

## ABSTRACTS

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## 2. LBP

### Work related LBP may increase risk of chronic

Eur Spine J. 2016 Apr;25(4):1242-50. doi: 10.1007/s00586-015-4151-3. Epub 2015 Jul 25.

#### **The association between a lifetime history of work-related low back injury and future low back pain: a population-based cohort study.**

Nolet PS<sup>1,2</sup>, Kristman VL<sup>3,4,5,6</sup>, Côté P<sup>7,5,8,9</sup>, Carroll LJ<sup>10</sup>, Hincapié CA<sup>5,11</sup>, David Cassidy J<sup>3,5,12</sup>.

#### **PURPOSE:**

This population-based cohort study investigated the association between a lifetime history of a work-related low back injury, in those who had recovered to have no or mild low back pain, and the development of troublesome low back pain (LBP). A secondary analysis explored the possible effects of misclassification of the exposure by examining the association between a lifetime history of having taken time off work or performed light duties at work because of a work-related low back injury. Current evidence from cross-sectional studies suggests that individuals with a history of a work-related low back injury are more likely to experience future LBP. However, there is a need to examine this association prospectively in a large population-based cohort with adequate control of known confounders.

#### **METHODS:**

We formed a cohort of 810 randomly sampled Saskatchewan adults with no or mild LBP in September 1995. At baseline, participants were asked if they had ever injured their low back at work. The secondary analysis asked if they had ever had to take time off work or perform light duties at work because of a work-related low back injury. Prospective follow-up 6 and 12 months later, asked about the presence of troublesome LBP (grade II-IV) on the Chronic Pain Grade Questionnaire. Multivariable Cox proportional hazards regression analysis was used to estimate these associations while controlling for known confounders.

#### **RESULTS:**

The proportion followed up at 6 and 12 months was 76 and 65 %, respectively. We found an association between a history of work-related low back injury and the onset of troublesome LBP after controlling for gender (adjusted HRR = 2.24; 95 % CI 1.41-3.56). When covariates that may also be mediators of the association were added to the model, the effect estimate was attenuated (adjusted HRR = 1.37; 95 % CI 1.41-3.56). We found a similar association between a lifetime history of having taken time off work or had to work light duties at work because of a work-related low back injury, adjusted for gender (adjusted HRR = 2.31; 95 % CI 1.39-3.85) which was also diluted by the further adjustment for covariates that may also be mediators of the association (adjusted HRR = 1.80; 95 % CI 1.08-3.01).

#### **CONCLUSION:**

Our study suggests that a history of work-related low back injury or taking time off work or having to perform light duties at work due to a work-related low back injury may be a risk factor for the development of troublesome LBP. Residual confounding may account for some of the observed associations, but this was less in the group who took time off work or had to work light duties due to a work-related low back injury.

**KEYWORDS:** *Cohort studies; Low back pain; Occupational injuries; Risk factors*

PMID:26208942

Cognitive functional therapy

Phys Ther. 2016 Mar 24.

**Patient Perspectives on Participation in Cognitive Functional Therapy for Chronic Low Back Pain: A Qualitative Study.**

Bunzli S<sup>1</sup>, McEvoy S<sup>2</sup>, Dankaerts W<sup>3</sup>, O'Sullivan P<sup>4</sup>, O'Sullivan K<sup>5</sup>.

Author information

Abstract

**BACKGROUND:**

Cognitive Functional Therapy has been shown to reduce pain and disability in people with chronic low back pain.

**OBJECTIVES:**

To investigate participants' experience of Cognitive Functional Therapy by comparing those who reported larger or smaller improvements with treatment, potentially yielding insight into the implementation of this approach.

**DESIGN:**

Non-interventional, cross-sectional study with an Interpretive Description framework.

**METHODS:**

Individuals who had participated in Cognitive Functional Therapy in two physiotherapy settings (in Ireland and Australia) were recruited through purposive sampling based on disability outcomes post intervention (n=9), and theoretical sampling (n=5). This sampling strategy was used to capture a range of participant experiences, but was not used to define the final qualitative groupings. Semi-structured interviews were conducted 3-6 months post intervention.

**RESULTS:**

Three groups emerged from the qualitative analysis; Large Improvers, Small Improvers and Unchanged. Two themes encapsulated the pivotal steps: (i) Changing Pain Beliefs and (ii) Achieving Independence. Changing pain beliefs to a more biopsychosocial perspective required a strong therapeutic alliance, development of body awareness and the experience of control over pain. Those who were Unchanged retained their biomedical beliefs. Independence was achieved by Large Improvers through newly cultivated problem solving skills, self-efficacy, decreased fear of pain and improved stress coping. Residual fear and poor stress coping meant Small Improvers were easily distressed and lacked independence. Those who were Unchanged continued to feel defined by their pain and retained a biomedical perspective.

**CONCLUSION:**

A successful outcome after Cognitive Functional Therapy is dependent on instilling biopsychosocial pain beliefs and developing independence among participants. Small Improvers may require ongoing support to maintain results. Further study is required to elucidate the optimal approach for those who were Unchanged.

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### 3. DISC

#### Cytokines and degeneration

Spine J. 2016 Mar 11. pii: S1529-9430(16)00464-2. doi: 10.1016/j.spinee.2016.03.019.

#### **Cytokine profile in degenerated painful intervertebral disc: variability with respect to duration of symptoms and type of disease.**

Altun I<sup>1</sup>.

**BACKGROUND CONTEXT:** Neuroinflammation is supposed to play a crucial role in the generation of chronic pain. Numerous trials have documented the contribution of proinflammatory cytokines in pathophysiology of pain associated with peripheral and central nociception. Local and systemic expression of proinflammatory cytokines have been implicated as mediators of pain. Among these cytokines, TNF- $\alpha$ , IL-1 $\beta$  and IL-6 are especially notable attributed to their hyperalgesic impacts after nerve damage.

**PURPOSE:**

To evaluate and to compare the tissue levels of interleukin-1 $\beta$  (IL-1 $\beta$ ), interleukin-6 (IL-6), interleukin-10 (IL-10) and tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ) in subligamentous and free fragment types of degenerated intervertebral disc at acute and chronic periods.

**STUDY DESIGN:**

This was a cross-sectional study **PATIENT SAMPLE:** A cross-sectional study was implemented on a total of 49 patients (24 women, 25 men) with an average age of 38.2 $\pm$ 4.9 treated surgically by means of microdiscectomy.

**OUTCOME MEASURES:**

Of these cases, 19 had complaints for less than 6 months; whereas 30 patients had been suffering from low back pain and leg pain for more than 6 months. Thirty-eight patients have been diagnosed with subligamentous type and 11 patients had free fragment type of disc degeneration.

**METHODS:**

Levels of IL-1 $\beta$ , IL-6, IL-10 and TNF- $\alpha$  were assessed in tissue samples prepared from nucleus pulposus tissue obtained during microdiscectomy procedure. Results were compared in patients with acute and chronic duration of complaints as well as subligamentous and free fragment types of intervertebral disc degeneration.

**RESULTS:**

Levels of IL-1 $\beta$  (p<0.001), IL-6 (p<0.001), IL-10 (p<0.001) and TNF- $\alpha$  (p<0.001) were significantly higher in patients with acute duration of complaints. Similarly, free fragment type of intervertebral disc degeneration displayed remarkably higher levels of IL-1 $\beta$  (p=0.009), IL-6 (p<0.001), IL-10 (p=0.024) and TNF- $\alpha$  (p=0.017) compared to the subligamentous type.

**CONCLUSION:**

Inflammatory cytokines seem to have a more apparent role in intervertebral disc degeneration especially at acute period and in free fragment type. Further trials should be performed for elucidation of pathophysiology at molecular level and development of more effective diagnostic and therapeutic measures.

**KEYWORDS:** *Intervertebral disc degeneration; cytokines; low back pain; nucleus pulposus*

PMID: 26975459

**Nutrition to the disc**

Spine (Phila Pa 1976). 2016 Apr;41(7):568-76. doi: 10.1097/BRS.0000000000001292.

**Influences of Nutrition Supply and Pathways on the Degenerative Patterns in Human Intervertebral Disc.**

Zhu Q<sup>1</sup>, Gao X, Levene HB, Brown MD, Gu W.

**STUDY DESIGN:**

Investigation of the effects of the impairment of different nutritional pathways on the intervertebral disc degeneration patterns in terms of spatial distributions of cell density, glycosaminoglycan content, and water content.

**OBJECTIVE:**

The aim of this study was to test the hypothesis that impairment of different nutritional pathways would result in different degenerative patterns in human discs.

**SUMMARY OF BACKGROUND DATA:**

Impairment of nutritional pathways has been found to affect cell viability in the disc. However, details on how impairment of different nutritional pathways affects the disc degeneration patterns are unknown.

**METHODS:**

A 3D finite element model was used for this study. This finite element method was based on the cell-activity coupled mechano-electrochemical theory for cartilaginous tissues. Impairment of the nutritional pathways was simulated by lowering the nutrition level at the disc boundaries. Effects of the impairment of cartilaginous endplate-nucleus pulposus (CEP-NP) pathway only (Case 1), annulus fibrosus (AF) pathway only (Case 2), and both pathways (Case 3) on disc degeneration patterns were studied.

**RESULTS:**

The predicted critical levels of nutrition for Case 1, Case 2, and Case 3 were around 30%, 20%, and 50% of the reference values, respectively. Below this critical level, the disc degeneration would occur. Disc degeneration appeared mainly in the NP for Case 1, in the outer AF for Case 2, and in both the NP and inner to middle AF for Case 3. For Cases 1 and 3, the loss of water content was primarily located in the mid-axial plane, which is consistent with the horizontal gray band seen in some T2-weighted magnetic resonance imaging (MRI). For the disc geometry used in this study, it was predicted that there existed a high-intensity zone (for Case 3), as seen in some T2-weighted MRI images.

**CONCLUSION:**

Impairment of different nutrition pathways results in different degenerative patterns.

**LEVEL OF EVIDENCE:**

N/A.

PMID: 26650874

## 5. SURGERY

### Smoking increase risk of morbidity

Spine (Phila Pa 1976). 2016 Apr;41(7):577-84. doi: 10.1097/BRS.0000000000001281.

#### **The Impact of Current Smoking and Smoking Cessation on Short-Term Morbidity Risk After Lumbar Spine Surgery.**

Martin CT<sup>1</sup>, Gao Y, Duchman KR, Pugely AJ.

Abstract

#### **STUDY DESIGN:**

A retrospective review of prospectively collected data.

#### **OBJECTIVE:**

The aim of this study was to determine the impact of current smoking or prior smoking cessation on 30-day morbidity risk following lumbar spine surgery.

#### **SUMMARY OF BACKGROUND DATA:**

Prior studies have reported conflicting data regarding the impact of smoking on morbidity risk, and few studies have investigated smoking cessation.

#### **METHODS:**

A large, multicenter, prospectively collected clinical registry was queried for all adult patients undergoing lumbar spine surgery in 2012 and 2013, and 35,477 cases were identified. Morbidity data are collected by on-site clinical personnel for 30 days postoperatively. Patients were divided into categories of "never-smoker," for patients with no reported cigarette use (n=27,246), "former smoker," for patients who quit smoking more than 12 months before surgery (n=562), and "current smoker," for patients still using cigarettes (n=7669). A univariate analysis was conducted to identify un-adjusted differences in morbidity risk, and a multivariate analysis was conducted in an attempt to control for confounders.

#### **RESULTS:**

In the multivariate analysis, current smokers had a significantly higher risk of both superficial surgical site infection and overall wound complications, than never-smokers (P<0.05 for each). Current smokers also had a significantly higher risk of total 30-day morbidity (P=0.04). There was a trend toward former smokers also having an increased risk, but this did not reach significance in any category. Patients with a pack-year smoking history of 1 to 20 pack-years and more than 40 pack-years both had a significantly higher risk of superficial surgical site infections (P<0.05 for each).

#### **CONCLUSION:**

Current smoking is associated with a small but significant increase in systemic morbidity and wound complications following elective lumbar spine procedures. Increasing pack year history was also associated with wound complication risk, suggesting a dose-related effect. The data provide preliminary support for future studies on smoking cessation.

**LEVEL OF EVIDENCE:**

3.

PMID: 27018898

**Poor long-term outcomes with cage**

Eur Spine J. 2016 Mar 8.

**Adjacent segment degeneration and revision surgery after circumferential lumbar fusion: outcomes throughout 15 years of follow-up.**Maruenda JI<sup>1</sup>, Barrios C<sup>2</sup>, Garibo F<sup>1</sup>, Maruenda B<sup>3</sup>.**PURPOSE:**

This retrospective study analyzes long-term outcomes (15 years) of circumferential lumbar fusion (CF) for degenerative spine disease using instrumented PLIF. The occurrence of adjacent segment degeneration (ASD) and the reintervention rate was specially focused.

**METHODS:**

A series of 73 patients who underwent CF (1-3 levels) was reviewed. Patients were evaluated preoperatively, at 2, 5, 10 and 15 years after surgery with static and dynamic radiographic studies, CT scan and MRI. Patients completed also the Oswestry-Disability index (ODI), the VAS score, and the patient self-satisfaction questionnaire.

**RESULTS:**

At 2-year follow-up, there was a decrease in the average ODI score (from  $72.3 \pm 16.4$  preop to  $30.5 \pm 6.2$ ). At 10- and 15-year follow-up, ODI scores return to preoperative scores in patients without revision surgery. The 82.8 % of patients referred an excellent/good self-satisfaction rate at this time. At 5-year follow-up, seven patients (9.6 %) required reoperation because of symptomatic ASD. At 10-year follow-up, reoperated patients increased to 24.6 % (18 cases). Excellent and good self-satisfaction rate decreased to 41.1 % at this time. Radiological ASD was then detected in 37 cases (50.7 %). At 15-year follow-up, nine patients were lost and a total of 24 (37.5 %) required a new surgical treatment because of ASD. The occurrence of revision surgery because of symptomatic ASD was highly dependent of the age of patients at the first surgery and the number of fused levels.

**CONCLUSION:**

Circumferential lumbar fusion provides good clinical results at short-term follow-up. From 2- to 15-year follow-up, outcome worsened significantly. The high rate of ASD occurrence and reintervention questions the reliability of this technique for lumbar fusion.

**KEYWORDS:**

Adjacent segment degeneration; Circumferential lumbar fusion; Degenerative spine disease; Revision surgery

PMID: 26957098

### Adjacent segments

Spine J. 2016 Mar 9. pii: S1529-9430(16)00455-1. doi: 10.1016/j.spinee.2016.03.010.

#### **Paraspinal muscle, facet joint, and disc problems: risk factors for adjacent segment degeneration after lumbar fusion.**

Kim JY<sup>1</sup>, Ryu DS<sup>1</sup>, Paik HK<sup>1</sup>, Ahn SS<sup>1</sup>, Kang MS<sup>1</sup>, Kim KH<sup>1</sup>, Park JY<sup>1</sup>, Chin DK<sup>1</sup>, Kim KS<sup>1</sup>, Cho YE<sup>1</sup>, Kuh SU<sup>2</sup>.

**BACKGROUND CONTEXT:** Adjacent segment degeneration (ASD) is one of the major complications after lumbar fusion. Several studies have evaluated the risk factors of ASD. Although the paraspinal muscles play an important role in spine stability, no study has assessed the relationship between paraspinal muscle atrophy and the incidence of ASD after lumbar fusion.

**PURPOSE:** In the present study, we aimed to verify the known risk factors of ASD, such as body mass index (BMI), pre-operative adjacent facet joint degeneration, and disc degeneration, and to assess the relationship between paraspinal muscle atrophy and ASD.

**STUDY DESIGN:** Retrospective 1:1 pair analysis, matched by age, sex, fusion level, and follow-up period.

**PATIENT SAMPLE:** To calculate the appropriate sample size for the study, we performed a pre-study analysis of the paraspinal muscle cross-sectional area (CSA), and estimated that at least 35 cases would be needed for each group. Among the 510 patients who underwent posterior lumbar fusion for degenerative lumbar disease between January 2009 and October 2009, a total of 50 patients with ASD after surgery were selected. Another group of 50 matched patients with degenerative lumbar disease without ASD after spinal fusion were selected as the control group. Each patient in the ASD group was matched with a control patient according to age, sex, fusion level, and follow-up period.

**OUTCOME MEASURES:** Radiographic measurements and demographic data were reviewed.

**METHODS:** The risk factors considered were higher BMI, pre-operative adjacent segment disc and facet degeneration, and pre-operative paraspinal muscle atrophy and fatty degeneration. The radiographic data were compared between the ASD and control groups, to determine the predictive factors of adjacent segment degeneration after posterior lumbar fusion by using logistic regression analysis. The study was not externally funded. The authors have no conflict of interest to declare.

**RESULTS:** Multivariate logistic regression analysis indicated that higher BMI (OR: 1.353,  $p = 0.008$ ), preoperative facet degeneration on computed tomography (CT) examination (OR: 3.075,  $p = 0.011$ ), disc degeneration on magnetic resonance imaging (MRI) (OR: 2.783,  $p = 0.003$ ), fatty degeneration (OR: 1.080,  $p = 0.044$ ), and a smaller relative cross sectional area (CSA) of the paraspinal muscle preoperatively (OR: 0.083,  $p = 0.003$ ) were significant factors for predicting the development of ASD.

**CONCLUSIONS:** The occurrence of radiologic ASD is most likely multifactorial, and is associated with a higher BMI, pre-existing facet and disc degeneration on preoperative examination, and a smaller pre-operative relative CSA of the paraspinal muscle on MRI.

**KEYWORDS:** adjacent segment degeneration; lumbar spinal fusion; paraspinal muscle atrophy; posterior lumbar interbody fusion; risk factors

PMID: 26970600

## 8. VISCERA

### Reflux surgery

Am J Gastroenterol. 2016 Mar 15. doi: 10.1038/ajg.2016.42.

### Effect of Vagus Nerve Integrity on Short and Long-Term Efficacy of Antireflux Surgery.

van Rijn S<sup>1,2</sup>, Rinsma NF<sup>1</sup>, van Herwaarden-Lindeboom MY<sup>3</sup>, Ringers J<sup>4</sup>, Gooszen HG<sup>5</sup>, van Rijn PJ<sup>6</sup>, Veenendaal RA<sup>7</sup>, Conchillo JM<sup>1</sup>, Bouvy ND<sup>2</sup>, Masclee AA<sup>1</sup>.

**OBJECTIVES:**

Vagus nerve injury is a feared complication of antireflux surgery (ARS) that may negatively affect reflux control. The aim of the present prospective study was to evaluate short-term and long-term impact of vagus nerve injury, evaluated by pancreatic polypeptide response to insulin-induced hypoglycemia (PP-IH), on the outcome of ARS.

**METHODS:**

In the period from 1990 until 2000, 125 patients with gastroesophageal reflux disease (GERD) underwent ARS at a single center. Before and 6 months after surgery, vagus nerve integrity testing (PP-IH), 24-h pH-monitoring, gastric emptying, and reflux-associated symptoms were evaluated. In 2014, 14-25 years after surgery, 110 patients were contacted again for evaluation of long-term symptomatic outcome using two validated questionnaires (Gastrointestinal Symptom Rating Scale (GSRS) and GERD-Health Related Quality of Life (HRQL)).

**RESULTS:**

Short-term follow-up: vagus nerve injury (PP peak  $\leq 47$  pmol/l) was observed in 23 patients (18%) 6 months after fundoplication. In both groups, a comparable decrease in reflux parameters and symptoms was observed at 6-month follow-up. Postoperative gastric emptying was significantly delayed in the vagus nerve injury group compared with the vagus nerve intact group. Long-term follow-up: patients with vagus nerve injury showed significantly less effective reflux control and a higher re-operation rate.

**CONCLUSIONS:**

Vagus nerve injury occurs in up to 20% of patients after ARS. Reflux control 6 months after surgery was not affected by vagus nerve injury. However, long-term follow-up showed a negative effect on reflux symptom control and re-operation rate in patients with vagus nerve injury. *Am J Gastroenterol* advance online publication, 15 March 2016; doi:10.1038/ajg.2016.42.

PMID: 26977759

**Diet and IBS**

*Curr Gastroenterol Rep.* 2016 Apr;18(4):19. doi: 10.1007/s11894-016-0494-0.

**Chili Peppers, Curcumins, and Prebiotics in Gastrointestinal Health and Disease.**

Patcharatrakul T<sup>1,2</sup>, Gonlachanvit S<sup>3,4</sup>.

**Abstract**

There is growing evidence for the role of several natural products as either useful agents or adjuncts in the management of functional GI disorders (FGIDs).

In this review, we examine the medical evidence for three such compounds: chili, a culinary spice; curcumin, another spice and active derivative of a root bark; and prebiotics, which are nondigestible food products. Chili may affect the pathogenesis of abdominal pain especially in functional dyspepsia and cause other symptoms. It may have a therapeutic role in FGIDs through desensitization of transient receptor potential vanilloid-1 receptor. Curcumin, the active ingredient of turmeric rhizome, has been shown in several preclinical studies and uncontrolled clinical trials as having effects on gut inflammation, gut permeability and the brain-gut axis, especially in FGIDs. Prebiotics, the non-digestible food ingredients in dietary fiber, may serve as nutrients and selectively stimulate the growth and/or activity of certain colonic bacteria. The net effect of this change on colonic microbiota may lead to the production of acidic metabolites and other compounds that help to reduce the production of toxins and suppress the growth of harmful or disease-causing enteric pathogens.

Although some clinical benefit in IBS has been shown, high dose intake of prebiotics may cause more bloating from bacterial fermentation.

**KEYWORDS:**

Chili; Curcumin; Food; Functional gastrointestinal disorder; Gastrointestinal motility; Gastrointestinal sensation; Prebiotic

PMID: 26973345

**Thermal changes in IBS**

Neurogastroenterol Motil. 2016 Mar 19. doi: 10.1111/nmo.12812.

**Relationships of abdominal pain, reports to visceral and temperature pain sensitivity, conditioned pain modulation, and heart rate variability in irritable bowel syndrome.**

Jarrett ME<sup>1</sup>, Han CJ<sup>1</sup>, Cain KC<sup>2</sup>, Burr RL<sup>1</sup>, Shulman RJ<sup>3</sup>, Barney PG<sup>1</sup>, Naliboff BD<sup>4</sup>, Zia J<sup>5</sup>, Heitkemper MM<sup>1</sup>.

**BACKGROUND:**

Irritable bowel syndrome (IBS) is a heterogeneous condition with a number of pathophysiological mechanisms that appear to contribute to symptom chronicity. One of these is altered pain sensitivity.

**METHODS:**

Women between ages 18-45 were recruited the community. Of those enrolled, 56 had IBS and 36 were healthy control (HC) women. Participants completed questionnaires, kept a 4-week symptom diary and had a 12-h Holter placed to assess nighttime heart rate variability including high frequency power (HF), low frequency power (LF), and total power (TP). At mid-follicular phase approximately 80% of women completed a thermal pain sensitivity test with conditioned pain modulation and visceral pain sensitivity using a water load symptom provocation (WLSP) test.

**KEY RESULTS:**

As expected, daily abdominal pain was significantly higher in the IBS compared to HC group. There were no differences between the bowel pattern subgroups (IBS-diarrhea [IBS-D], IBS-constipation plus mixed [IBS-CM]). Thermal pain sensitivity did not differ between the IBS and the HC groups, but was significantly higher in the IBS-CM group than the IBS-D group. In the WLSP test, the IBS group experienced significantly more symptom distress than HCs and the IBS-CM group was higher than the IBS-D group. Heart rate variability indicators did not differ between the groups or IBS subgroups. Daily abdominal pain was positively correlated with LF and TP in the IBS group.

**CONCLUSIONS & INFERENCES:**

Despite similar levels of abdominal pain in IBS, the IBS-CM group demonstrated greater sensitivity to both thermal and visceral testing procedures.

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**KEYWORDS:**

autonomic nervous system; conditioned pain modulation; heart rate variability; irritable bowel syndrome; water load symptom provocation test

PMID: 26993039

IBS

Am J Gastroenterol. 2016 Mar 22. doi: 10.1038/ajg.2016.59.

**Poor Correlation Between Clinical Disease Activity and Mucosal Inflammation, and the Role of Psychological Comorbidity, in Inflammatory Bowel Disease.**

Gracie DJ<sup>1,2</sup>, Williams CJ<sup>1</sup>, Sood R<sup>1,2</sup>, Mumtaz S<sup>1</sup>, Bholah MH<sup>1</sup>, Hamlin PJ<sup>1</sup>, Ford AC<sup>1,2</sup>.

**OBJECTIVES:**

There is a move toward patient-reported outcome measures as end points in clinical trials of novel therapies for inflammatory bowel disease (IBD). However, the association between patient-reported symptoms and mucosal inflammation, and the influence of psychological factors, remains unclear. We examined this in a secondary care population.

**METHODS:**

Validated patient-reported disease activity indices were used to define clinically active disease in a cohort of 356 patients with ulcerative colitis (UC) or Crohn's disease (CD). A fecal calprotectin  $\geq 250$   $\mu\text{g/g}$  was used to define active mucosal inflammation. The hospital anxiety and depression scale (HADS) and patient health questionnaire (PHQ)-15 were used to assess for anxiety, depression, or somatization, respectively. Logistic regression analysis was performed to determine the association between symptoms, mucosal inflammation, and psychological comorbidity.

**RESULTS:**

Clinical disease activity was associated with mucosal inflammation in UC (odds ratio (OR) 3.36; 95% confidence interval (CI) 1.34-8.47) but not in CD (OR 1.69; 95% CI 0.74-3.83). Depression in UC (OR 1.21 per 1-point increase in HADS; 95% CI 1.02-1.44) and somatization in UC (OR 1.17 per 1-point increase in PHQ-15; 95% CI 1.03-1.33) and CD (OR 1.31 per 1-point increase in PHQ-15; 95% CI 1.13-1.52) were associated with clinical disease activity. Overall, patient-reported symptoms yielded poor positive predictive values for mucosal inflammation in both CD and UC.

**CONCLUSIONS:**

Patient-reported symptoms and the Harvey-Bradshaw index were poor predictors of mucosal inflammation in CD. Psychological comorbidity was associated with gastrointestinal symptom-reporting. A shift in the focus of IBD management toward one addressing both psychological and physical well-being is required. Am J Gastroenterol advance online publication, 22 March 2016; doi:10.1038/ajg.2016.59.

PMID: 27002800

**13. CRANIUM/TMJ**

**Botox**

J Headache Pain. 2016 Dec;17(1):29. doi: 10.1186/s10194-016-0621-1. Epub 2016 Mar 24.

**The efficiency of botulinum toxin type A for the treatment of masseter muscle pain in patients with temporomandibular joint dysfunction and tension-type headache.**

Pihut M<sup>1</sup>, Ferendiuk E<sup>1</sup>, Szewczyk M<sup>1</sup>, Kasprzyk K<sup>2</sup>, Wieckiewicz M<sup>3</sup>.

**BACKGROUND:**

Temporomandibular joint dysfunction are often accompanied by symptoms of headache such as tension-type headache which is the most frequent spontaneous primary headache. Masseter muscle pain is commonly reported in this group. The purpose of the study was to assess the efficiency of intramuscular botulinum toxin type A injections for treating masseter muscle pain in patients with temporomandibular joint dysfunction and tension-type headache.

**METHODS:**

This prospective outcome study consisted of 42 subjects of both genders aged 19-48 years diagnosed with masseter muscle pain related to temporomandibular joint dysfunction and tension-type headache. The subjects were treated by the intramuscular injection of 21 U (mice units) of botulinum toxin type A (Botox, Allergan) in the area of the greatest cross-section surface of both masseter bellies. Pain intensity was evaluated using visual analogue scale (VAS) and verbal numerical rating scale (VNRS) 1 week before the treatment and 24 weeks after the treatment. The obtained data were analyzed using the Wilcoxon matched pairs test ( $p \leq 0,005$ ).

**RESULTS:**

The results of this study showed a decrease in the number of referred pain episodes including a decrease in pain in the temporal region bilaterally, a reduction of analgesic drugs intake as well as a decrease in reported values of VAS and VNRS after injections ( $p = 0,000$ ).

**CONCLUSIONS:**

The intramuscular botulinum toxin type A injections have been an efficient method of treatment for masseter muscle pain in patients with temporomandibular joint dysfunction and tension-type headache.

**KEYWORDS:**

Botulinum toxin; Masseter muscle pain; Temporomandibular joint dysfunction; Tension-type headache

PMID: 27011213

Incisor position

Odontology. 2016 Mar 24.

**The relationship between the incisor position and lingual surface morphology in normal occlusion.**

Hasegawa Y<sup>1,2</sup>, Ezura A<sup>3</sup>, Nomintsetseg B<sup>4,5</sup>.

**Abstract**

This study aimed to investigate the relationship between the morphological characteristics of maxillary incisors and the anterior occlusion.

The study materials comprised dental casts and lateral cephalograms of 26 modern Mongolian females with Angle Class I normal occlusion (mean age, 21 years 5 months). Computed tomography (CT) images of the dental casts were taken with an X-ray micro-CT system (SMX-100CT, Shimadzu, Kyoto Japan). The thickness of the marginal ridges and incisal edges, and the overjet and overbite, was measured on the three-dimensional images of the dental casts. On the lateral cephalogram, maxillary incisor to sella-nasion plane angle (U1 to SN angle), maxillary incisor to nasion-point A plane distance (U1 to NA distance), mandibular incisor to nasion-point B plane distance (L1 to NB distance), incisor mandibular plane angle, and interincisal angle were measured by tracing the left incisors of the maxilla and mandible. Spearman's single rank correlation coefficients were used to investigate any correlation between measurement items for each maxillary incisor. The thickness of the marginal ridges and incisal edges was positively correlated with the overbite. The thickness of the incisal edges was positively correlated with the irregularity index of the maxilla.

There were significant negative correlations between overbite and U1 to SN angle, U1 to NA distance, and L1 to NB distance. Significant positive correlations were noted between the overbite and the overjet. In conclusion, there was no strong relationship between the morphological characteristics of maxillary incisors and the anterior occlusion.

**KEYWORDS:**

Anterior occlusion; Marginal ridge; Maxillary incisor; Micro-CT; Mongolian

PMID: 27011328

**Botox and TMJ pain**

J Headache Pain. 2016 Dec;17(1):29. doi: 10.1186/s10194-016-0621-1. Epub 2016 Mar 24.

### **The efficiency of botulinum toxin type A for the treatment of masseter muscle pain in patients with temporomandibular joint dysfunction and tension-type headache.**

Pihut M<sup>1</sup>, Ferendiuk E<sup>1</sup>, Szewczyk M<sup>1</sup>, Kasprzyk K<sup>2</sup>, Wieckiewicz M<sup>3</sup>.

#### ***BACKGROUND:***

Temporomandibular joint dysfunction are often accompanied by symptoms of headache such as tension-type headache which is the most frequent spontaneous primary headache. Masseter muscle pain is commonly reported in this group. The purpose of the study was to assess the efficiency of intramuscular botulinum toxin type A injections for treating masseter muscle pain in patients with temporomandibular joint dysfunction and tension-type headache.

#### ***METHODS:***

This prospective outcome study consisted of 42 subjects of both genders aged 19-48 years diagnosed with masseter muscle pain related to temporomandibular joint dysfunction and tension-type headache. The subjects were treated by the intramuscular injection of 21 U (mice units) of botulinum toxin type A (Botox, Allergan) in the area of the greatest cross-section surface of both masseter bellies. Pain intensity was evaluated using visual analogue scale (VAS) and verbal numerical rating scale (VNRS) 1 week before the treatment and 24 weeks after the treatment. The obtained data were analyzed using the Wilcoxon matched pairs test ( $p \leq 0,005$ ).

#### ***RESULTS:***

The results of this study showed a decrease in the number of referred pain episodes including a decrease in pain in the temporal region bilaterally, a reduction of analgesic drugs intake as well as a decrease in reported values of VAS and VNRS after injections ( $p = 0,000$ ).

#### ***CONCLUSIONS:***

The intramuscular botulinum toxin type A injections have been an efficient method of treatment for masseter muscle pain in patients with temporomandibular joint dysfunction and tension-type headache.

#### ***KEYWORDS:***

Botulinum toxin; Masseter muscle pain; Temporomandibular joint dysfunction; Tension-type headache

PMID: 27011213

## **14. HEADACHES**

### **Depression and HA's**

Clin EEG Neurosci. 2016 Mar 21. pii: 1550059416632411.

**Neurophysiologic Correlates of Headache Pain in Subjects With Major Depressive Disorder.**

Scanlon GC<sup>1</sup>, Jain FA<sup>2</sup>, Hunter AM<sup>1</sup>, Cook IA<sup>1</sup>, Leuchter AF<sup>1</sup>.

**BACKGROUND:**

Headache pain is often comorbid with major depressive disorder (MDD) and is associated with greater symptom burden, disability, and suicidality. The biological correlates of headache pain in MDD, however, remain obscure. The purpose of this study was to examine the association between brain oscillatory activity and headache pain in MDD subjects.

**METHODS:**

A total of 64 subjects with MDD who were free of psychoactive medications were evaluated for severity of headache pain in the past week. Brain function was assessed using resting-state quantitative electroencephalography (qEEG). We derived cordance in the theta (4-8 Hz) and alpha (8-12 Hz) frequency bands at each electrode, and examined correlations with headache pain in regions of interest while controlling for depression severity. Frontal and posterior asymmetry in alpha power was calculated in regions of interest.

**RESULTS:**

Headache pain severity was associated with depression severity ( $r = 0.447$ ,  $P < .001$ ). In bilateral frontal and right posterior regions, alpha cordance was significantly associated with headache intensity, including when controlling for depression severity. The direction of the correlation was positive anteriorly and negative posteriorly. Frontal left dominant alpha asymmetry correlated with severity of headache but not depression symptoms.

**CONCLUSION:**

Alterations in brain oscillations identified by alpha cordance and alpha asymmetry may be associated with the pathophysiology of headache pain in depression. These findings should be prospectively confirmed.

© EEG and Clinical Neuroscience Society (ECNS) 2016.

**KEYWORDS:**

alpha asymmetry; cordance; depression; electroencephalography; headache

PMID: 27000108

**Sodium intake**

Headache. 2016 Mar 26. doi: 10.1111/head.12792.

**Severe Headache or Migraine History Is Inversely Correlated With Dietary Sodium Intake: NHANES 1999-2004.**

Pogoda JM<sup>1</sup>, Gross NB<sup>2</sup>, Arakaki X<sup>2</sup>, Fonteh AN<sup>2</sup>, Cowan RP<sup>3</sup>, Harrington MG<sup>2</sup>.

**OBJECTIVE:**

We investigated whether dietary sodium intake from respondents of a national cross-sectional nutritional study differed by history of migraine or severe headaches.

**BACKGROUND:**

Several lines of evidence support a disruption of sodium homeostasis in migraine.

**DESIGN:**

Our analysis population was 8819 adults in the 1999-2004 National Health and Nutrition Examination Survey (NHANES) with reliable data on diet and headache history. We classified respondents who reported a history of migraine or severe headaches as having probable history of migraine. To reduce the diagnostic conflict from medication overuse headache, we excluded respondents who reported taking analgesic medications. Dietary sodium intake was measured using validated estimates of self-reported total grams of daily sodium consumption and was analyzed as the residual value from the linear regression of total grams of sodium on total calories. Multivariable logistic regression that accounted for the stratified, multistage probability cluster sampling design of NHANES was used to analyze the relationship between migraine and dietary sodium.

**RESULTS:**

Odds of probable migraine history decreased with increasing dietary sodium intake (odds ratio = 0.93, 95% confidence interval = 0.87, 1.00, P = .0455). This relationship was maintained after adjusting for age, sex, and body mass index (BMI) with slightly reduced significance (P = .0505). In women, this inverse relationship was limited to those with lower BMI (P = .007), while in men the relationship did not differ by BMI. We likely excluded some migraineurs by omitting frequent analgesic users; however, a sensitivity analysis suggested little effect from this exclusion.

**CONCLUSIONS:**

This study is the first evidence of an inverse relationship between migraine and dietary sodium intake. These results are consistent with altered sodium homeostasis in migraine and our hypothesis that dietary sodium may affect brain extracellular fluid sodium concentrations and neuronal excitability.

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**KEYWORDS:**

analgesic medication; body mass index; dietary sodium

PMID: 27016121

**22 A. IMPINGMENT**

Muscle activity

### **Scapulothoracic muscle activity during elevation exercises measured with surface and fine wire EMG: a comparative study between patients with subacromial impingement syndrome and healthy controls**

Birgit Castelein, Msc, PT Barbara Cagnie, PhD, PT Thierry Parlevliet, MD Ann Cools, PhD, PT

DOI: <http://dx.doi.org/10.1016/j.math.2016.03.007>

#### **Highlights**

- •Significantly higher Pm activity was found in patients with SIS during elevation.
- •No differences were found for other scapulothoracic muscles in patients with SIS.
- •This study supports the idea of a possible role of Pm in patients with SIS.

#### **Background**

The quality of the scapular movement depends on the coordinated activity of the surrounding scapulothoracic muscles. Besides the well-known changes in Trapezius and Serratus Anterior (SA) activity in patients with subacromial impingement syndrome (SIS), no studies exist that have investigated the activity of the smaller less superficial muscles that attach on the scapula (Pectoralis Minor (Pm), the Levator Scapulae (LS) and the Rhomboid Major (RM)) in a population with SIS, despite the hypothesized importance of these muscles in shoulder function.

#### **Objectives**

To investigate if patients with SIS show differences in deeper and superficial lying scapulothoracic muscle activity in comparison with a healthy control group during arm elevation tasks.

#### **Study Design**

Controlled laboratory study.

#### **Methods**

Activity of the deeper lying (LS, Pm and RM) and superficial lying scapulothoracic muscles (Trapezius and SA) was investigated with fine-wire and surface EMG in 17 subjects with SIS and 20 healthy subjects while performing 3 elevation tasks: scaption, wall slide and elevation with external rotation. Possible differences between the groups were studied with a linear mixed model (factor “group” and “exercise”).

#### **Results**

For the Pm only, a significant main effect for “Group” was found: during the elevation exercises, the Pm was significantly more active in the SIS group in comparison with the healthy controls.

#### **Conclusion**

Patients with SIS show significantly higher Pm activity during elevation tasks in comparison with healthy controls. This study supports the idea of a possible role of the Pm in SIS.

#### *Keywords:*

EMG, scapular muscles, shoulder pain, pectoralis minor

## **26. CARPAL TUNNEL SYNDROME**

### **Vit D**

Neurol Sci. 2016 Mar 3.

**The evaluation of vitamin D levels in patients with carpal tunnel syndrome.**

Gürsoy AE<sup>1</sup>, Bilgen HR<sup>2</sup>, Dürüyen H<sup>3</sup>, Altıntaş Ö<sup>4</sup>, Kolukisa M<sup>2</sup>, Asil T<sup>2</sup>.

**Abstract**

The aim of this study was to evaluate the relationship between 25-hydroxyvitamin D (25(OH)D) levels and carpal tunnel syndrome (CTS).

25(OH)D levels were checked in 108 consecutive patients with CTS symptoms and 52 healthy controls. All patients underwent nerve conduction studies and completed Boston Carpal Tunnel Questionnaire (BQ) symptom severity and functional status scales to quantify symptom severity, pain status and functional status. There were 57 patients with electrophysiological confirmed CTS (EP+ group) and 51 electrophysiological negative symptomatic patients (EP- group). 25(OH) D deficiency (25(OH)D < 20 ng/ml) was found in 96.1 % of EP- group, in 94.7 % of EP+ group and in 73.8 % of control group. 25(OH) D level was found significantly lower both in EP+ and EP- groups compared to control group (p = 0.006, p < 0.001, respectively). Although mean vitamin D level in EP- group was lower than EP+ group, statistically difference was not significant between EP+ and EP- groups (p = 0.182). BQ symptom severity and functional status scores and BQ pain sum score were not significantly different between EP+ and EP- groups.

We found no correlation with 25(OH) D level for BQ symptom severity, functional status and pain sum scores. 25(OH) D deficiency is a common problem in patients with CTS symptoms. As evidenced by the present study, assessment of serum 25(OH)D is recommended in CTS patients even with electrophysiological negative results.

**KEYWORDS:**

Boston Carpal Tunnel Questionnaire; Carpal tunnel syndrome; Entrapment neuropathy; Pain; Vitamin D

PMID:26939675

## Changes in muscle activity

**M-Mode Ultrasound Reveals Earlier Gluteus Minimus Activity in Individuals With Chronic Hip Pain During a Step-down Task**

**Authors:** Angela V. Dieterich, PT, PhD<sup>1,2</sup>, Louise Deshon, AMS<sup>3</sup>, Geoffrey R. Strauss, MPE<sup>1</sup>, Jan McKay, PhD<sup>3</sup>, Christine M. Pickard, PT, PhD<sup>1</sup>

**Published:** *Journal of Orthopaedic & Sports Physical Therapy*, 2016 **Volume:**46 **Issue:**4 **Pages:**277–285 **DOI:**10.2519/jospt.2016.6132

**Study Design**

Controlled laboratory study.

**Background**

The hip abductor muscles are important hip joint stabilizers. Hip joint pain may alter muscle recruitment. Motion-mode (M-mode) ultrasound enables noninvasive measurements of the onset of deep and superficial muscle motion, which is associated with activation onset.

**Objectives**

To compare (1) the onset of superficial and deep gluteus medius and gluteus minimus muscle motion relative to the instant of peak ground reaction force and (2) the level of swing-phase muscle motion during step-down between subjects with chronic hip pain and controls using M-mode ultrasound.

**Methods**

Thirty-five subjects with anterior, nontraumatic hip pain for more than 6 months (mean  $\pm$  SD age,  $54 \pm 9$  years) and 35 controls (age,  $57 \pm 7$  years) were scanned on the lateral hip of the leading leg during frontal step-down onto a force platform using M-mode ultrasound. Computerized motion detection with the Teager-Kaiser energy operator was applied on the gluteus minimus and the deep and superficial gluteus medius to determine the time lag between muscle motion onset and instant of peak ground reaction force and the level of gluteus minimus motion during the swing phase. Time lags and motion levels were averaged per subject, and *t* tests were used to determine between-group differences.

**Results**

In participants with hip pain, gluteus minimus motion onset was 103 milliseconds earlier ( $P = .002$ ) and superficial gluteus medius motion was 70 milliseconds earlier ( $P = .047$ ) than those in healthy control participants. The level of gluteus minimus swing-phase motion was higher with pain ( $P = .006$ ).

**Conclusion**

Increased gluteus minimus motion during the swing phase and earlier gluteus minimus and superficial gluteus medius motion in individuals with hip pain suggest an overall increase of muscle activity, possibly a protective behavior. *J Orthop Sports Phys Ther* 2016;46(4):277–285. Epub 8 Mar 2016. doi:10.2519/jospt.2016.6132

Keyword: gluteus medius, hip abductor, muscle activation, onset

**30 A. IMPINGEMENT**

**Impingement testing**

Arthroscopy. 2016 Mar 25. pii: S0749-8063(16)00054-2. doi: 10.1016/j.arthro.2016.01.024.

**Accuracy of Two Clinical Tests for Ischiofemoral Impingement in Patients With Posterior Hip Pain and Endoscopically Confirmed Diagnosis.**

Gómez-Hoyos J<sup>1</sup>, Martin RL<sup>2</sup>, Schröder R<sup>3</sup>, Palmer IJ<sup>3</sup>, Martin HD<sup>3</sup>.

**PURPOSE:**

To establish the accuracy of the long-stride walking (LSW) and ischiofemoral impingement (IFI) tests for diagnosing IFI in patients whose primary symptom is posterior hip pain.

**METHODS:**

Confirmed IFI cases and cases in which IFI had been ruled out were identified considering imaging, injections, and endoscopic assessment, combined with pain relief and negative IFI-specific tests after treatment. Demographic data, duration of symptoms, pain location, ischiofemoral space, quadratus femoris space, quadratus femoris edema, surgical findings, and visual analog scale score for pain before and after treatment were computed for all patients included in this study. Sensitivity, specificity, predictive values, likelihood ratios, and diagnostic odds ratios were computed individually for the LSW test and IFI test.

**RESULTS:**

Cases from 1,166 consecutive hip operations and charts from 564 consecutive outpatients were retrospectively reviewed to identify patients who underwent injection and/or endoscopic surgery because of posterior hip pain. Thirty individuals (21 women and 9 men) with a mean age of 49.8 years (range, 20 to 76 years; SD, 13.0 years) were included for analysis. Of the 30 patients, 17 (56.6%) were confirmed as positive for IFI and 13 (43.4%) were confirmed as negative for IFI. The IFI test had a sensitivity of 0.82, specificity of 0.85, positive predictive value of 0.88, negative predictive value of 0.79, positive likelihood ratio of 5.35, negative likelihood ratio of 0.21, and diagnostic odds ratio of 25.6. The LSW test had a sensitivity of 0.94, specificity of 0.85, positive predictive value of 0.89, negative predictive value of 0.92, positive likelihood ratio of 6.12, negative likelihood ratio of 0.07, and diagnostic odds ratio of 88.8.

**CONCLUSIONS:**

In patients with complaints of posterior hip pain and negative evaluation findings for lumbosacral spine involvement or static/dynamic mechanical axis malalignment, the IFI and LSW tests are highly accurate to help identify those with or without IFI. LEVEL OF EVIDENCE: Level III, diagnostic study.

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PMID: 27020393

## 31. KNEE

### Age declining proprioception

*Knee*. 2016 Mar 21. pii: S0968-0160(16)00080-6. doi: 10.1016/j.knee.2016.02.018.

**The effects of knee direction, physical activity and age on knee joint position sense.**

Relph N<sup>1</sup>, Herrington L<sup>2</sup>.

***BACKGROUND:***

Previous research has suggested a decline in knee proprioception with age. Furthermore, regular participation in physical activity may improve proprioceptive ability. However, there is no large scale data on uninjured populations to confirm these theories. The aim of this study was to provide normative knee joint position data (JPS) from healthy participants aged 18-82years to evaluate the effects of age, physical activity and knee direction.

***METHODS:***

A sample of 116 participants across five age groups was used. The main outcome measures were knee JPS absolute error scores into flexion and extension, Tegner activity levels and General Practitioner Physical Activity Questionnaire results.

***RESULTS:***

Absolute error scores in to knee flexion were 3.6°, 3.9°, 3.5°, 3.7° and 3.1° and knee extension were 2.7°, 2.5°, 2.9°, 3.4° and 3.9° for ages 15-29, 30-44, 45-59, 60-74 and 75 years old respectively. Knee extension and flexion absolute error scores were significantly different when age group data were pooled. There was a significant effect of age and activity level on joint position sense into knee extension. Age and lower Tegner scores were also negatively correlated to joint position sense into knee extension.

***CONCLUSIONS:***

The results provide some evidence for a decline in knee joint position sense with age. Further, active populations may have heightened static proprioception compared to inactive groups. Normative knee joint position sense data is provided and may be used by practitioners to identify patients with reduced proprioceptive ability.

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***KEYWORDS:***

Age; Knee extension; Knee flexion; Physical activity; Proprioception

PMID: 27012638

## 34. PATELLA

## OA after ACL repair

**Patellofemoral Osteoarthritis: Are We Missing an Important Source of Symptoms After Anterior Cruciate Ligament Reconstruction?**

**Authors:** Adam G. Culvenor, PT, PhD<sup>1,2</sup>, Kay M. Crossley, PT, PhD<sup>2</sup>

**Published:** *Journal of Orthopaedic & Sports Physical Therapy*,  
2016 **Volume:**46 **Issue:**4 **Pages:**232–234 **DOI:**10.2519/jospt.2016.0603

Anterior cruciate ligament (ACL) rupture is a well-established risk factor for knee osteoarthritis (OA). Fifty to ninety percent of individuals will develop radiographic tibiofemoral OA within a decade after ACL injury and anterior cruciate ligament reconstruction (ACLR). Although less well recognized, radiographic patellofemoral OA is present in approximately 50% of individuals at more than 10 years after ACLR. This early-onset OA and its associated pain and functional limitations pose a particular challenge to younger adults with OA compared to an older OA population. Targeted interventions need to be developed to reduce the burden of early-onset OA following ACLR. Emerging evidence suggests that such interventions should target both the patellofemoral and tibiofemoral joints.

*J Orthop Sports Phys Ther* 2016;46(4):232–234. doi:10.2519/jospt.2016.0603

**Keyword:** ACL, ACLR, age, anterior cruciate ligament, knee osteoarthritis, OA, patellofemoral osteoarthritis, tibial osteoarthritis

Release in adolescents

J Pediatr Orthop. 2016 Apr-May;36(3):268-73. doi: 10.1097/BPO.0000000000000445.

### **Arthroscopic Lateral Retinacular Release in Adolescents With Medial Patellofemoral Ligament-centered Knee Pain.**

Blackman AJ<sup>1</sup>, Smith JC, Luhmann SJ.

#### ***BACKGROUND:***

The medial patellofemoral ligament (MPFL) has been implicated as a common pain generator in adolescents with anterior knee pain. The purpose of this study is to report the clinical outcomes of arthroscopic lateral retinacular release (ALRR) for refractory MPFL-centered pain and to identify risk factors for poor outcomes and surgical failures.

#### ***METHODS:***

A single-surgeon database was queried to identify all patients undergoing ALRR. Inclusion criteria included minimum 12-month follow-up and ALRR performed for MPFL pain rather than for generalized anterior knee pain or patellar instability. All patients had persistent MPFL-centered pain despite participating in a nonsurgical protocol before surgery. Primary outcomes included International Knee Documentation Committee (IKDC) subjective score and need for further surgery, typically tibial tubercle osteotomy (TTO).

#### ***RESULTS:***

Eighty-eight knees in 71 patients [66 female, 5 male; average age, 15.7 y (range, 8.4 to 20.2 y)] were included. Average follow-up was 59 months (range, 12 to 138 mo). Average preoperative IKDC score was 41.9 (range, 18.4 to 67.8), whereas average postoperative IKDC score was 77.8 (range, 11.5 to 98.9;  $P < 0.01$ ). Postoperative IKDC scores were worse in patients with a preoperative sulcus angle of  $< 134$  degrees than those with sulcus angle of  $\geq 134$  degrees ( $69.9 \pm 22.1$  vs.  $82.0 \pm 12.5$ ,  $P = 0.04$ ). Lower preoperative IKDC score correlated negatively with improvement of IKDC score postoperatively ( $r = -0.40$ ,  $P < 0.05$ ). Seventeen knees (19.3%) subsequently underwent TTO for persistent symptoms. Patients who ultimately required TTO were younger than patients who did not ( $14.8 \pm 1.5$  vs.  $15.9 \pm 2.1$ ;  $P = 0.04$ ) and had lower mean preoperative Blackburne-Peel ratio ( $0.95 \pm 0.25$  vs.  $1.11 \pm 0.24$ ;  $P = 0.02$ ).

#### ***CONCLUSIONS:***

This study demonstrates that patients with refractory MPFL-centered knee pain had significant improvements in clinical outcomes after undergoing ALRR at mean 5 years' follow-up. Poor outcomes and surgical failures were associated with lower preoperative IKDC score, younger age, lower preoperative Blackburne-Peel ratio, and sulcus angle of  $< 134$  degrees. Outcomes were not recorded prospectively, but mean IKDC scores  $< 60$  months postoperatively were similar to those collected  $\geq 60$  months after surgery ( $80.4$  vs.  $78.3$ ,  $P = 0.15$ ).

#### ***LEVEL OF EVIDENCE:***

Level IV.

PMID: 25851673

## **37. OSTEOARTHRITIS/KNEE**

**Plasma injections helps**

Am J Sports Med. 2016 Feb 1. pii: 0363546515624678.

**Intra-articular Autologous Conditioned Plasma Injections Provide Safe and Efficacious Treatment for Knee Osteoarthritis: An FDA-Sanctioned, Randomized, Double-blind, Placebo-controlled Clinical Trial.**

Smith PA<sup>1</sup>.

**BACKGROUND:**

Platelet-rich plasma (PRP) injections have become an intriguing treatment option for osteoarthritis (OA), particularly OA of the knee. Despite the plethora of PRP-related citations, there is a paucity of high-level evidence that is comparable, cohort specific, dose controlled, injection protocol controlled, and double-blinded.

**PURPOSE:**

To determine the safety and efficacy of leukocyte-poor PRP autologous conditioned plasma (ACP) for knee OA treatment through a feasibility trial regulated by the US Food and Drug Administration (FDA).

**STUDY DESIGN:**

Randomized controlled trial; Level of evidence, 1.

**METHODS:**

In accordance with FDA protocol, patient selection was based on strict inclusion/exclusion criteria; 114 patients were screened, and 30 were ultimately included in the study. These patients were randomized to receive either ACP (n = 15) or saline placebo (n = 15) for a series of 3 weekly injections. Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores served as the primary efficacy outcome measure. Patients were followed for 1 year.

**RESULTS:**

No adverse events were reported for ACP administration. Furthermore, the results demonstrated no statistically significant difference in baseline WOMAC scores between the 2 groups. However, in the ACP group, WOMAC scores at 1 week were significantly decreased compared with baseline scores, and the scores for this group remained significantly lower throughout the study duration. At the study conclusion (12 months), subjects in the ACP group had improved their overall WOMAC scores by 78% from their baseline score, compared with 7% for the placebo group.

**CONCLUSION:**

ACP is safe and provides quantifiable benefits for pain relief and functional improvement with regard to knee OA. No adverse events were reported for ACP administration. After 1 year, WOMAC scores for the ACP subjects had improved by 78% from their baseline score, whereas scores for the placebo control group had improved by only 7%. Other joints affected with OA may also benefit from this treatment.

**KEYWORDS:** FDA; WOMAC; autologous conditioned plasma; leukocyte-poor platelet-rich plasma; level 1; osteoarthritis; placebo; saline control

PMID: 26831629

**Impact on society**

Arthritis Care Res (Hoboken). 2016 Mar 25. doi: 10.1002/acr.22897.

**The number of persons with symptomatic knee osteoarthritis in the United States: Impact of race/ethnicity, age, sex, and obesity.**

Deshpande BR<sup>1</sup>, Katz JN<sup>1,2,3,4</sup>, Solomon DH<sup>2,3,5</sup>, Yelin EH<sup>6,7</sup>, Hunter DJ<sup>8,9</sup>, Messier SP<sup>10,11,12,13</sup>, Suter LG<sup>14,15,16</sup>, Losina E<sup>1,2,3,17</sup>.

**TIVE:**

The prevalence of symptomatic knee osteoarthritis (OA) has been increasing over the past several decades in the United States concurrent with an aging population and the growing obesity epidemic. We quantify the impact of these factors on the number of persons with symptomatic knee OA in the first decades of 21st century.

**METHODS:**

We calculated prevalence of clinically diagnosed symptomatic knee OA from the National Health Interview Survey 2007-08 and derived the proportion with advanced disease (Kellgren-Lawrence grades 3-4) using the Osteoarthritis Policy Model, a validated simulation model of knee OA. Incorporating contemporary obesity rates and population estimates, we calculated the number of persons living with symptomatic knee OA.

**RESULTS:**

We estimate that about fourteen million persons had symptomatic knee OA, with advanced OA comprising over half of those cases. This includes over three million African American, Hispanic, and other racial/ethnic minorities. Adults under 45 years of age represented nearly two million cases of symptomatic knee OA and individuals between 45 and 65 years of age six million more.

**CONCLUSION:**

Over half of all persons with symptomatic knee OA are younger than 65 years of age. As many of these younger persons will live for three decades or more, there is substantially more time for greater disability to occur and policymakers should anticipate healthcare utilization for knee OA to increase further in upcoming decades. These data emphasize the need for the deployment of innovative prevention and treatment strategies for knee OA, especially among younger persons. This article is protected by copyright. All rights reserved.

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PMID: 27014966

## 39 B. SHOES

### Minimalist shoes transitions

May 2016 Volume 46, Pages 142–146

### Does “transition shoe” promote an intermediate biomechanical condition compared to running in conventional shoe and in reduced protection condition?

Ana Paula da Silva Azevedo Bruno Mezêncio Raísa Valvassori Luis Mochizuki  
Alberto Carlos Amadio Júlio Cerca Serrão

DOI: <http://dx.doi.org/10.1016/j.gaitpost.2016.03.008>

#### Highlights

- TrS led to changes in VGRF variables and lower limbs kinematics.
- TrS promoted an intermediate biomechanical condition only for VGRF variables.
- Running in TrS is not the same of running in CS or MS for impact force variables.
- TrS arises as an option to transition and achieve minimal running.

#### Abstract

This study evaluated if running in a “transition shoe” commercially available results in intermediate mechanical load upon lower extremities compared to conventional shoe and minimalist shoe/barefoot.

Kinematic and kinetic parameters while running in different shoe conditions were compared. Fourteen runners (12 men, 2 women; age =  $28.4 \pm 7.3$  years), inexperienced in minimalist shoes and barefoot running, ran on an instrumented treadmill within four experimental conditions (conventional shoe – CS, transition shoe – TrS, minimalist shoe – MS, and barefoot – BF). Running was performed at 9 km/h for 10 min in each experimental condition. Vertical ground reaction force (VGRF) and two-dimensional kinematic variables of lower limbs (both legs) were recorded. Nine data acquisitions (10 s) were conducted for each footwear condition. Transition shoe lead to significant changes in VGRF variables related to impact control, while kinematic parameters were little affected. The TrS had smaller first peak of VGRF (Fy1) than CS ( $p \leq 0.001$ ) and higher than MS ( $p = 0.050$ ) and BF ( $p \leq 0.001$ ). Time to first peak of VGRF (tFy1) of TrS was smaller than CS ( $p \leq 0.001$ ) and higher than MS ( $p \leq 0.001$ ) and BF ( $p \leq 0.001$ ). The TrS and MS induced to lesser knee flexion ( $p < 0.001$ ) and greater dorsiflexion ( $p < 0.001$ ) than CS and BF.

Thus, results suggest the transition shoe (TrS) tested seem to promote an intermediate mechanical load condition only for VGRF parameters, presenting values of impact forces between those found for conventional shoe and minimalist shoe/barefoot. Such knowledge could be useful for the transition process from conventional running shoe to minimalist shoe/barefoot.

#### Keywords:

Biomechanics, Ground reaction force, Kinematic, Barefoot, Minimalist

## 40. ANKLE SPRAINS AND INSTABILITY

### Sensory changes

## Plantar Cutaneous Sensitivity With and Without Cognitive Loading in People With Chronic Ankle Instability, Copers, and Uninjured Controls

**Authors:** Christopher J. Burcal, MSc, ATC<sup>1</sup>, Erik A. Wikstrom, PhD, ATC<sup>2</sup>

**AFFILIATIONS:**

**Published:** *Journal of Orthopaedic & Sports Physical Therapy*,  
2016 **Volume:**46 **Issue:**4 **Pages:**270–276 **DOI:**10.2519/jospt.2016.6351

### Study Design

Controlled laboratory study.

### Background

Deficits in light touch have recently been identified on the plantar surface of the foot in those with chronic ankle instability (CAI) but not in uninjured controls. It is unknown whether copers display similar deficits. Similarly, cognitive loading has been shown to impact postural control in different populations, but it is unclear how it may impact sensory perception.

### Objectives

To evaluate the difference in cutaneous sensation thresholds at rest and under cognitive loading, using Semmes-Weinstein monofilaments (SWMs), among uninjured controls, copers, and those with CAI.

### Methods

A total of 45 participants (mean  $\pm$  SD age, 20.2  $\pm$  2.8 years; height, 167.6  $\pm$  9.9 cm; mass, 66.3  $\pm$  14.7 kg) were recruited and categorized to a CAI, coper, or control group, based on Ankle Instability Instrument scores. Participants were assessed with SWMs for cutaneous thresholds using a 4-2-1 stepping algorithm at the head of the first metatarsal, base of the fifth metatarsal, calcaneus, and sinus tarsi. Each participant was then retested while generating random digits to the beat of a metronome in order to simulate cognitive loading.

### Results

Participants with CAI displayed significantly higher SWM thresholds at the head of the first metatarsal, base of the fifth metatarsal, and sinus tarsi than those of the control participants, and significantly higher thresholds at the base of the fifth metatarsal and calcaneus than those of copers (all,  $P < .05$ ). Copers showed higher thresholds than those of controls at the sinus tarsi only ( $P < .05$ ). A main effect of cognitive loading was identified at all 4 sites ( $P < .05$ ).

### Conclusion

People with CAI have deficits in plantar sensation relative to controls and copers. Cognitive loading increases plantar cutaneous sensation thresholds irrespective of CAI status. *J Orthop Sports Phys Ther* 2016;46(4):270–276. Epub 26 Jan 2016. doi:10.2519/jospt.2016.6351

Keyword: deafferentation, dual-task interference, light touch, mechanoreceptor

**Assessment for instability**

Am J Sports Med. 2016 Feb 24. pii: 0363546516628870.

### **Recovery From a First-Time Lateral Ankle Sprain and the Predictors of Chronic Ankle Instability: A Prospective Cohort Analysis.**

Doherty C<sup>1</sup>, Bleakley C<sup>2</sup>, Hertel J<sup>3</sup>, Caulfield B<sup>4</sup>, Ryan J<sup>5</sup>, Delahunt E<sup>6</sup>.

#### **BACKGROUND:**

Impairments in motor control may predicate the paradigm of chronic ankle instability (CAI) that can develop in the year after an acute lateral ankle sprain (LAS) injury. No prospective analysis is currently available identifying the mechanisms by which these impairments develop and contribute to long-term outcome after LAS.

#### **PURPOSE:**

To identify the motor control deficits predicating CAI outcome after a first-time LAS injury.

#### **STUDY DESIGN:**

Cohort study (diagnosis); Level of evidence, 2.

#### **METHODS:**

Eighty-two individuals were recruited after sustaining a first-time LAS injury. Several biomechanical analyses were performed for these individuals, who completed 5 movement tasks at 3 time points: (1) 2 weeks, (2) 6 months, and (3) 12 months after LAS occurrence. A logistic regression analysis of several "salient" biomechanical parameters identified from the movement tasks, in addition to scores from the Cumberland Ankle Instability Tool and the Foot and Ankle Ability Measure (FAAM) recorded at the 2-week and 6-month time points, were used as predictors of 12-month outcome.

#### **RESULTS:**

At the 2-week time point, an inability to complete 2 of the movement tasks (a single-leg drop landing and a drop vertical jump) was predictive of CAI outcome and correctly classified 67.6% of cases (sensitivity, 83%; specificity, 55%;  $P = .004$ ). At the 6-month time point, several deficits exhibited by the CAI group during 1 of the movement tasks (reach distances and sagittal plane joint positions at the hip, knee and ankle during the posterior reach directions of the Star Excursion Balance Test) and their scores on the activities of daily living subscale of the FAAM were predictive of outcome and correctly classified 84.8% of cases (sensitivity, 75%; specificity, 91%;  $P < .001$ ).

#### **CONCLUSION:**

An inability to complete jumping and landing tasks within 2 weeks of a first-time LAS and poorer dynamic postural control and lower self-reported function 6 months after a first-time LAS were predictive of eventual CAI outcome.

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#### **KEYWORDS:**

ankle instability; ankle joint; biomechanical phenomena; kinematics; kinetics; postural balance

PMID: 26912285

## **41 B. COMPARTMENT SYNDROME**

### **Surgical outcomes**

Arthroscopy. 2016 Mar 24. pii: S0749-8063(16)00123-7. doi: 10.1016/j.arthro.2016.01.069.

### **Surgical Management for Chronic Exertional Compartment Syndrome of the Leg: A Systematic Review of the Literature.**

Campano D<sup>1</sup>, Robaina JA<sup>1</sup>, Kusnezov N<sup>2</sup>, Dunn JC<sup>2</sup>, Waterman BR<sup>3</sup>.

#### ***PURPOSE:***

To review published literature to characterize the at-risk demographic, operative indications, surgical techniques, functional outcomes, and reoperation and complication rates after operative management of chronic exertional compartment syndrome (CECS) of the lower leg.

#### ***METHODS:***

We searched PubMed, Embase, Cochrane Database, and CINAHL (Cumulative Index to Nursing and Allied Health Literature) through February 1, 2015, using the terms "chronic exertional" and/or "exercise induced compartment syndrome." The inclusion criteria were studies of Level I to IV evidence in English, published in 1970 or later, involving human subjects, reporting clinical outcomes of operative management of CECS of the lower leg, including at least 5 patients, and having follow-up of at least 80% and 6 months.

#### ***RESULTS:***

Among the 204 original articles, 24 primary studies with 1,596 patients met the inclusion criteria. The mean age was 26.6 years (SD, 8.9 years), and the majority of patients were male patients (70%). The total study population mostly comprised military service members (54%) and athletes (29%). Of the athletes, 83% were recreational; 9% were college level; and 8% were either national, international, or professional. The most commonly involved compartment was the anterior compartment (51%; 95% confidence interval [CI], 48.6% to 52.3%), followed by lateral (33%; 95% CI, 31.4% to 34.9%), deep posterior (13%), and superficial posterior (3%). The cumulative posterior involvement rate was 16% (95% CI, 15.1% to 17.8%). Mean follow-up was 48.8 months (SD, 22.1 months; 95% CI, 47.1 to 50.5 months). Six percent underwent revision surgery. The overall complication rate was 13% (due to postoperative neurologic dysfunction, infection, and so on).

#### ***CONCLUSIONS:***

Primary operative management of lower-extremity CECS was successful in approximately two-thirds of all young athletic patients, and 84% were satisfied with their surgical outcomes at short- to mid-term follow-up. Open fasciotomy remains the predominant surgical technique, although its comparative efficacy relative to newer endoscopic or other minimally invasive techniques is not currently known. These data may be used to guide the orthopaedic community on accurate preoperative counseling and benchmark patient outcomes for future quality-improvement initiatives.

#### ***LEVEL OF EVIDENCE:***

Level IV, systematic review (studies ranging from Level I to Level IV).

Published by Elsevier Inc.

PMID: 27020462

### **43. HALLUX VALGUS**

#### **Measurement**

Yonsei Med J. 2016 May;57(3):741-7. doi: 10.3349/ymj.2016.57.3.741.

**Point-Connecting Measurements of the Hallux Valgus Deformity: A New Measurement and Its Clinical Application.**

Seo JH<sup>1</sup>, Ahn JY<sup>2</sup>, Boedijono D<sup>3</sup>.

**PURPOSE:**

The aim of this study was to investigate new point-connecting measurements for the hallux valgus angle (HVA) and the first intermetatarsal angle (IMA), which can reflect the degree of subluxation of the first metatarsophalangeal joint (MTPJ). Also, this study attempted to compare the validity of midline measurements and the new point-connecting measurements for the determination of HVA and IMA values.

**MATERIALS AND METHODS:**

Sixty feet of hallux valgus patients who underwent surgery between 2007 and 2011 were classified in terms of the severity of HVA, congruency of the first MTPJ, and type of chevron metatarsal osteotomy. On weight-bearing dorsal-plantar radiographs, HVA and IMA values were measured and compared preoperatively and postoperatively using both the conventional and new methods.

**RESULTS:**

Compared with midline measurements, point-connecting measurements showed higher inter- and intra-observer reliability for preoperative HVA/IMA and similar or higher inter- and intra-observer reliability for postoperative HVA/IMA. Patients who underwent distal chevron metatarsal osteotomy (DCMO) had higher intraclass correlation coefficient for inter- and intra-observer reliability for pre- and post-operative HVA and IMA measured by the point-connecting method compared with the midline method. All differences in the preoperative HVAs and IMAs determined by both the midline method and point-connecting methods were significant between the deviated group and subluxated groups ( $p=0.001$ ).

**CONCLUSION:**

The point-connecting method for measuring HVA and IMA in the subluxated first MTPJ may better reflect the severity of a HV deformity with higher reliability than the midline method, and is more useful in patients with DCMO than in patients with proximal chevron metatarsal osteotomy.

**KEYWORDS:**

Hallux valgus; hallux valgus angle; intermetatarsal angle; measurement; reliability

PMID: 26996576

## 45 A. MANUAL THERAPY LUMBAR & GENERAL

McKenzie and centralization

## The Influence of Centralization and Directional Preference on Spinal Control in Patients With Nonspecific Low Back Pain

**Authors:** Adri T. Apeldoorn, PT, PhD<sup>1,2</sup>, Hans van Helvoirt, PT, MA<sup>3</sup>, Hanneke Meihuizen, PT<sup>3</sup>, Henk Tempelman, PT<sup>4</sup>, David Vandeput, PT<sup>5</sup>, Dirk L. Knol, PhD<sup>1</sup>, Steven J. Kamper, PT, PhD<sup>1,6</sup>, Raymond W. Ostelo, PT, PhD<sup>1,7</sup>

**Published:** *Journal of Orthopaedic & Sports Physical Therapy*, 2016 **Volume:**46 **Issue:**4 **Pages:**258–269 **DOI:**10.2519/jospt.2016.6158

**Study Design** Prospective cohort, test-retest design.

**Background** Directional preference (DP) with centralization (CEN) and DP without CEN are common pain-pattern responses assessed by Mechanical Diagnosis and Therapy (MDT). Although there is evidence that MDT can reduce pain and disability in the short term by treating the patient with direction-specific exercises concordant with the patient's DP, the mechanism responsible for this is unclear.

**Objective** To determine whether clinical signs of impaired spinal control improve immediately after eliciting a DP-with-CEN response or a DP-without-CEN response in patients with nonspecific low back pain.

**Methods** Participants underwent a standardized MDT assessment and were classified into the following pain-pattern subgroups: DP with CEN, DP without CEN, or no DP. Clinical signs of impaired spinal control were assessed pre-MDT assessment and post-MDT assessment by an independent examiner. Four spinal control tests were conducted: aberrant lumbar movements while bending forward, the active straight leg raise (ASLR) test, the Trendelenburg test, and the prone instability test. Differences in spinal control pre-MDT assessment and post-MDT assessment were calculated for the 3 pain-pattern subgroups and compared with chi-square tests. We hypothesized that a larger proportion of patients in the DP-with-CEN subgroup would exhibit improved spinal control than patients categorized as DP without CEN or no DP.

**Results** Of 114 patients recruited, 51 patients (44.7%) were categorized as DP with CEN, 23 (20.2%) as DP without CEN, and 40 (35.1%) as no DP. Before MDT assessment, between 28.9% (Trendelenburg test) and 63.7% (ASLR test) of patients showed impaired spinal control. After MDT assessment, a larger proportion of patients in the DP-with-CEN subgroup (43%) showed improvement than those in the no-DP subgroup (7%) on aberrant lumbar movements ( $P = .02$ ). Likewise, more patients in the DP-with-CEN subgroup (50%) improved on the ASLR test than those in the no-DP subgroup (8%,  $P < .01$ ) or the DP-without-CEN subgroup (7%,  $P = .01$ ). Changes in Trendelenburg test and prone instability test outcomes did not reach statistical significance.

**Conclusion** Immediately following MDT assessment, a larger proportion of patients with a DP-with-CEN pain pattern showed improvement in clinical signs of spinal control compared to patients with a DP-without-CEN or no-DP pain pattern. The current study was registered in the Dutch trial registry at <http://www.trialregister.nl/trialreg/index.asp> (NTR4246).

**Level of Evidence**

Therapy, level 2b. *J Orthop Sports Phys Ther* 2016;46(4):258–269. Epub 26 Jan 2016.

*doi:*10.2519/jospt.2016.6158

**Keyword:** Mechanical Diagnosis and Therapy, motor control, physical therapy

**Specificity of manipulation**

## **A Prescriptively Selected Nonthrust Manipulation Versus a Therapist-Selected Nonthrust Manipulation for Treatment of Individuals With Low Back Pain: A Randomized Clinical Trial**

Authors: Megan Donaldson, PT, PhD, FAAOMPT<sup>1</sup>, Shannon Petersen, PT, DScPT, FAAOMPT<sup>2</sup>, Chad Cook, PT, PhD, FAAOMPT<sup>3</sup>, Ken Learman, PT, PhD, FAAOMPT<sup>4</sup>

Published: *Journal of Orthopaedic & Sports Physical Therapy*,  
2016 Volume:46 Issue:4 Pages:243–250 DOI:10.2519/jospt.2016.6318

Study Design Randomized controlled trial.

### **Background**

Several studies that have investigated the effects of a therapist-selected versus a randomly assigned segmental approach have looked at immediate effects only for pain-related outcomes.

### **Objectives**

To examine differences in outcomes following a therapist-selected nonthrust manipulation versus a prescriptively selected nonthrust manipulation in subjects with low back pain.

### **Methods**

Subjects with mechanically producible low back pain were randomly treated with nonthrust manipulation in a therapist-selected approach or a prescriptively selected approach. All subjects received a standardized home exercise program. Outcome measures included pain, disability, global rating of change, and patient acceptable symptom state. Analyses of covariance, chi-square tests, and Mann-Whitney *U* tests were used to determine differences between groups.

### **Results**

Sixty-three subjects were tracked for 6 months, during which subjects in both groups significantly improved. There were no differences between groups in pain, disability, or patient acceptable symptom state scores at 6 months. There was a significant difference in global rating of change scores favoring the therapist-selected manipulation group at 6 months.

### **Conclusion**

This study measured long-term differences between a prescriptively selected nonthrust manipulation and a therapist-selected approach to nonthrust manipulation. In pain, disability, and patient acceptable symptom state there were no differences in outcomes, findings similar to studies of immediate effects. After 6 months, perceived well-being was significantly higher for those in the therapist-selected treatment group. The study was registered at ClinicalTrials.gov (NCT01940744).

### **Level of Evidence**

Therapy, level 1b. *J Orthop Sports Phys Ther* 2016;46(4):243–250. Epub 8 Mar 2016.  
doi:10.2519/jospt.2016.6318

Keyword: joint mobilization, low back pain, manual therapy, outcomes

**Manual therapy and exercise**

BMC Musculoskelet Disord. 2016 Mar 22;17(1):135. doi: 10.1186/s12891-016-0986-y.

**Sub-classification based specific movement control exercises are superior to general exercise in sub-acute low back pain when both are combined with manual therapy: A randomized controlled trial.**

Lehtola V<sup>1,2</sup>, Luomajoki H<sup>3</sup>, Leinonen V<sup>4,5</sup>, Gibbons S<sup>6</sup>, Airaksinen O<sup>7,8</sup>.

**BACKGROUND:**

Clinical guidelines recommend research on sub-groups of patients with low back pain (LBP) but, to date, only few studies have been published. One sub-group of LBP is movement control impairment (MCI) and clinical tests to identify this sub-group have been developed. Also, exercises appear to be beneficial for the management of chronic LBP (CLBP), but very little is known about the management of sub-acute LBP.

**METHODS:**

A randomized controlled trial (RCT) was conducted to compare the effects of general exercise versus specific movement control exercise (SMCE) on disability and function in patients with MCI within the recurrent sub-acute LBP group. Participants having a MCI attended five treatment sessions of either specific or general exercises. In both groups a short application of manual therapy was applied. The primary outcome was disability, assessed by the Roland-Morris Disability Questionnaire (RMDQ). The measurements were taken at baseline, immediately after the three months intervention and at twelve-month follow-up.

**RESULTS:**

Seventy patients met the inclusion criteria and were eligible for the trial. Measurements of 61 patients (SMCE n = 30 and general exercise n = 31) were completed at twelve months. (Drop-out rate 12.9 %). Patients in both groups reported significantly less disability (RMDQ) at twelve months follow-up. However, the mean change on the RMDQ between baseline and the twelve-month measurement showed statistically significantly superior improvement for the SMCE group -1.9 points (-3.9 to -0.5) 95 % (CI). The result did not reach the clinically significant three point difference. There was no statistical difference between the groups measured with Oswestry Disability Index (ODI).

**CONCLUSION:**

For subjects with non-specific recurrent sub-acute LBP and MCI an intervention consisting of SMCE and manual therapy combined may be superior to general exercise combined with manual therapy.

**TRIAL REGISTRATION:**

The study protocol registration number is ISRCTN48684087 . It was registered retrospectively 18th Jan 2012.

PMID: 27005470

**45 B. MANUAL THERAPY CERVICAL**

Compared to PT

Eur Spine J. 2016 Mar 21.

**Cost-effectiveness of manual therapy versus physiotherapy in patients with sub-acute and chronic neck pain: a randomised controlled trial.**

van Dongen JM<sup>1</sup>, Groeneweg R<sup>2,3,4</sup>, Rubinstein SM<sup>2</sup>, Bosmans JE<sup>2</sup>, Oostendorp RA<sup>3,5</sup>, Ostelo RW<sup>2,6</sup>, van Tulder MW<sup>2,6</sup>.

**PURPOSE:**

To evaluate the cost-effectiveness of manual therapy according to the Utrecht School (MTU) in comparison with physiotherapy (PT) in sub-acute and chronic non-specific neck pain patients from a societal perspective.

**METHODS:**

An economic evaluation was conducted alongside a 52-week randomized controlled trial, in which 90 patients were randomized to the MTU group and 91 to the PT group. Clinical outcomes included perceived recovery (yes/no), functional status (continuous and yes/no), and quality-adjusted life-years (QALYs). Costs were measured from a societal perspective using self-reported questionnaires. Missing data were imputed using multiple imputation. To estimate statistical uncertainty, bootstrapping techniques were used.

**RESULTS:**

After 52 weeks, there were no significant between-group differences in clinical outcomes. During follow-up, intervention costs ( $\beta$ :€-32; 95 %CI: -54 to -10) and healthcare costs ( $\beta$ :€-126; 95 %CI: -235 to -32) were significantly lower in the MTU group than in the PT group, whereas unpaid productivity costs were significantly higher ( $\beta$ :€186; 95 %CI:19-557). Societal costs did not significantly differ between groups ( $\beta$ :€-96; 95 %CI:-1975-2022). For QALYs and functional status (yes/no), the maximum probability of MTU being cost-effective in comparison with PT was low ( $\leq 0.54$ ). For perceived recovery (yes/no) and functional status (continuous), a large amount of money must be paid per additional unit of effect to reach a reasonable probability of cost-effectiveness.

**CONCLUSIONS:**

From a societal perspective, MTU was not cost-effective in comparison with PT in patients with sub-acute and chronic non-specific neck pain for perceived recovery, functional status, and QALYs. As no clear total societal cost and effect differences were found between MTU and PT, the decision about what intervention to administer, reimburse, and/or implement can be based on the preferences of the patient and the decision-maker at hand.

**TRIAL REGISTRATION:**

ClinicalTrials.gov Identifier: [NCT00713843](https://clinicaltrials.gov/ct2/show/study/NCT00713843).

**KEYWORDS:**

Economic evaluation; Musculoskeletal manipulation; Physical therapy modalities

PMID: 27001136

**48 A. STM**

Connective tissue

### **Protection from muscle damage in the absence of changes in muscle mechanical behavior**

Medicine and Science in Sports and Exercise, 04/01/2016Hoffman BW, et al.

**I**n this study, evidence was sought for three possible mechanical changes that would support either the sarcomerogenesis or increased tendon compliance hypotheses; a sustained rightward shift in the fascicle length–tension relationship, reduced fascicle strain amplitude, and reduced starting fascicle length.

Protection from a repeated bout of eccentric exercise was conferred without changes in muscle fascicle strain behaviour, indicating that sarcomerogenesis and increased tendon compliance were unlikely to be responsible. As fascicle strains are relatively small in humans, the authors suggest that changes to connective tissue structures, such as extracellular matrix remodelling, are better able to explain the repeated bout effect observed here.

## **52. EXERCISE**

### **Exercise and depression**

J Psychiatr Res. 2016 Mar 4;77:42-51. doi: 10.1016/j.jpsychires.2016.02.023.

**Exercise as a treatment for depression: A meta-analysis adjusting for publication bias.**

Schuch FB<sup>1</sup>, Vancampfort D<sup>2</sup>, Richards J<sup>3</sup>, Rosenbaum S<sup>4</sup>, Ward PB<sup>4</sup>, Stubbs B<sup>5</sup>.

The effects of exercise on depression have been a source of contentious debate.

Meta-analyses have demonstrated a range of effect sizes. Both inclusion criteria and heterogeneity may influence the effect sizes reported. The extent and influence of publication bias is also unknown. Randomized controlled trials (RCTs) were identified from a recent Cochrane review and searches of major electronic databases from 01/2013 to 08/2015. We included RCTs of exercise interventions in people with depression (including those with a diagnosis of major depressive disorder (MDD) or ratings on depressive symptoms), comparing exercise versus control conditions. A random effects meta-analysis calculating the standardized mean difference (SMD, 95% confidence interval; CI), meta-regressions, trim and fill and fail-safe n analyses were conducted.

Twenty-five RCTs were included comparing exercise versus control comparison groups, including 9 examining participants with MDD. Overall, exercise had a large and significant effect on depression (SMD adjusted for publication bias = 1.11 (95% CI 0.79-1.43)) with a fail-safe number of 1057. Most adjusted analyses suggested publication bias led to an underestimated SMD. Larger effects were found for interventions in MDD, utilising aerobic exercise, at moderate and vigorous intensities, in a supervised and unsupervised format. In MDD, larger effects were found for moderate intensity, aerobic exercise, and interventions supervised by exercise professionals.

Exercise has a large and significant antidepressant effect in people with depression (including MDD). Previous meta-analyses may have underestimated the benefits of exercise due to publication bias. Our data strongly support the claim that exercise is an evidence-based treatment for depression.

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**KEYWORDS:**

Depression; Exercise; Meta-analysis; Meta-regression; Publication bias; Review

PMID: 26978184

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**53. CORE**

Postural clueing

## Postural Cueing to Increase Lumbar Lordosis Increases Lumbar Multifidus Activation During Trunk Stabilization Exercises: Electromyographic Assessment Using Intramuscular Electrodes

**Authors:** George J. Beneck, PT, PhD, OCS, KEMG<sup>1</sup>, John W. Story, MPT, CSCS<sup>2</sup>, Shelby Donald, MPT<sup>3</sup>

**Published:** *Journal of Orthopaedic & Sports Physical Therapy*, 2016 **Volume:**46 **Issue:**4 **Pages:**293–299 **DOI:**10.2519/jospt.2016.6174

### Study Design

Controlled laboratory study, repeated-measures design.

### Background

Diminished multifidus activation and cross-sectional area are frequent findings in persons with low back pain. Increasing lumbar lordosis has been shown to increase activation of the multifidus with a minimal increase in activation of the long global extensors during unsupported sitting.

### Objectives

To examine the influence of postural cueing to increase lumbar lordosis on lumbar extensor activation during trunk stabilization exercises.

### Methods

Thirteen asymptomatic participants (9 male, 4 female) were instructed to perform 6 trunk stabilization exercises using a neutral position and increasing lumbar lordosis. Electrical activity of the deep multifidus and longissimus thoracis was recorded using fine-wire intramuscular electrodes. The mean root-mean-square of the electromyography (EMG) signal obtained during each exercise was normalized to a maximum voluntary isometric contraction (MVIC). A 2-way, repeated-measures analysis of variance (posture by exercise) was performed for each muscle.

### Results

When averaged across the 6 exercises, postural cueing to increase lumbar lordosis resulted in greater multifidus EMG activity compared to performing the exercises in a neutral posture ( $35.3\% \pm 15.1\%$  versus  $29.5\% \pm 11.2\%$  MVIC). No significant increase in longissimus thoracis EMG activity was observed when exercising with cueing to increase lumbar lordosis.

### Conclusion

This study suggests that postural cueing to increase lumbar lordosis during trunk stabilization exercises may better promote multifidus activation than traditional stabilization exercises alone. Future studies are needed to determine whether increasing lumbar lordosis improves multifidus activation in persons with low back pain. *J Orthop Sports Phys Ther* 2016;46(4):293–299. Epub 8 Mar 2016. doi:10.2519/jospt.2016.6174

Keyword: electromyography, multifidus, trunk stabilization exercises

Abdominal bracing

## Abdominal Bracing Increases Ground Reaction Forces and Reduces Knee and Hip Flexion During Landing

**Authors:** Amity Campbell, PhD<sup>1</sup>, Kevin Kemp-Smith, PT, ScD<sup>1</sup>, Peter O'Sullivan, PT, PhD<sup>1</sup>, Leon Straker, PT, PhD<sup>1</sup>

**Published:** *Journal of Orthopaedic & Sports Physical Therapy*,  
2016 **Volume:**46 **Issue:**4 **Pages:**286–292 **DOI:**10.2519/jospt.2016.5774

### Study Design

Controlled laboratory study.

### Background

Abdominal bracing (AB) is a widely advocated method of increasing spine stability, yet the influence of AB on the execution of sporting movements has not been quantified. Landing is a common task during sporting endeavors; therefore, investigating the effect of performing AB during a drop-landing task is relevant.

### Objective

To quantify the effect of AB on kinematics (ankle, knee, hip, and regional lumbar spine peak flexion angles) and peak vertical ground reaction force (vGRF) during a drop-landing task.

### Methods

Sixteen healthy adults (7 female, 9 male; mean  $\pm$  SD age,  $27 \pm 7$  years; height,  $170.6 \pm 8.1$  cm; mass,  $68.0 \pm 11.3$  kg) were assessed using 3-D motion analysis, electromyography (EMG), and a force platform while performing a drop-landing task with and without AB. Abdominal bracing was achieved with the assistance of real-time internal oblique EMG feedback. Lower-limb and regional lumbar spine kinematics, peak vGRF, and normalized EMG of the left and right internal obliques and lumbar multifidus were quantified. Paired-sample *t* tests were used to compare variables between the AB and no-AB conditions.

### Results

Abdominal bracing resulted in significantly reduced knee and hip flexion and increased peak vGRF during landing. No differences in lumbar multifidus EMG or lumbar spine kinematics were observed.

### Conclusion

Abdominal bracing reduces impact attenuation during landing. These altered biomechanics may have implications for lower-limb and spinal injury risk during dynamic tasks. *J Orthop Sports Phys Ther* 2016;46(4):286–292. Epub 8 Mar 2016. doi:10.2519/jospt.2016.5774

Keyword: back pain, core stability, exercise, rehabilitation

Fat infiltration

Eur Spine J. 2016 Mar 8. [Epub ahead of print]

Paraspinal muscle asymmetry and fat infiltration in patients with symptomatic disc herniation.

Fortin M<sup>1</sup>, Lazáry A<sup>2</sup>, Varga PP<sup>2</sup>, McCall I<sup>3</sup>, Battié MC<sup>4</sup>.

Author information

Abstract

**PURPOSE:**

To investigate asymmetry in size and composition of the multifidus and erector spinae in patients with posterolateral disc herniation and concordant radicular symptoms, and determine whether symptom duration is associated with degree of asymmetry.

**METHODS:**

Thirty-three patients diagnosed with posterolateral disc herniation at L4-L5 verified on imaging and concordant leg pain were included. Multifidus and erector spinae cross-sectional area (CSA), functional cross-sectional area (FCSA, fat-free area), signal intensity and ratio of FCSA to total CSA were measured bilaterally from T<sub>2</sub>-weighted axial magnetic resonance imaging (MRI) at L3-L4, L4-L5, L5-S1 and S1 levels.

**RESULTS:**

No side-to-side differences in multifidus CSA, FCSA, and ratio of FCSA/CSA reached statistical significance at any spinal level. The multifidus signal intensity at L5-S1 was significantly greater (more fatty infiltration) on the side of the disc herniation. The erector spinae FCSA (lean muscle mass) at L5-S1 was found to be significantly smaller on the side of the herniation and the ratio of FCSA/CSA was smaller (more fatty infiltration) on the side of the herniation at L4-L5 and L5-S1. The degree of muscle asymmetry was not associated with symptoms duration.

**CONCLUSIONS:**

There was no significant asymmetry of the multifidus at spinal level above, same or level below the disc herniation. Instead, variations in muscle composition were observed, with greater fat infiltration on the side and at spinal levels adjacent to the disc herniation. Muscle asymmetry was not correlated with symptom duration.

**KEYWORDS:**

Atrophy; Disc herniation; Erector spinae; Fatty infiltration; Multifidus

PMID: 26957101

## 54. POSTURE

**Postural retraining**

Phys Ther. 2016 Mar 24.

**Effectiveness of Global Postural Reeducation in Patients With Chronic Nonspecific Neck Pain: A Randomized Controlled Trial.**

Pillastrini P<sup>1</sup>, De Lima E Sá Resende F<sup>2</sup>, Banchelli F<sup>3</sup>, Burioli A<sup>4</sup>, Di Ciaccio E<sup>5</sup>, Guccione AA<sup>6</sup>, Villafañe JH<sup>7</sup>, Vanti C<sup>8</sup>.

**BACKGROUND CONTEXT:**

Global Postural Reeducation (GPR) has shown positive results for patients with musculoskeletal disorders, but no previous randomized controlled trial (RCT) has investigated its effectiveness as the sole procedure for adult patients with chronic nonspecific Neck Pain (NP).

**PURPOSE:**

We evaluated the effectiveness of applying GPR compared to a manual therapy (MT) intervention to patients with chronic nonspecific NP.

**STUDY DESIGN:**

RCT.

**PATIENT SAMPLE:**

94 patients, 72 women and 22 men, average age  $47.5 \pm 11.3$  years, with chronic nonspecific NP were randomly assigned to receive a GPR or a MT treatment.

**OUTCOME MEASURES:**

Pain intensity [Visual Analogue Scale (VAS)], disability [Neck Disability Index (NDI)], cervical Range of Motion (ROM), and kinesiophobia [Tampa Scale of Kinesiophobia (TSK)] were assessed.

**METHODS:**

The experimental group received GPR, whereas the reference group received MT. Both groups received nine 60-minutes long sessions with one-to-one supervision from physical therapists as the care providers. All subjects were asked to follow ergonomic advice and to perform home exercises. Measures were assessed at pre-treatment, at post-treatment and at a 6-months follow-up.

**RESULTS:**

No important baseline differences between groups. Subjects in the experimental GPR group exhibited a statistically significant reduction in pain at post-treatment ( $P=0.0043$ ), and disability at six months after the intervention ( $P=0.0113$ ), compared to the reference group.

**CONCLUSIONS:**

Our results suggest that GPR was more effective than MT for improving pain at post-treatment and disability at six month follow-up in patients with chronic nonspecific NP.

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PMID: 27013576

**55. SCOLIOSIS**

## Cervical spine

Eur Spine J. 2016 Mar 10.

**Relationship between cervical sagittal alignment and health-related quality of life in adolescent idiopathic scoliosis.**

Youn MS<sup>1</sup>, Shin JK<sup>2</sup>, Goh TS<sup>2</sup>, Kang SS<sup>3</sup>, Jeon WK<sup>2</sup>, Lee JS<sup>4</sup>.

**PURPOSE:**

Little information is available on the relationship between cervical sagittal alignment and health-related quality of life (HRQOL) in adolescent idiopathic scoliosis (AIS) patients. The aim of this study was to identify relationships between postoperative cervical sagittal alignment and HRQOL in AIS.

**METHODS:**

The study and control groups comprised 67 AIS patients (51 girls and 16 boys). All underwent anteroposterior and lateral plain radiography and completed clinical questionnaires. The radiographic parameters investigated were pre- and postoperative C2-C7 lordosis, C2-C7 sagittal vertical axis (SVA), T1 slope, T1 slope minus C2-C7 lordosis (TS-CL), thoracic kyphosis (TK), lumbar lordosis (LL), pelvic tilt (PT), sacral slope (SS), and pelvic incidence (PI). The Korean version of the SRS-22 questionnaire and the previously validated Short Form-36 (SF-36) outcome questionnaire were administered to evaluate HRQOL at last follow-up visits. Statistical analysis was performed to determine the significances of differences between preoperative and last follow-up radiological findings. In addition, correlations between radiological parameters and clinical questionnaire scores were sought.

**RESULTS:**

Radiological sagittal parameters were found to be significantly increased after surgical correction in terms of C2-C7 lordosis ( $3.5 \pm 11.4$ ), C2-C7 SVA ( $1.5 \pm 6.0$ ), T1 slope ( $3.5 \pm 6.1$ ), and TK ( $6.0 \pm 8.1$ ). However, no significant difference was observed for TS-CL, LL, PT, SS, and PI ( $P > 0.05$ ). Correlation analysis revealed significant relationships between radiographic parameters and questionnaire scores. Multiple regression analysis was performed to identify predictors of HRQOL, and the results obtained revealed that postoperative T1 slope significantly predicted SRS, PCS, and MCS scores and that postoperative C2-C7 SVA predicted SRS scores.

**CONCLUSIONS:**

Changes in cervical sagittal parameters were significant after deformity correction in AIS patients. Correlation analysis revealed significant relationships between postoperative radiographic parameters and HRQOL. In particular, T1 slope and C2-C7 SVA were found to be significant predictors of HRQOL in AIS patient.

**KEYWORDS:**

Adolescent idiopathic scoliosis; Cervical sagittal parameter; Quality of life

PMID: 26963762

## 56. ATHLETICS

### Sports injuries

**Shedding Light on the Etiology of Sports Injuries: A Look Behind the Scenes of Time-to-Event Analyses**

**Authors:** Rasmus Østergaard Nielsen, PT, PhD<sup>1</sup>, Laurent Malisoux, PhD<sup>2</sup>, Merete Møller, PT, MHSc<sup>1</sup>, Daniel Theisen, PhD<sup>2</sup>, Erik Thorlund Parner, PhD<sup>3</sup>

**Published:** *Journal of Orthopaedic & Sports Physical Therapy*, 2016 **Volume:**46 **Issue:**4 **Pages:**300–311 **DOI:**10.2519/jospt.2016.6510

**Synopsis**

The etiological mechanism underpinning any sports-related injury is complex and multifactorial. Frequently, athletes perceive “excessive training” as the principal factor in their injury, an observation that is biologically plausible yet somewhat ambiguous. If the applied training load is suddenly increased, this may increase the risk for sports injury development, irrespective of the absolute amount of training. Indeed, little to no rigorous scientific evidence exists to support the hypothesis that fluctuations in training load, compared to absolute training load, are more important in explaining sports injury development. One reason for this could be that prospective data from scientific studies should be analyzed in a different manner. Time-to-event analysis is a useful statistical tool in which to analyze the influence of changing exposures on injury risk. However, the potential of time-to-event analysis remains insufficiently exploited in sports injury research. Therefore, the purpose of the present article was to present and discuss measures of association used in time-to-event analyses and to present the advanced concept of time-varying exposures and outcomes. In the paper, different measures of association, such as cumulative relative risk, cumulative risk difference, and the classical hazard rate ratio, are presented in a nontechnical manner, and suggestions for interpretation of study results are provided.

To summarize, time-to-event analysis complements the statistical arsenal of sports injury prevention researchers, because it enables them to analyze the complex and highly dynamic reality of injury etiology, injury recurrence, and time to recovery across a range of sporting contexts. *J Orthop Sports Phys Ther* 2016;46(4):300–311. Epub 8 Mar 2016. doi:10.2519/jospt.2016.6510

**Keyword:** injury prevention, methodology, statistics, time-varying variables

Vascular flow and fitness

Scand J Med Sci Sports. 2016 Mar 19. doi: 10.1111/sms.12674.

**Impact of aerobic fitness on cerebral blood flow and cerebral vascular responsiveness to CO<sub>2</sub> in young and older men.**

Braz ID<sup>1</sup>, Flück D<sup>2,3</sup>, Lip GY<sup>4</sup>, Lundby C<sup>2,3</sup>, Fisher JP<sup>1</sup>.

We sought to test the hypothesis that brain blood flow and cerebral vascular responsiveness to carbon dioxide (CVR<sub>CO<sub>2</sub></sub>) are greater in aerobically trained young and old individuals compared to their untrained counterparts.

In 11 young trained {[23 (20-26) years] [mean (95% confidence interval)]}, 10 young untrained [25 (22-28) years], 8 older trained [65 (61-69) years], and 9 older untrained [67 (64-71) years] healthy individuals, Doppler ultrasound of the internal carotid (ICA) and vertebral (VA) artery blood flow were determined, along with middle cerebral artery mean flow velocity (MCA V<sub>mean</sub>). Bilateral ICA blood flow was higher in trained individuals when compared to untrained ( $\approx 31\%$ ,  $P < 0.05$ ), but was not influenced by age. VA blood flow was not affected by age or cardiorespiratory fitness. MCA V<sub>mean</sub> was reduced with age [59.5 (55.0-64.1) cm/s young vs 43.6 (38.4-48.9) cm/s old,  $P < 0.05$ ] with no significant effect of training observed. MCA CVR<sub>CO<sub>2</sub></sub> were not significantly affected by either age or training status, while ICA CVR<sub>CO<sub>2</sub></sub> tended to be elevated in the old trained group.

These findings indicate that endurance training enhances bilateral ICA but not VA blood flow in both young and older individuals.

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**KEYWORDS:**

Aging; cardio-respiratory fitness; cerebrovascular circulation

PMID: 26993209

Baseball pitchers

J Shoulder Elbow Surg. 2016 Apr;25(4):671-5. doi: 10.1016/j.jse.2015.12.027.

**Major League Baseball pitch velocity and pitch type associated with risk of ulnar collateral ligament injury.**

Keller RA<sup>1</sup>, Marshall NE<sup>2</sup>, Guest JM<sup>2</sup>, Okoroha KR<sup>2</sup>, Jung EK<sup>2</sup>, Moutzouros V<sup>2</sup>.

**BACKGROUND:**

The number of Major League Baseball (MLB) pitchers requiring ulnar collateral ligament (UCL) reconstructions is increasing. Recent literature has attempted to correlate specific stresses placed on the throwing arm to risk for UCL injury, with limited results.

**METHODS:**

Eighty-three MLB pitchers who underwent primary UCL reconstruction were evaluated. Pitching velocity and percent of pitch type thrown (fastball, curve ball, slider, and change-up) were evaluated 2 years before and after surgery. Data were compared with control pitchers matched for age, position, size, innings pitched, and experience.

**RESULTS:**

The evaluation of pitch velocity compared with matched controls found no differences in pre-UCL reconstruction pitch velocities for fastballs (91.5 vs. 91.2 miles per hour [mph],  $P = .69$ ), curveballs (78.2 vs. 77.9 mph,  $P = .92$ ), sliders (83.3 vs. 83.5 mph,  $P = .88$ ), or change-ups (83.9 vs. 83.8 mph,  $P = .96$ ). When the percentage of pitches thrown was evaluated, UCL reconstructed pitchers pitch significantly more fastballs than controls (46.7% vs. 39.4%,  $P = .035$ ). This correlated to a 2% increase in risk for UCL injury for every 1% increase in fastballs thrown. Pitching more than 48% fastballs was a significant predictor of UCL injury, because pitchers over this threshold required reconstruction ( $P = .006$ ).

**CONCLUSION:**

MLB pitchers requiring UCL reconstruction do not pitch at higher velocities than matched controls, and pitch velocity does not appear to be a risk factor for UCL reconstruction. However, MLB pitchers who pitch a high percentage of fastballs may be at increased risk for UCL injury because pitching a higher percent of fastballs appears to be a risk factor for UCL reconstruction.

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**KEYWORDS:**

Major League Baseball; Pitching; UCL injury; elbow; ligament; velocity

PMID: 26995458

**57. GAIT**

Weak plantar flexors

**Plantar flexor muscle weakness may cause stiff-knee gait★**

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,  
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DOI: <http://dx.doi.org/10.1016/j.gaitpost.2016.03.010>

**Abstract****Aim**

The iterative simulation studies proclaim that plantar flexor (PF) muscle weakness is one of the contributors of stiff knee gait (SKG), although, whether isolated PF weakness generates SKG has not been validated in able-bodied people or individuals with neuromuscular disorders. The aim of the study was to investigate the effects of isolated PF muscle weakness on knee flexion velocity and SKG in healthy individuals.

**Method**

Twenty able-bodied young adults ( $23 \pm 3$  years) participated in this study. Passive stretch (PS) protocol was applied until the PF muscle strength dropped 33.1% according to the hand-held dynamometric measurement. Seven additional age-matched able-bodies were compared with participants' to discriminate the influence of slow-walking. All participants underwent 3D gait analysis before and after the PS. Peak knee flexion angle, range of knee flexion between toe-off and peak knee flexion, total range of knee-flexion, and time of peak knee flexion in swing were selected to describe SKG pattern.

**Results**

After PS, the reduction of plantar flexor muscle strength (33.14%) caused knee flexion velocity drop at toe-off ( $p = 0.008$ ) and developed SKG pattern by decreasing peak knee flexion ( $p = 0.0001$ ), range of knee flexion in early swing ( $p = 0.006$ ), and total knee flexion range ( $p = 0.002$ ). These parameters were significantly correlated with decreased PF velocity at toe-off ( $p = 0.015$ ,  $p = 0.0001$ ,  $p = 0.005$  respectively). The time of peak knee flexion was not significantly different between before and after stretch conditions ( $p = 0.130$ ).

**Conclusions**

These findings verified that plantar flexor weakness cause SKG pattern by completing three of SKG parameters. Any treatment protocol that weakens the plantar flexor muscle might impact the SKG pattern.

*Keywords:*

Plantar flexor, Stiff knee, Muscle stretch, Weakness, Cerebral Palsy

**59. PAIN****Behavioral components**

## The Behavioral Activation and Inhibition Systems: Implications for Understanding and Treating Chronic Pain

Mark P. Jensen Dawn M. Ehde Melissa A. Day

DOI: <http://dx.doi.org/10.1016/j.jpain.2016.02.001>

### Highlights

- Two neurophysiological systems underlie avoidance and approach responses.
- A model on the basis of these systems may help to explain the effect of chronic pain.
- The 2-factor model also suggests new innovative chronic pain treatments.
- Research that develops the model could further improve our understanding of pain.

### Abstract

Evidence from a number of sources supports the existence of 2 relatively independent neurophysiological systems that underlie avoidance- and approach-related emotions, cognitions, and behavior. There is considerable overlap between 1) the emotions, cognitions, and behaviors controlled by these 2 systems, and 2) the known effects of chronic pain. Here we propose a 2-factor model of chronic pain on the basis of these well established 2-factor models, and discuss the implications of the model for understanding the effects of pain and mechanisms of psychological pain treatments. The model makes specific hypotheses, which are unique to the proposed model, regarding the mechanisms underlying pain's negative influence and the benefits of psychological pain treatments. The model also provides an overarching framework that could enhance outcomes by 1) broadening the assessment of factors that may be influencing pain and its effect on individual patients, and 2) suggesting that specific techniques from different treatments may be combined to better target these factors.

### Perspective

The 2-factor model presented in this report provides a framework for understanding the effects of psychological pain treatments, and makes specific a priori hypotheses regarding the specific mechanisms of those treatments. Clinical applications of the model have the potential for enhancing treatment outcomes.

### Key words:

Behavioral inhibition system, behavioral activation system, chronic pain, theory, mechanisms

### Impact of elderly pain

BMC Musculoskelet Disord. 2016 Mar 28;17(1):139. doi: 10.1186/s12891-016-0994-y.

**Impairment in the activities of daily living in older adults with and without osteoporosis, osteoarthritis and chronic back pain: a secondary analysis of population-based health survey data.**

Stamm TA<sup>1</sup>, Pieber K<sup>2</sup>, Crevenna R<sup>2</sup>, Dorner TE<sup>3</sup>.

**BACKGROUND:**

Independence in performing activities of daily living (ADLs) is a central aspect of functioning. Older adults frequently experience impairments and limitations in functioning in various life areas. The aim of this survey was to explore the limitations in the ADLs in older adults in a population-based survey in Austria.

**METHOD:**

A population-based cross-sectional study in 3097 subjects aged  $\geq 65$  years who were included in the Austrian health interview survey was performed. Descriptive statistics were used to calculate frequencies of problems in the ADLs. A principal component analysis was applied to analyze the main dimensions of 19 ADL items. Binary logistic regression models were used with the ADL dimensions as the dependent variables and osteoarthritis, chronic back pain, osteoporosis, sex, education level, anxiety or depression, age and pain intensity as independent variables.

**RESULTS:**

People with musculoskeletal conditions were significantly more often affected by ADL problems than people without these diseases. The ADL domain which caused problems in the highest proportion of people was "doing heavy housework" (43.9 %). It was followed by the ADL domains "bending or kneeling down" (39.3 %), "climbing stairs up and down without walking aids" (23.1 %), and "walking 500 m without walking aids" (22.8 %). The principal components analysis revealed four dimensions of ADLs: (1) intense "heavy burden" ADLs, (2) basic instrumental ADLs, (3) basic ADLs and (3) hand-focused ADLs. The proportion of subjects who had problems with the respective dimensions was 58.2, 29.2, 23.0, and 9.2 %. Anxiety/depression (greatest effect), followed by the chronic musculoskeletal disease itself, female sex, higher age and pain intensity were significant predictors of ADL problems.

**CONCLUSION:**

This population-based survey indicates that older people have considerable ADL problems. More attention should be paid to the high impact of pain intensity, anxiety and depression on ADLs.

**KEYWORDS:**

Activities of daily living; Occupational therapy; Population-based study

PMID: 27020532

**Medical costs of chronic pain**

Pain. 2016 Apr;157(4):818-26. doi: 10.1097/j.pain.0000000000000440.

**Complexity, comorbidity, and health care costs associated with chronic widespread pain in primary care.**

Morales-Espinoza EM1, Kostov B, Salami DC, Perez ZH, Rosalen AP, Molina JO, Paz LG, Momblona JM, Àreu JB, Brito-Zerón P, Ramos-Casals M, Sisó-Almirall A.

The objective was to estimate the prevalence of chronic widespread pain (CWP) and compare the quality-of-life (QoL), cardiovascular risk factors, comorbidity, complexity, and health costs with the reference population. A multicenter case-control study was conducted at 3 primary care centers in Barcelona between January and December 2012: 3048 randomized patients were evaluated for CWP according to the American College of Rheumatology definition. Questionnaires on pain, QoL, disability, fatigue, anxiety, depression, and sleep quality were administered. Cardiovascular risk and the Charlson index were calculated. We compared the complexity of cases and controls using Clinical Risk Groups, severity and annual direct and indirect health care costs. CWP criteria were found in 168 patients (92.3% women, prevalence 5.51% [95% confidence interval: 4.75%-6.38%]). Patients with CWP had worse QoL (34.2 vs 44.1,  $P < 0.001$ ), and greater disability (1.04 vs 0.35;  $P < 0.001$ ), anxiety (43.9% vs 13.3%;  $P < 0.001$ ), depression (27% vs 5.8%;  $P < 0.001$ ), sleep disturbances, obesity, sedentary lifestyle, high blood pressure, diabetes mellitus, and number of cardiovascular events (13.1% vs 4.8%;  $P = 0.028$ ) and higher rates of complexity, severity, hospitalization, and mortality. Costs were &OV0556;3751 per year in patients with CWP vs &OV0556;1397 in controls ( $P < 0.001$ ). In conclusion, the average patient with CWP has a worse QoL and a greater burden of mental health disorders and cardiovascular risk.

The average annual cost associated with CWP is nearly 3 times higher than that of patients without CWP, controlling for other clinical factors. These findings have implications for disease management and budgetary considerations.

PMID: 26645546

**Catastrophizing**

Pain. 2016 Apr;157(4):922-30. doi: 10.1097/j.pain.0000000000000472.

**Does changing pain-related knowledge reduce pain and improve function through changes in catastrophizing?**

Lee H<sup>1</sup>, McAuley JH, Hübscher M, Kamper SJ, Traeger AC, Moseley GL.

Evidence from randomized controlled studies shows that reconceptualizing pain improves patients' knowledge of pain biology, reduces catastrophizing thoughts, and improves pain and function.

However, causal relationships between these variables remain untested. It is hypothesized that reductions in catastrophizing could mediate the relationship between improvements in pain knowledge and improvements in pain and function. To test this causal mechanism, we conducted longitudinal mediation analyses on a cohort of 799 patients who were exposed to a pain education intervention. Patients provided responses to the neurophysiology of pain questionnaire, catastrophic thoughts about pain scale, visual analogue pain scale, and the patient specific functional scale, at baseline, 1-month, 6-month, and 12-month follow-up. With adjustment for potential confounding variables, an improvement in pain biology knowledge was significantly associated with a reduction in pain intensity (total effect = -2.20, 95% confidence interval [CI] = -2.96 to -1.44). However, this effect was not mediated by a reduction in catastrophizing (indirect effect = -0.16, 95% CI = -0.36 to 0.02). This might be due to a weak, nonsignificant relationship between changes in catastrophizing and pain intensity (path b = 0.19, 95% CI = -0.03 to 0.41). Similar trends were found in models with function as the outcome.

Our findings indicate that change in catastrophizing did not mediate the effect of pain knowledge acquisition on change in pain or function. The strength of this conclusion is moderated, however, if patient-clinician relational factors are conceptualized as a consequence of catastrophizing, rather than a cause.

PMID: 26761387

**No relationship found between MRI findings and pain**

Spine (Phila Pa 1976). 2016 Mar 2.

### **Is There An Association Between Pain and Magnetic Resonance Imaging Parameters in Patients with Lumbar Spinal Stenosis?**

Burgstaller JM<sup>1</sup>, Schöffler PJ, Buhmann JM, Andreisek G, Winklhofer S, Del Grande F, Mattle M, Brunner F, Karakoumis G, Steurer J, Held U.

***STUDY DESIGN:***

Prospective multi-center cohort study.

***OBJECTIVE:***

To identify an association between pain and magnetic resonance imaging (MRI) parameters in patients with lumbar spinal stenosis (LSS).

***SUMMARY OF BACKGROUND DATA:***

To the present, the relationship between abnormal MRI findings and pain in patients with LSS is still unclear.

***METHODS:***

First we conducted a systematic literature search. We identified relationships of relevant MRI parameters and pain in patients with LSS. Second, we addressed the study question with a thorough descriptive and graphical analysis to establish a relationship between MRI parameters and pain using data of the lumbar spinal stenosis outcome study (LSOS).

***RESULTS:***

In the systematic review including four papers about the associations between radiological findings in the MRI and pain, the authors of two articles reported no association and two of them did. Of the latter, only one study found a moderate correlation between leg pain measured by Visual Analogue Scale (VAS) and the degree of stenosis assessed by spine surgeons. In the data of the LSOS study we could not identify a relevant association between any of the MRI parameters and buttock, leg and back pain, quantified by the Spinal Stenosis Measure (SSM) and the Numeric Rating Scale (NRS). Even by restricting the analysis to the level of the lumbar spine with the most prominent radiological 'stenosis' no relevant association could be shown.

***CONCLUSION:***

Despite a thorough analysis of the data we were not able to prove any correlation between radiological findings (MRI) and the severity of pain. There is a need for innovative 'methods/techniques' to learn more about the causal relationship between radiological findings and the patients' pain related complaints.

***LEVEL OF EVIDENCE:***

2.

PMID: 26953669

## **60. COMPLEX REGIONAL PAIN**

**In pediatrics**

Pediatr Emerg Care. 2016 Mar;32(3):185-9. doi: 10.1097/PEC.0000000000000731.

### **Complex Regional Pain Type 1.**

Barrett MJ<sup>1</sup>, Barnett PL.

Author information

Abstract

Complex regional pain syndrome is increasingly recognized in the pediatric population.

Owing to the nature of presentation with pain, many of these children present to the emergency setting at different stages of the syndrome with or without numerous prior interactions with health professionals. Complex regional pain syndrome type 1 (CRPS1) is a clinical syndrome characterized by amplified musculoskeletal limb pain that is out of proportion to the history and physical findings, or pain due to non-noxious stimuli (allodynia/hyperalgesia), and accompanied by one or more signs of autonomic dysfunction. Differential diagnosis may include significant trauma (eg, fractures), inflammatory conditions, malignancies, and systemic illness. The diagnosis is clinical.

The treatment goals for CRPS1 are restoration of function and relief of pain. Education, physical, and occupational therapy with psychotherapy and defined goals of achievement with reward are the mainstay of treatment for this population. Most children with CRPS1 will have a favorable outcome.

PMID: 26928099

## **62 A. NUTRITION/VITAMINS**

### **Omega 3's**

Transl Psychiatry. 2016 Mar 15;6:e756. doi: 10.1038/tp.2016.29.

**Meta-analysis and meta-regression of omega-3 polyunsaturated fatty acid supplementation for major depressive disorder.**

Mocking RJ<sup>1</sup>, Harmsen I<sup>1</sup>, Assies J<sup>1</sup>, Koeter MW<sup>1</sup>, Ruhé HG<sup>1,2</sup>, Schene AH<sup>3,4</sup>.

Author information

Abstract

Omega-3 polyunsaturated fatty acid (PUFA) supplementation has been proposed as (adjuvant) treatment for major depressive disorder (MDD).

In the present meta-analysis, we pooled randomized placebo-controlled trials assessing the effects of omega-3 PUFA supplementation on depressive symptoms in MDD. Moreover, we performed meta-regression to test whether supplementation effects depended on eicosapentaenoic acid (EPA) or docosahexaenoic acid dose, their ratio, study duration, participants' age, percentage antidepressant users, baseline MDD symptom severity, publication year and study quality. To limit heterogeneity, we only included studies in adult patients with MDD assessed using standardized clinical interviews, and excluded studies that specifically studied perinatal/perimenopausal or comorbid MDD. Our PubMed/EMBASE search resulted in 1955 articles, from which we included 13 studies providing 1233 participants. After taking potential publication bias into account, meta-analysis showed an overall beneficial effect of omega-3 PUFAs on depressive symptoms in MDD (standardized mean difference=0.398 (0.114-0.682),  $P=0.006$ , random-effects model). As an explanation for significant heterogeneity ( $I(2)=73.36$ ,  $P<0.001$ ), meta-regression showed that higher EPA dose ( $\beta=0.00037$  (0.00009-0.00065),  $P=0.009$ ), higher percentage antidepressant users ( $\beta=0.0058$  (0.00017-0.01144),  $P=0.044$ ) and earlier publication year ( $\beta=-0.0735$  (-0.143 to 0.004),  $P=0.04$ ) were significantly associated with better outcome for PUFA supplementation. Additional sensitivity analyses were performed. In conclusion, present meta-analysis suggested a beneficial overall effect of omega-3 PUFA supplementation in MDD patients, especially for higher doses of EPA and in participants taking antidepressants.

Future precision medicine trials should establish whether possible interactions between EPA and antidepressants could provide targets to improve antidepressant response and its prediction. Furthermore, potential long-term biochemical side effects of high-dosed add-on EPA supplementation should be carefully monitored.

PMID: 26978738