boncser G, Condie Allen H, and Byars A; Centralization of symptoms and lumbar range of motion in patients with low back pain. Physio Theory Pract; 25:257-267, 2009.  42 patients with back pain were classified as centralised (30), centralising (3), non-centralised (9); there were significant differences between initial and final extension range in first 2 groups, but not in the latter. Patients who showed centralisation on initial visit also showed an increase of ROM during initial visit. |  |  |
| Bybee R, Hipple L, McConnell R, Crossland P ; The relationship between reported pain during movement and centralization of symptoms in low back pain patients. Manuelle Therapie; 9:122-127 (German), 2005.  Occurrence of centralisation was correlated with occurrence of pain during movement in 33 patients with back pain. 22 (67%) reported centralisation, 8 (24%) centralising symptoms, and 3 (9%) reported no site change in symptoms; and 29 reported pain during movement. 97% of those who reported pain during movement reported centralisation/centralising; and 93% of those who reported centralisation/centralising reported pain during movement (p=0.001 for both). |  |  |
| Christiansen D, Larsen K, Jensen OK, Nielsen CV; Pain Responses in Repeated End-Range Spinal Movements and Psychological Factors in Sick-Listed Patients with Low Back Pain: is there an Association? J Rehabil Med; 41.545-549, 2009.  Cross sectional study looking at centralisation status and psychological factors in 331 patients with back pain. Centralisation occurred in 30% of their sample. There were significant associations between non-centralisation and mental distress and depression. |  |  |
| Donelson R, Aprill C, Medcalf R, Grant W.; A prospective study of centralization of lumbar and referred pain. A predictor of symptomatic discs and anular competence. Spine; May 15;22(10):1115-22, 1997.  63 chronic patients received a mechanical evaluation and discography, with clinicians blind to the findings of the other assessment. Centralisation (74%) and peripheralisation (69%) were strongly associated with discogenic pain, compared to no change in symptoms (12%). Centralisation (91%) was strongly associated with a competent annulus compared to peripheralisation (54%). |  |  |
| Donelson R, Grant W, Kamps C, Medcalf R.; Pain response to sagittal end-range spinal motion. A prospective, randomized, multicentered trial. Spine; Jun;16(6 Suppl):S206-12, 1991.  Donelson found that 47% of low back pain patients with or without referred pain displayed a directional preference to end range sagital spinal movement – 40% preferred extension, 7% preferred flexion. |  |  |
| Donelson R, Silva G, Murphy K.; Centralization phenomenon. Its usefulness in evaluating and treating referred pain. Spine; Mar;15(3):211-3, 1990.  The centralisation phenomenon is found to be a reliable predictor of good or excellent treatment outcome. In 87 patients centralisation occurred in 87% - with centralisation occurring in 100% of 59 patients with excellent outcomes. |  |  |
| George SZ, Bialosky JE, Donald DA ; The centralization phenomenon and fear-avoidance beliefs as prognostic factors for acute low back pain: a preliminary investigation involving patients classified for specific exercise. J Orthop Sports Phys Ther; 35:580-588, 2005.  Secondary analysis of 28 patients who were classified as specific exercise category and observed for the effects of prognostic variables at baseline on outcomes at 6 months. Centralisation and fear-avoidance at work both independently and significantly predicted disability at 6 months. Only centralisation significantly predicted pain at 6 months. |  |  |
| Heintz MM, Hegedus EJ; Multimodal management of mechanical neck pain using a treatment based classification system. J Manual Manip Thera; 16.217-224, 2009.  Case report of patient with neck pain classified under treatment-based classification system, whose pain centralised with retraction exercises, mobilisations and posture advice. |  |  |
| Karas, R.; McIntosh, G.; Hall, H.; Wilson, L.; Melles, T.; The Relationship Between Nonorganic Signs and Centralization of Symptoms in the Prediction of Return to Work for Patients With Low Back Pain Phys Ther; 77:354-360, 1997.  Inability to centralize indicated a decreased probability of returning to work, regardless of the Waddell score. A high Waddell score predicted a poor chance of returning to work regardless of the patients’ ability to centralize symptoms. Waddell scores appear to be a better predictor of poor outcomes. |  |  |
| Laslett M, Oberg B, Aprill CN, McDonald B ; Centralization as a predictor of provocation discography results in chronic low back pain, and the influence of disability and distress on diagnostic power. Spine J; 5:370-380, 2005.  83 patients with chronic low back pain underwent a full or partial mechanical examination and discography and the results were compared. The prevalence of positive discography was 75%, and of centralisation 32%. Sensitivity of centralisation to predict discogenic pain was weak (about 40%), but specificity was high and 100% in patients without severe distress or disability. |  |  |
| Lisi AJ.; The centralization phenomenon in chiropractic spinal manipulation of discogenic low back pain and sciatica J Manipulative Physiol Ther ; Nov-Dec;24(9):596-602, 2001.  3 case studies demonstrating value of centralisation. 2 patients displayed centralisation and responded to mobilisation / manipulation treatment. One patient only able to peripheralise came to surgery. |  |  |
| Long A; The centralization phenomenon: its usefulness as a predictor of outcome in conservative treatment of chronic low back pain (a pilot study Spine; 20(23):2513-2521, 1995.  A pilot study indicating that centralisation is useful as an outcome predictor in chronic patients. There was a superior outcome comparing centralisers to non-centralisers in an interdisciplinary work-hardening programme. |  |  |
| Long A, May S, Fung T ; The comparative prognostic value of directional preference and centralization: a useful tool for front-line clinicians? J Manual Manip Thera; 16.248-254, 2008.  Secondary analysis from a previous trial (Long et al 2004) of 312 patients who received a mechanical evaluation at baseline, 84 were deemed to have a good outcome (defined as at least 30% reduction in baseline Roland-Morris score). Factors that were predictive of a good outcome were analysed using multivariate analysis. Only leg bothersomeness rating and treatment assignment survived multivariate analysis. Subjects with directional preference who received matched directional treatment were 7.8 times more likely to have a good outcome, which was a stronger predictor than a range of other biopsychosocial factors. |  |  |
| New!Murphy DR, Hurwitz EL, McGovern EE; Outcome of pregnancy-related lumbopelvic pain treated according to a diagnosis-based decision rule: a prospective observational cohort study. J Manip Physiol Ther ; 32:616-624, 2010.  Use of a classification system that included centralisation as initial part of algorithm, after exclusion of serious pathology, in a cohort with pregnancy related back pain, of which 58% was pelvic pain, 20% back pain and the rest a mixture. Proportion with each classification is not given. |  |  |
| Murphy DR, Hurwitz EL, McGovern EE.; A nonsurgical approach to the management of patients with lumbar radiculopathy secondary to herniated disk: a prospective observational cohort study with follow-up. J Manip Physiol Thera; 32.723-733, 2009.  Report on consecutive cohort study of patients with lumbar radiculopathy of who 62% demonstrated centralisation with repeated movements, and 8% peripheralisation. Centralisation was associated with functional improvement, especially at long-term follow-up. |  |  |
| Rathore S; Use of McKenzie cervical protocol in the treatment of radicular neck pain in a machine operator. J Can Chiropr Assoc; 47:291-297, 2003.  Case study of patient with cervical radicular pain, demonstrating centralisation in response to retraction and extension, categorised as derangement and treated with retraction and extension exercises. |  |  |
| Schenk R, Bhaidani T, Boswell M, Kelley J, Kruchowsky T; Inclusion of mechanical diagnosis and therapy (MDT) in the management of cervical radiculopathy: a case report. J Manual Manip Ther; 16:E2-E8, 2008.  Case report of patients with cervical radiculopathy whose symptoms centralise with repeated retraction and rotation, and then are abolished with repeated retraction and extension. Numeric pain rating scale and Neck Disability Index are reduced to zero at discharge and 3 month follow-up. |  |  |
| Skytte L, May S, Petersen P; Centralization: Its prognostic value in patients with referred symptoms and sciatica Spine; 30:E293-E299, 2005.  60 patients with referred symptoms and sciatica following a mechanical evaluation were classified as centralisers (25) or non-centralisers (35). Patients then followed a standardised management pathway that involved surgery if there was a failure to improve. Both short and long-term the centralisation group had significantly better outcomes for pain and disability. Non-centralisers were 6 times more likely to have surgery. |  |  |
| Sufka A, Hauger B, Trenary M, Bishop B, Hagen A, Lozon R, Martens B.; Centralization of low back pain and perceived functional outcome. J Orthop Sports Phys Ther; Mar;27(3):205-12, 1998.  Of 36 patients 70% centralised within 14-day test period – centralisation was less amongst those with chronic symptoms and those with more referred pain. Centralisation was associated with significantly more improvement on one of the functional outcome measures used. |  |  |
| Tuttle N; Is it reasonable to use an individual patient’s progress after treatment as a guide to ongoing clinical reasoning? J Manip Physiol Ther; 32.396-403, 2009.  Review and commentary about using patient responses as a guide to clinical reasoning. Changes in range of movement and centralisation of symptoms are better indicators of treatment effectiveness than changes in pain intensity or changes in joint position. Limited evidence to support the use of changes in segmental stiffness to guide management. |  |  |
| Werneke M, Hart DL, Cook D; A descriptive study of the centralization phenomenon. A prospective analysis. Spine; Apr 1;24(7):676-83, 1999.  Of 289 patients with acute neck and back pain 31% centralised during repeated movement testing in the clinic and achieved abolition of symptoms on an average of 4 sessions; 46% showed some centralisation or reduction of symptoms on an average of 8 sessions (partial response); 23% showed no change in symptom site or intensity over an average of 8 sessions. The authors question whether in the partial response group changes were a product of the natural history or exercise programme. Both centralisers and partial responders showed significant improvement in pain intensity and function, whilst the non-response group did not. Assessment of initial pain location was reliably assessed. |  |  |
| Werneke M, Hart DL, Resnik L, Stratford PW, Reyes A; Centralization: prevalence and effect on treatment outcomes using a standardized operational definition and measurement method. J Orthop Sports Phys Ther; 38:116-125, 2008.  Report of over 350 spine patients; 76% lumbar, 53% chronic symptoms (> 3 months), mean age 58 years. Overall rate of centralization at intake as measured on a body chart template was 17%, with higher rates in more acute and younger patients. For instance rates were 29% and 24% for acute (< 3 weeks) lumbar and cervical patients, and 32% and 30% for lumbar and cervical patients aged between 18 and 44. Centralization was much less common in those with chronic symptoms and those over 64 for lumbar problems and over 44 for those with cervical problems. Outcomes were better amongst centralizers and outcomes were worse amongst non-centralizers. |  |  |
| Werneke M, Hart DL.; Centralization phenomenon as a prognostic factor for chronic low back pain and disability. Spine; Apr 1;26(7):758-65 , 2001.  In 225 patients with acute back pain 24 psychosocial, somatic and demographic variables were recorded at initial assessment. Patient outcomes at one year were predicted by a range of independent variables. When all these variables were entered in a multivariate analysis only pain pattern classification (centralisation or partial centralisation v non-centralisation), and leg pain at intake were significant predictors of chronic pain and disability. |  |  |
| Werneke M, Hart DL:; Discriminant validity and relative precision for classifying patients with non-specific neck and back pain by anatomical pain patterns Spine; 28(2), 161-166, 2003.  Re-analysis of data from earlier study comparing prognostic usefulness of classifying patients as centralisers on the first visit compared to during subsequent visits. At first visit 130 (45%) were classified as centralisers, only 4 became non-centralisers, but 43 became partial centralisers. At first visit 157 (55%) were classified as non-centralisers – of these 95 (60%) became partial or full centralisers at later sessions. |  |  |
| Werneke MW, Hart DL, George SZ, Stratford PW, Matheson JW, Reyes A ; Clinical outcomes for patients classified by fear-avoidance beliefs and centralization phenomenon Arch Phys Med Rehab; 90:768-777, 2009.  Secondary analysis looking at predictors of outcome in 238 patients with back pain: 18% centralisers, 52% non-centralisers, and 30% could not be classified; 56% had low fear avoidance, 44% had high fear avoidance. Treatments depended on classification according to these variables. Patients who demonstrated centralisation improved most whatever their levels of fear avoidance; those with high levels of fear avoidance improved least. Both centralisation and fear-avoidance levels impacted on outcomes. |  |  |
| Werneke MW, Hart DL.; Categorizing patients with occupational low back pain by use of the Quebec Task Force Classification system versus pain pattern classification procedures: discriminant and predictive validity Phys Ther; Mar;84(3):243-54, 2004.  Re-analysis of previously collected data comparing different methods of classifying back pain patients for their ability to predict outcome. QTF 3 or 4 predicted high levels of pain and disability at intake, but only centralisation / non-centralisation categories predicted pain and disability at discharge. Non-centralisation was stronger predictor of work status at 1 year than fear-avoidance. Predictive value of centralisation / non-centralisation stronger when followed through rehabilitation period, than just at intake. |  |  |
| Werneke MW, Hart DL.; Centralization: association between repeated end-range pain responses and behavioral signs in patients with acute non-specific low back pain. J Rehabil Med; Sep;37(5):286-90, 2005.  Re-analysis of data from previous study to determine association between centralisation category and psychosocial variables. Non-centralisation patients were significantly more likely to have positive non-organic signs, overt pain behaviour, fear of work activities and somatisation, but no difference was found between centralisation category regarding depression, fear of physical activity, disability or pain intensity. |  |  |
| Williams MM, Hawley JA, McKenzie RA, van Wijmen PM.; A comparison of the effects of two sitting postures on back and referred pain. Spine; Oct;16(10):1185-91, 1991.  Over a 24-48 hour period 2 groups of patients with back and referred pain were encouraged to sit in lordosis or in a kyphotic posture. Lordotic sitting group had back and leg pain significantly reduced and pain centralised compared to kyphotic group. |  |  |