

## ABSTRACTS

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## 2. LBP

### Out of pocket spending for LBP

#### **Out-of-Pocket Expenditures on Complementary Health Approaches Associated with Painful Health Conditions in a Nationally Representative Adult Sample**

Richard L. Nahin, Ph.D., M.P.H. Barbara J. Stussman, B.A Patricia M. Herman, N.D., Ph.D.

##### Highlights

- Many adults in the United States use complementary approaches to manage their pain
- In 2007, U.S. adults spent \$14.9 billion out-of-pocket (OOP) for this reason
- \$7.5 billion OOP was spent on visits to providers, e.g., chiropractors, acupuncturists
- \$5.2 billion OOP was spent for nonvitamin, nonmineral dietary supplements
- Costs are comparable to those seen for OOP expenditures on conventional care.

##### Abstract

National surveys suggest that millions of adults in the United States use complementary health approaches such as acupuncture, chiropractic manipulation, and herbal medicines to manage painful conditions such as arthritis, back pain and fibromyalgia. Yet, national and per person out-of-pocket (OOP) costs attributable to this condition-specific use are unknown. In the 2007 National Health Interview Survey, use of complementary health approaches, reasons for this use, and associated OOP costs were captured in a nationally representative sample of 5,467 adults. Ordinary least square regression models that controlled for co-morbid conditions were used to estimate aggregate and per person OOP costs associated with 14 painful health conditions. Individuals using complementary approaches spent a total of \$14.9 billion (S.E. \$0.9 billion) OOP on these approaches to manage these painful conditions. Total OOP expenditures seen in those using complementary approaches for their back pain (\$8.7 billion, S.E. \$0.8 billion) far outstripped that of any other condition, with the majority of these costs (\$4.7 billion, S.E. \$0.4 billion) resulting from visits to complementary providers. Annual condition-specific per-person OOP costs varied from a low of \$568 (SE \$144) for regular headaches, to a high of \$895 (SE \$163) for fibromyalgia.

##### Perspective

Adults in the United States spent \$14.9 billion OOP on complementary health approaches (e.g., acupuncture, chiropractic, herbal medicines) to manage painful conditions including back pain (\$8.7 billion). This back pain estimate is almost 1/3rd of total conventional healthcare expenditures for back pain (\$30.4 billion) and 2/3rds higher than conventional OOP expenditures (\$5.1 billion).

Keywords: Complementary and Alternative Medicine, out-of-pocket costs, expenditures, back pain, chronic pain

### Combined movement and MT

#### **Computer-aided combined movement examination of the lumbar spine and manual therapy implications: Case report**

A.P. Monie C.J. Barrett R.I. Price C.R.P. Lind K.P. Singer

##### Highlights

- Two cases of non-specific, mechanical low back pain were assessed.
- Combined movement examination of the low back was used as an objective measure.
- Both cases of low back pain were treated using manual therapy, guided by combined movement examination.
- Combined movement examination normal reference ranges and validated self-reports were used as outcome measures.
- Both cases demonstrated marked clinical improvements across all outcome measures.

##### Abstract

Combined movement examination (CME) of the lumbar spine has been recommended for clinical examination as it confers information about mechanical pain patterns. However, little quantitative study has been undertaken to validate its use in manual therapy practice.

This study used computer aided CME to develop a normal reference range, and to guide provisional diagnosis and management. Two cases were assessed, before and after manual therapy using CME, a pain Visual Analogue Scale, the Roland Morris Low Back Pain and Disability Questionnaire and the Short Form (SF-12) Health Survey. Diagnosis and management were guided by comparing each CME pattern with the age and gender matched reference range. Self-reports data and CME total change scores were markedly improved for both cases, particularly for the most painful and restricted CME directions.

This report describes how computer-aided CME and a normal reference range may be used objectively to inform a diagnosis and as an outcome measure in cases of mechanical LBP. Future investigations of cases with specific lumbar pathologies are required to validate this concept.

Keywords: Lumbar spine, Low back pain, Combined movement examination, Lumbar movement, Manual therapy

**Laterality in LBP****Laterality judgments in people with low back pain – A cross-sectional observational and test–retest reliability study**

Martin Linder Peter Michaelson Ulrik Røijezon

**Highlights**

- Laterality judgment performance was compared between people with LBP and controls.
- Tests were administered in a clinic and then twice unsupervised in a home setting.
- No impairment of laterality judgment ability was found in LBP on group level.
- Measures of reliability indicated moderate ICC and wide CI especially for trunk ACC.
- Significant learning effects were evident in tests of laterality judgment ability.

**Abstract****Background**

Disruption of cortical representation, or body schema, has been indicated as a factor in the persistence and recurrence of low back pain (LBP). This has been observed through impaired laterality judgment ability and it has been suggested that this ability is affected in a spatial rather than anatomical manner.

**Objectives**

We compared laterality judgment performance of foot and trunk movements between people with LBP with or without leg pain and healthy controls, and investigated associations between test performance and pain. We also assessed the test–retest reliability of the Recognise Online™ software when used in a clinical and a home setting.

**Design**

Cross-sectional observational and test–retest study.

**Methods**

Thirty individuals with LBP and 30 healthy controls performed judgment tests of foot and trunk laterality once supervised in a clinic and twice at home.

**Results**

No statistically significant group differences were found. LBP intensity was negatively related to trunk laterality accuracy ( $p = 0.019$ ). Intraclass correlation values ranged from 0.51 to 0.91. Reaction time improved significantly between test occasions while accuracy did not.

**Conclusions**

Laterality judgments were not impaired in subjects with LBP compared to controls. Further research may clarify the relationship between pain mechanisms in LBP and laterality judgment ability. Reliability values were mostly acceptable, with wide and low confidence intervals, suggesting test–retest reliability for Recognise Online™ could be questioned in this trial. A significant learning effect was observed which should be considered in clinical and research application of the test.

**Keywords:** Low back pain, Body schema, Sensorimotor cortex, Psychomotor performance

### 3. DISC

#### Advances

#### Advances in biological therapy for nucleus pulposus regeneration

Priyanka Priyadarshani Yongchao Li Li Yao, Ph.D

##### Abstract

##### Objective

The intervertebral disc is composed of the external annulus fibrosus and the inner gel-like center, the nucleus pulposus (NP). The elastic NP can function to relieve stress and maintain intervertebral disc function by distributing hydraulic pressure evenly to annulus and endplate. Degeneration of the NP, which leads to increased death of NP cells, the loss of proteoglycan, and aberrant gene expression, may result in an overall alteration of the biomechanics of the spinal column and cause low back pain. Recent advances in biological therapy strategies that target therapy at the regeneration of degenerated and damaged NP have been investigated in in vitro and in vivo studies and demonstrated promising outcomes. In this article, we review recent studies of biological approaches for NP regeneration.

##### Method

The articles regarding NP regeneration using biomaterials, stem cells, and gene vectors were identified in PubMed databases.

##### Results

Stem cell-mediated cell therapy demonstrates the potential to restore the function and structure of the NP. The viral or non-viral vectors encoding functional genes may generate a therapeutic effect when they are introduced into grafted cells or native cells in the NP. Biomaterial scaffolds generate an initial permissive environment for cell growth and allow the remodeling of scaffolds in the regeneration process. Biomaterial scaffolds provide structural support for NP regeneration and serve as a carrier for stem cell and gene vector delivery.

##### Conclusion

Though recent studies advance the body of knowledge needed to treat degenerated discs, many challenges need to be overcome before the application of these approaches can be successful clinically.

##### Keywords:

Nucleus pulposus, biomaterial, stem cell, gene therapy

**Vascular displacement**

Eur Spine J. 2015 Aug 18.

**The occurrence of vascular displacement into intervertebral disc space following the compensated sagittal imbalance of the spine: a case report and review of literature.**

Lee JH<sup>1</sup>, Chaichankul C, Kang KC, Lee HH.  
Author information

## Abstract

**BACKGROUND:**

It is known that sagittal compensating mechanisms are created for counteracting sagittal imbalance problems; however, they can sometimes be associated with incidents which affect the plan of management.

**PURPOSE:**

The purpose of this study was to report a case of the occurrence of common iliac vessel displacement into the intervertebral disc space following one of the spinal compensatory mechanisms.

**MATERIAL AND METHODS:**

The authors demonstrated this case by showing the patient history, physical examination, imaging studies, and treatment strategy as well as by reviewing some related literature.

**RESULTS:**

An 81-year-old woman presented with a long history of low back pain with claudication. An upright plain radiograph and flexion-extension study demonstrated a progressive local thoracolumbar kyphosis and losing of lumbar lordosis with significant widening of the intervertebral disc space of L4-L5. An MRI scan and 3D volume rendering spiral computed tomography (3D-CT) revealed an abnormal content which was depicted as common iliac vessels inside the disc space of L4-L5. Consequently, a rare case of the occurrence of common iliac vessel displacement into the intervertebral disc space following one of the spinal compensatory mechanisms was reported.

**CONCLUSION:**

The occurrence of vascular displacement into the intervertebral disc space related to lumbar hyperextension, as a compensating mechanism, is a rare incident but can occur. Consequently, when this mechanism presents with abnormal widening of the intervertebral disc space, especially at the low lumbar level, it should raise surgeon's concern about the probability of vascular injury when performing a disc procedure. Thorough investigation with imaging studies and selecting the optimum surgical treatment are warranted.

PMID: 26281982

**Nutrition through dynamic loading**

Spine (Phila Pa 1976). 2015 Aug 1;40(15):1158-64. doi: 10.1097/BRS.0000000000001012.

**ISSLS Prize Winner: Dynamic Loading-Induced Convective Transport Enhances Intervertebral Disc Nutrition.**

Gullbrand SE<sup>1</sup>, Peterson J, Ahlborn J, Mastropolo R, Fricker A, Roberts TT, Abousayed M, Lawrence JP, Glennon JC, Ledet EH.

Author information

Abstract

***STUDY DESIGN:***

Experimental animal study of convective transport in the intervertebral disc.

***OBJECTIVE:***

To quantify the effects of mechanical loading rate on net transport into the healthy and degenerative intervertebral disc in vivo.

***SUMMARY OF BACKGROUND DATA:***

Intervertebral disc degeneration is linked with a reduction in transport to the avascular disc. Enhancing disc nutrition is, therefore, a potential strategy to slow or reverse the degenerative cascade. Convection induced by mechanical loading is a potential mechanism to augment diffusion of small molecules into the disc.

***METHODS:***

Skeletally mature New Zealand white rabbits with healthy discs and discs degenerated via needle puncture were subjected to low rate axial compression and distraction loading for 2.5, 5, 10, 15, or 20 minutes after a bolus administration of gadodiamide. Additional animals with healthy discs were subjected to high-rate loading for 10 minutes or no loading for 10 minutes. Transport into the disc for each loading regimen was quantified using post-contrast-enhanced magnetic resonance imaging.

***RESULTS:***

Low-rate loading resulted in the rapid uptake and clearance of gadodiamide in the disc. Low-rate loading increased net transport into the nucleus by a mean 16.8% and 12.6% in healthy and degenerative discs, respectively. The kinetics of small molecule uptake and clearance were accelerated in both healthy and degenerative discs with low-rate loading. In contrast, high-rate loading reduced transport into nucleus by a mean 16.8%.

***CONCLUSION:***

These results illustrate that trans-endplate diffusion can be enhanced by forced convection in both healthy and degenerative discs in vivo. Mechanical loading-induced convection could offer therapeutic benefit for degenerated discs by enhancing uptake of nutrients and clearance of by-products.

***LEVEL OF EVIDENCE: 4.***

PMID: 26222661

## Inflammation and fatty infiltrate in discs

### Inflammatory and fatty lesions in the spine and sacroiliac joints on whole-body MRI in early axial spondyloarthritis- 3 year data of the ESTHER trial

In-Ho Song Kay-Geert A Hermann Hildrun Haibel Christian E Althoff Denis Poddubnyy Joachim Listing Anja Weiß Bruce Freundlich Ekkehard Lange Martin Rudwaleit Joachim Sieper

#### Objective

To assess the relationship between active inflammation and development of chronic lesions in the spine and sacroiliac (SI)-joints on MRI in early axial spondyloarthritis (SpA) during treatment with etanercept.

#### Methods

Here we analysed the 41 patients of the ESTHER trial who were treated with etanercept over 3 continuous years and of whom MRIs were available for baseline, year 2 and year 3. MRIs were scored for active inflammation (STIR-sequences) and chronic changes (T1 sequence) such as fatty lesions, erosions and ankylosis in the SI- joints and spinal vertebral units (VUs).

#### Results

The mean fatty lesion scores increased between baseline and year 2 both in the spine (1.13 at baseline vs. 1.40 at year 2,  $p=0.0254$ ) and in the SI-joints (4.76 at baseline vs. 5.46 at year 2,  $p=0.27$ ), but we found no further increase of the fatty lesion score between years 2 and 3. New fatty lesions at years 2 and 3 developed nearly exclusively in SI-joint quadrants and VUs in which active MRI inflammation was present at baseline. Fatty lesions disappeared only in 3 SI-joint quadrants and in none of VUs at years 2 and 3. Erosion and ankylosis scores remained unchanged.

#### Conclusion

Our data indicate a relationship between presence of active MRI inflammation and new development of fatty lesions. Furthermore, there was no increase of fatty lesions during continuous treatment of axial SpA patients with etanercept after successful suppression of active inflammation. Whether this is predictive of stopping radiographic progression needs to be further investigated.

#### Significance and Innovations

- This is the first study prospectively following inflammatory lesions including fatty lesions on MRI of spine and sacroiliac joints of patients with early axial SpA treated over 3 years of continuous treatment with a TNF-inhibitor
- No further increase of fatty lesions between year 2 and year 3 was found in early axial SpA patients treated continuously with etanercept
- Our data indicate a strong relationship between presence of active MRI inflammation and new development of fatty lesions.
- Whether this is predictive of stopping radiographic progression needs to be further investigated.

#### Keywords:

Ankylosing spondylitis, axial spondyloarthritis, magnetic resonance imaging, radiographic progression, TNFalpha-blocker



**Bacteria in disc herniation**

Eur Spine J. 2015 Aug 19.

**Relationship between annular tear and presence of Propionibacterium acnes in lumbar intervertebral disc.**

Zhou Z<sup>1</sup>, Chen Z, Zheng Y, Cao P, Liang Y, Zhang X, Wu W, Xiao J, Qiu S.  
Author information

Abstract

**PURPOSE:**

Propionibacterium acnes (*P. acnes*) in the intervertebral disc may result in low back pain. The purpose of this study was to determine how *P. acnes* accesses the disc.

**METHODS:**

Patients with low back pain and/or sciatica were examined using X-ray and MRI before surgery. The intervertebral disc space height was measured on X-ray image. Disc and muscle samples were obtained from 46 patients undergoing discectomy at the lumbar spine. The tear of annulus was inspected before discectomy. In the disc and muscle tissue cultures, 16S rDNA gene specific for *P. acnes* was examined using PCR.

**RESULTS:**

The discs from 11 (23.9 %) patients were identified as 16S rDNA positive, in which two patients also had 16S rDNA in their muscles. 16S rDNA gene was significantly more likely to appear in the discs with annular tear than those without tear ( $P < 0.05$ ). The disc space height was significantly decreased when the disc contained *P. acnes*.

**CONCLUSION:**

*P. acnes* is significantly more likely to be present in herniated discs with an annular tear than in herniated discs without such a tear. Since in the vast majority of these cases, no *P. acnes* was found in control muscle samples, a true infection with *P. acnes* is far more likely than a contamination.

PMID:26287263

## PRP and disc

Eur Spine J. 2015 Aug 14.

**What is the preclinical evidence on platelet rich plasma and intervertebral disc degeneration?**

Formica M<sup>1</sup>, Cavagnaro L, Formica C, Mastrogiacomo M, Basso M, Di Martino A.  
Author information

## Abstract

**PURPOSE:**

Intervertebral disc degeneration is a common disease that usually starts from the third decade of life and it represents a significant cause of socio-economic problems. The accepted surgical treatment for disc degeneration is disc removal and vertebral fusion or, in selected cases, intervertebral disc arthroplasty. Several studies have demonstrated the ability of platelet rich plasma (PRP) to stimulate cell proliferation and extracellular matrix regeneration. However, literature results are still limited and more studies are required to clarify the role of PRP in the prevention or in the treatment of degenerative disc disease. The aim of this review is to summarize and critically analyze the current preclinical evidence about the use of PRP in intervertebral disc degeneration.

**METHODS:**

Literature search was performed through various combinations of the following keywords: Intervertebral Disc Degeneration, Platelet Rich Plasma, PRP, Intervertebral disc regeneration. Papers included in our review cover the period between 2006 and 2014. The PRISMA 2009 checklist was followed.

**RESULTS:**

At the end of the review process, 12 articles were included in our final manuscript, including 6 "in vitro" and 6 "in vivo" studies. All the included studies lead to positive preclinical results. No standardization of methodological analysis was observed.

**CONCLUSION:**

It is not possible to draw definitive evidence about the use of PRP in IVD regeneration. We advise a proper standardization of the methodological analysis in order to compare the available data and achieve definitive results. This should be the cornerstone for future clinical applications.

PMID:26272374

**Factors of disc DJD**

Eur Spine J. 2015 Aug 11.

**Interplay between low plasma RANKL and VDR-FokI polymorphism in lumbar disc herniation independently from age, body mass, and environmental factors: a case-control study in the Italian population.**

Sansoni V<sup>1</sup>, Perego S, Colombini A, Banfi G, Brayda-Bruno M, Lombardi G.  
Author information

## Abstract

**PURPOSE:**

Aim of this study was to investigate RANKL and osteoprotegerin plasma concentrations in patients affected by disc herniation, the most common epiphenomenon of disc degenerative diseases, and in a matched cohort of healthy subjects and whether the expression of these markers was associated to a polymorphism of the vitamin D receptor gene.

**METHODS:**

For this case-control study, 110 consecutive cases affected by lumbar disc herniation (confirmed by MRI) and 110 healthy age- and sex-matched controls were enrolled. Subjects affected by any other pathology were excluded. RANKL and osteoprotegerin were measured in plasma by immunoassays. The difference in these markers between cases and controls was assessed by t test. The correlation between osteoimmunological markers concentrations, anthropometrical variables, and the expression of the pathology was statistically assessed (Pearson's test) along with the association (Fisher's exact test) with the vitamin D receptor gene genotype, determined elsewhere.

**RESULTS:**

Despite comparable osteoprotegerin concentrations, cases, altogether or grouped for gender, express lower RANKL and, consequently, RANKL-to-osteoprotegerin ratio. While in cases RANKL and osteoprotegerin concentrations were independent from age and BMI, in controls they increased with age. Disc herniation was strongly associated with RANKL and the presence of the F allele of the VDR gene.

**CONCLUSIONS:**

Whether vertebral bone changes precede or follow cartilage deterioration in intervertebral disc degeneration is not known. Our results suggest a reduced bone turnover rate, associated to a specific genetic background, in patients affected by lumbar disc herniation which could be one of the favoring factors for disc degeneration.

PMID: 26261013

## 4. INJECTIONS

### Epidurals for radiculopathy – successful

Ann Intern Med. 2015 Sep 1;163(5):373-81. doi: 10.7326/M15-0934.

#### **Epidural Corticosteroid Injections for Radiculopathy and Spinal Stenosis: A Systematic Review and Meta-analysis.**

Chou R, Hashimoto R, Friedly J, Fu R, Bougatsos C, Dana T, Sullivan SD, Jarvik J.

Abstract

**BACKGROUND:** Use of epidural corticosteroid injections is increasing.

**PURPOSE:** To review evidence on the benefits and harms of epidural corticosteroid injections in adults with radicular low back pain or spinal stenosis of any duration.

**DATA SOURCES:** Ovid MEDLINE (through May 2015), Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, prior systematic reviews, and reference lists.

**STUDY SELECTION:** Randomized trials of epidural corticosteroid injections versus placebo interventions, or that compared epidural injection techniques, corticosteroids, or doses.

**DATA EXTRACTION:** Dual extraction and quality assessment of individual studies, which were used to determine the overall strength of evidence (SOE).

**DATA SYNTHESIS:** 30 placebo-controlled trials evaluated epidural corticosteroid injections for radiculopathy, and 8 trials were done for spinal stenosis. For radiculopathy, epidural corticosteroids were associated with greater immediate-term reduction in pain (weighted mean difference on a scale of 0 to 100, -7.55 [95% CI, -11.4 to -3.74]; SOE, moderate), function (standardized mean difference after exclusion of an outlier trial, -0.33 [CI, -0.56 to -0.09]; SOE, low), and short-term surgery risk (relative risk, 0.62 [CI, 0.41 to 0.92]; SOE, low). Effects were below predefined minimum clinically important difference thresholds, and there were no longer-term benefits. Limited evidence showed no clear effects of technical factors, patient characteristics, or comparator interventions on estimates. There were no clear effects of epidural corticosteroid injections for spinal stenosis (SOE, low to moderate). Serious harms were rare, but harms reporting was suboptimal (SOE, low).

**LIMITATIONS:** The review was restricted to English-language studies. Some meta-analyses were based on small numbers of trials (particularly for spinal stenosis), and most trials had methodological shortcomings.

**CONCLUSION:** Epidural corticosteroid injections for radiculopathy were associated with immediate reductions in pain and function. However, benefits were small and not sustained, and there was no effect on long-term surgery risk. Limited evidence suggested no effectiveness for spinal stenosis.

PMID: 26302454

## 5. SURGERY

### Fusion and adjacent levels/factors

Eur Spine J. 2015 Aug 14.

#### **Risk factors for adjacent segment pathology requiring additional surgery after single-level spinal fusion: impact of pre-existing spinal stenosis demonstrated by preoperative myelography.**

Yugué I<sup>1</sup>, Okada S, Masuda M, Ueta T, Maeda T, Shiba K.  
Author information

Abstract

#### **PURPOSE:**

We determined the incidence of and risk factors for clinical adjacent segment pathology (C-ASP) requiring additional surgeries among patients previously treated with one-segment lumbar decompression and fusion surgery.

#### **METHODS:**

We retrospectively analysed 161 consecutive patients who underwent one-segment lumbar decompression and fusion surgery for L4 degenerative spondylolisthesis. Patient age, sex, body mass index (BMI), facet orientation and tropism, laminar inclination angle, spinal canal stenosis ratio [on myelography and magnetic resonance imaging (MRI)], preoperative adjacent segment instability, arthrodesis type, pseudarthrosis, segmental lordosis at L4-5, and the present L4 slip were evaluated by a log-rank test using the Kaplan-Meier method. A multivariate Cox proportional-hazards model was used to analyse all factors found significant by the log-rank test.

#### **RESULTS:**

Of 161 patients, 22 patients (13.7 %) had additional surgeries at cranial segments located adjacent to the index surgery's location. Pre-existing canal stenosis  $\geq 47$  % at the adjacent segment on myelography, greater facet tropism, and high BMI were significant risk factors for C-ASP. The estimated incidences at 10 years postoperatively for each of these factors were 51.3, 39.6, and 32.5 %, and the risks for C-ASP were 4.9, 3.7, and, 3.1 times higher than their counterparts, respectively. Notably, spinal canal stenosis on myelography, but not on MRI, was found to be a significant risk factor for C-ASP (log-rank test  $P < 0.0001$  and 0.299, respectively).

#### **CONCLUSIONS:**

Pre-existing spinal stenosis, greater facet tropism, and higher BMI significantly increased C-ASP risk. Myelography is a more accurate method for detecting latent spinal canal stenosis as a risk factor for C-ASP.

PMID: 26272373

## Fusion and adjacent level DJD

Eur Spine J. 2015 Aug 13.

**Symptomatic adjacent segment degeneration at the L3-4 level after fusion surgery at the L4-5 level: evaluation of the risk factors and 10-year incidence.**

Heo Y<sup>1</sup>, Park JH, Seong HY, Lee YS, Jeon SR, Rhim SC, Roh SW.  
Author information

## Abstract

**PURPOSE:** There have been few studies on revision surgery for clinically symptomatic adjacent segment degeneration (CASD). We aimed to find the incidence of revision surgery due to CASD and to analyze the factors that affected CASD at the L3-4 level after L4-5 or L4-5-S1 level fusion surgery over a long-term follow-up period.

**METHODS:** Between January 2001 and October 2009, fusion surgeries were performed on 401 patients with spondylolisthesis at the L4-5 or L4-5-S1 level; 378 patients were followed up for a minimum of 2 years. We assessed CASD-free survival using Kaplan-Meier survival analysis. We also analyzed factors affecting the development of CASD, including sex, age, pelvic incidence, overall lordosis, segmental lordosis, lamina inclination angle, facet tropism, and the extent of disc and facet degeneration. Isthmic spondylolisthesis treated using total laminectomy or degenerative spondylolisthesis treated using subtotal laminectomy and interbody fusion (IBF) or posterolateral fusion (PLF) were also included in the risk factor analysis. The difference in disc height before and after initial surgery was also analyzed, as was inclusion of the sacrum in the fusion level.

**RESULTS:** Fusion extension surgery was performed on 33 of these patients due to CASD at the L3-4 level during the follow-up period. Kaplan-Meier survival analysis indicated 3-, 5-, and 10-year disease-free survival rates of 99.20, 96.71, and 76.93 %. Statistically significant factors affecting CASD included old age, low overall lordosis, low segmental lordosis, progression of facet degeneration, total laminectomy-treated isthmic spondylolisthesis, and PLF-alone rather than IBF alone or IBF + PLF.

**CONCLUSION:** We determined six significant factors affecting CASD development. Among these risk factors, facet degeneration, isthmic-type spondylolisthesis, and the type of fusion show higher hazard ratios and seem to be clinically more relevant than the other three factors (age, overall lordosis, and segmental lordosis).

PMID: 26266771

## 6. PELVIC GIRDLE

### Innominate motions

#### **Innominate movement patterns, rotation trends and range of motion in individuals with low back pain of sacroiliac joint origin**

Divya Bharatkumar Adhia Stephan Milosavljevic1 Steve Tumilty Melanie D. Bussey

DOI: <http://dx.doi.org/10.1016/j.math.2015.06.004>

#### Highlights

- Innominate kinematics comparison between SIJ-positive & SIJ-negative individuals.
- SIJ pain individuals predominantly exhibit unilateral innominate movement patterns.
- SIJ pain individuals exhibit significantly different innominate trends of rotation.
- No significant between-group differences in innominate ranges of motion.
- Demonstrates association between innominate kinematic anomalies and SIJ pain.

#### Abstract

##### Background

Innominate kinematic anomalies resulting in low back pain (LBP) of sacroiliac joint (SIJ) origin (SIJ-positive), has always been a topic of contention, owing to difficulty in its evaluation. Recent technique of electromagnetic palpation-digitization has been able to accurately quantify innominate kinematics in healthy individuals.

##### Objectives

The purpose of this study is to determine if participants with LBP of SIJ origin (SIJ-positive) demonstrate significantly different innominate kinematics than participants with LBP of non-SIJ origin (SIJ-negative).

##### Design

Single-blinded cross-sectional case-control study.

##### Method

Participants [n(122)] between the ages of 18 to 50 years, suffering from chronic non-specific LBP ( $\geq 3$  months) volunteered in the study. An experienced musculoskeletal physiotherapist evaluated and classified participants into either SIJ-positive [n(45)] or SIJ-negative [n(77)] group, using the reference standard pain provocation tests [ $\geq 3$  positive tests = SIJ-positive]. A research physiotherapist, blinded to clinical groups, conducted the innominate kinematic testing using a valid and reliable electromagnetic palpation-digitization technique, during prone lying incremental hip abduction-external rotation test positions.

##### Results

The results of the mixed model regression analyses demonstrated that SIJ-positive participants exhibited significantly different innominate movement patterns and trends of rotation, but not innominate ranges of motion, when compared with SIJ-negative LBP participants.

##### Conclusions

These findings demonstrate association between SIJ pain and altered innominate kinematics, and have led the groundwork for further exploration of clinical measurement, relevance, and management of these potentially important movement observations.

Keywords: Sacroiliac joint, Low back pain, Biomechanics, Range of motion

**Innominate motions in weight bearing**

Clin Biomech (Bristol, Avon). 2004 Jun;19(5):456-64.

**Altered patterns of pelvic bone motion determined in subjects with posterior pelvic pain using skin markers.**

Hungerford B<sup>1</sup>, Gilleard W, Lee D.  
Author information

## Abstract

**OBJECTIVE:** To determine whether the pattern of pelvic bone motion, determined by skin markers, differs between control subjects and subjects with posterior pelvic pain.

**DESIGN:** Cross-sectional study of three-dimensional angular and translational motion of the innominates relative to the sacrum in two subject groups.

**BACKGROUND:** Comparative in vivo analysis of the 3D patterning of pelvic motion in subjects with posterior pelvic pain and controls is limited.

**METHODS:** Fourteen males with posterior pelvic pain and healthy age and height matched controls were studied. A 6-camera motion analysis system was used to determine 3D angular and translational motion of pelvic skin markers during standing hip flexion.

**RESULTS:** Posterior rotation of the innominate occurred with hip flexion in control subjects and pelvic pain subjects as previously reported in the literature. On the supporting leg, the innominate rotated posteriorly in controls and anteriorly in symptomatic subjects.

**CONCLUSION:** Posterior rotation of the innominate, as measured using skin markers during weight bearing in controls may reflect activation of optimal lumbo-pelvic stabilisation strategies for load transfer. Anterior rotation occurred in symptomatic subjects, suggesting failure to stabilise intra-pelvic motion for load transfer.

**RELEVANCE:** This study found that posterior rotation of the innominate occurred during weight bearing in controls. This movement pattern is thought to optimise stability of the pelvic girdle during increased loading. Conversely, anterior rotation occurred in symptomatic subjects during weight bearing. This is a non-optimal pattern and may indicate abnormal articular or neuromyofascial function during increased vertical loading through the pelvis.

PMID: 15182980



## Hip ext and ext rot for detecting SI Pain

### Can hip abduction and external rotation discriminate sacroiliac joint pain?

Divya Bharatkumar Adhia Steve Tumilty Ramakrishnan Mani Stephan Milosavljevic<sup>1</sup> Melanie D. Bussey

DOI: <http://dx.doi.org/10.1016/j.math.2015.08.002>

#### Highlights

- Hip abduction-external rotation reproduces familiar pain in SIJ +ve LBP individuals.
- Moderate levels of sensitivity and specificity for discriminating LBP of SIJ origin.
- $\geq 30^\circ$  of HABER test positions demonstrates highest sensitivity and specificity.

#### Abstract

##### Aim

The primary aim of the study is to determine if Hip Abduction and External Rotation (HABER) test is capable of reproducing familiar pain in individuals with low back pain (LBP) of sacroiliac joint (SIJ) origin (SIJ-positive) when compared with LBP of Non-SIJ origin (SIJ-negative). If so, the secondary aim is to determine the diagnostic accuracy of HABER test against the reference standard of pain provocation tests, and to determine which increments of the HABER test has highest sensitivity and specificity for identifying SIJ-positive individuals.

##### Design

Single-blinded diagnostic accuracy study.

##### Method

Participants [n(122)] between ages of 18–50 y, suffering from chronic non-specific LBP ( $\geq 3$  months) volunteered in the study. An experienced musculoskeletal physiotherapist evaluated and classified participants into either SIJ-positive [n(45)] or SIJ-negative [n(77)], based on reference standard of pain provocation tests [ $\geq 3$  positive tests = SIJ-positive]. Another musculoskeletal physiotherapist, blinded to clinical groups, evaluated participants for reproduction of familiar pain during each increment ( $10^\circ$ ,  $20^\circ$ ,  $30^\circ$ ,  $40^\circ$ , and  $50^\circ$ ) of HABER test.

##### Results

The HABER test reproduced familiar pain in SIJ-positive individuals when compared with SIJ-negative individuals [ $p(0.001)$ ,  $R^2(0.38)$ ,  $\text{Exp}(\beta)(5.95-10.32)$ ], and demonstrated moderate level of sensitivity (67%–78%) and specificity (71%–72%) for identifying SIJ-positive individuals. Receiver operator curve analysis demonstrated that the HABER increments of  $\geq 30^\circ$  have the highest sensitivity (83%–100%) and specificity (52%–64%).

##### Conclusions

The HABER test is capable of reproducing familiar pain in SIJ-positive LBP individuals and has moderate levels of sensitivity and specificity for identifying SIJ-positive LBP individuals.

##### Keywords:

Sacroiliac joint, Clinical tests, Sensitivity, Specificity

**7. PELVIC ORGANS/WOMAN'S HEALTH**

Tethered cord syndrome and perineal pain  
Childs Nerv Syst. 2015 Aug 18.

**Perineal pain secondary to tethered cord syndrome: retrospective review of single institution experience.**

Robbins JW<sup>1</sup>, Lundy PA, Gard AP, Puccioni MJ.  
Author information

Abstract

**OBJECT:**

Tethered cord syndrome (TCS) encompasses a spectrum of neurological dysfunction related to excessive tension on the distal spinal cord resulting in anatomic deformation and metabolic disturbance. Symptoms typically manifest as back/leg pain, neurogenic bladder dysfunction, constipation, sphincter abnormalities, and scoliosis. To date, among the least well-described symptoms of TCS is pain or hypersensitivity in the perineal region. The authors reviewed their experience with spinal cord detethering to identify and further characterize those who present with perineal pain or hypersensitivity.

**METHODS:**

Cases of spinal cord detethering at a single institution were retrospectively reviewed. Patients were initially identified by procedural codes. Cases were reviewed for presenting symptoms, specifically perineal pain or hypersensitivity. Magnetic resonance image (MRI) findings, clinical outcome, and length of follow-up were also noted.

**RESULTS:**

Of the 491 patients identified, seven patients (1.4 %) were identified as having preoperative perineal pain or hypersensitivity. All of these patients had complete resolution of perineal pain/hypersensitivity at the time of last follow-up. Furthermore, five (71 %) of these patients experienced resolution of all initial symptoms.

**CONCLUSION:**

Perineal pain or hypersensitivity can be an important symptom of spinal cord tethering. Spinal cord detethering may result in a good outcome and relief of perineal pain or hypersensitivity.

PMID:26280630

**Endometriosis and chronic pain****Gynecologic Endocrinology And Reproductive Medicine**

Archives of Gynecology and Obstetrics

First online: 02 September 2015

**Association between chronic pelvic pain symptoms and the presence of endometriosis**

Nikolaos V. Apostolopoulos Krystallenia I. Alexandraki Anwen Gorry Adeyemi Coker

Top of Form

**Abstract****Purpose**

The link between endometriosis and the presence or intensity of pain is controversial. The aim of the present study was to assess the relationship between chronic pelvic pain (CPP) and severity of endometriosis and the effectiveness of laparoscopic treatment in a 6-month follow-up.

**Methods**

Prospective observational study in a referral unit. 144 women had laparoscopy to investigate CPP. Symptoms were assessed by a 10-point visual analog scale. The main outcome measure was the frequency and intensity of CPP.

**Results**

No difference in pain was found between women with and without endometriosis. Advanced endometriosis was associated with dysmenorrhea, deep endometriosis with dyspareunia and rectovaginal disease with dyschezia. Laparoscopic treatment improves symptoms.

**Conclusions**

Women with severe endometriosis are more likely to report severe dysmenorrhoea. Furthermore location of endometriosis in the rectovaginal space is associated with dyschezia and deep endometriosis with dyspareunia. However, the association between presence and stage of endometriosis and severity of symptoms is marginal.

**Keywords** Endometriosis Dysmenorrhea Chronic pelvic pain Laparoscopy Dyspareunia

**LBP successfully helped with Kinesio tape**

Clin Rehabil. 2015 Aug 27. pii: 0269215515603218.

**The effect of Kinesio taping application for acute non-specific low back pain: A randomized controlled clinical trial.**

Kelle B<sup>1</sup>, Güzel R<sup>2</sup>, Sakallı H<sup>3</sup>.

Author information

**Abstract**

**OBJECTIVE:** To investigate the effect of Kinesio taping application in acute non-specific low back pain.

**DESIGN:** A randomized controlled clinical trial.

**SETTING:** Physical Medicine and Rehabilitation Clinic.

**PARTICIPANTS:** A total of 109 patients with acute low back pain were randomized into either Kinesio taping (n = 54) or control (n = 55) groups.

**INTERVENTION:** The intervention group was treated with information and reassurance plus Kinesio taping, while the control group received merely information and reassurance. All participants were allowed to use as-needed doses of paracetamol. Kinesio tape was applied to the most painful area of the low back for a total of 12 days.

**MAIN OUTCOME MEASURES:** Worst pain and disability were assessed at baseline, after the 12-day intervention, and at four weeks follow-up. During the first 12 days, participants filled in a pain diary consisting of a numeric rating scale and recorded the number of paracetamol tablets consumed daily. Disability was assessed with the Oswestry Disability Index.

**RESULTS:** After 12 days of intervention, pain intensity and the Oswestry Disability Index improved significantly in both groups; the improvements were significantly superior in the Kinesio taping group (p = 0.003, p = 0.011). The Kinesio taping group reached pain control earlier (sixth day vs. 12th day) and consumed less paracetamol. At the fourth week, although pain intensity was significantly more reduced in the Kinesio taping group (p = 0.015), there were no differences with regard to disability.

**CONCLUSIONS:** Kinesio taping provided significant improvements in pain and disability; thus, it can be used as a complementary method in acute non-specific low back pain.

**KEYWORDS:** Acute non-specific low back pain; Kinesio tape; Oswestry Disability Index; numeric rating scale

PMID: 26316553

## Pregnancy/LBP and body image

**Disturbed body perception, reduced sleep, and kinesiophobia in subjects with pregnancy-related persistent lumbopelvic pain and moderate levels of disability: An exploratory study**Darren Beales Alison Lutz Judith Thompson Benedict Martin Wand Peter O'Sullivan DOI: <http://dx.doi.org/10.1016/j.math.2015.04.016>

## Highlights

- This study profiled subjects with pregnancy-related, persistent lumbopelvic pain.
- Those with moderate disability had altered body perception, kinesiophobia and sleep impairment.
- Disability level was not related to mindfulness.

## Abstract

## Background

For a small but significant group, pregnancy-related lumbopelvic pain may become persistent. While multiple factors may contribute to disability in this group, previous studies have not investigated sleep impairments, body perception or mindfulness as potential factors associated with disability post-partum.

## Objectives

To compare women experiencing no pain post-pregnancy with those experiencing pregnancy-related persistent lumbopelvic pain (either low- or high-level disability) across multiple biopsychosocial domains.

## Design

Cross-sectional.

## Methods

Participants completed questionnaires for thorough profiling of factors thought to be important in pregnancy-related lumbopelvic pain. Specific measures were the Urinary Distress Inventory, Medical Outcomes Study Sleep Scale, Back Beliefs Questionnaire, Tampa Scale for Kinesiophobia, Depression Anxiety Stress Scale, Coping Strategies Questionnaire, Pain Catastrophising Scale, The Fremantle Back Awareness Questionnaire and the Mindful Attention Awareness Scale. Women were categorised into three groups; pain free ( $n = 26$ ), mild disability ( $n = 12$ ) and moderate disability ( $n = 12$ ) (based on Oswestry Disability Index scores). Non-parametric group comparisons were used to compare groups across the profiling variables.

## Results

Differences were identified for kinesiophobia ( $p = 0.03$ ), body perception ( $p = 0.02$ ), sleep quantity ( $p < 0.01$ ) and sleep adequacy ( $p = 0.02$ ). Generally subjects in the moderate disability group had more negative findings for these variables.

## Conclusion

Disturbances in body-perception, sleep and elevated kinesiophobia were found in pregnancy-related lumbopelvic pain subjects with moderate disability, factors previously linked to persistent low back pain. The cross-sectional nature of this study does not allow for identification of directional pathways between factors. The results support the consideration of these factors in the assessment and management of pregnancy-related lumbopelvic pain.

Keywords: Pregnancy, Pelvic girdle pain, Fear, Sleep, Body image

**Pregnancy and draw in maneuver****The Immediate Effects on Inter-Rectus Distance of Abdominal Crunch and Drawing in Exercises During Pregnancy and the Postpartum Period**

Authors: Patrícia Mota, PT, PhD1, Augusto Gil Pascoal, PT, PhD1, Ana Isabel Carita, PhD2, Kari Bø, PT, PhD3

Published: Journal of Orthopaedic & Sports Physical Therapy, Ahead of Print Pages: 1-24 doi:10.2519/jospt.2015.5459

**Abstract**

**Study Design** Longitudinal descriptive exploratory study.

**Objectives** To evaluate the immediate effect induced by drawing in and abdominal crunch exercises on inter-rectus distance (IRD) of first time pregnant women measured at 4 time points during pregnancy and in the postpartum period.

**Background** There is scant knowledge on the effect of different abdominal exercises on IRD in pregnant and postpartum women.

**Methods** The study included 84 primiparous participants. Ultrasound images were recorded with a 12 MHz linear transducer at rest and during abdominal drawing in and abdominal crunch exercises, at 3 locations on the linea alba. IRD was measured at 4 time points: gestational weeks 35-41 and 6th to 8th, 12th to 14th, and 24th to 26th weeks postpartum. Separate 2-way repeated measures ANOVA were performed for each exercise (drawing in and abdominal crunch) and each measurement location to evaluate the immediate effects of exercises on IRD at each of the 4 time points. Similarly, 2-way ANOVAs were used to contrast the effects of the 2 exercises on IRD.

**Results** Performing the DI exercise caused a significant change in width of the IRD at the location 2 cm below the umbilicus, narrowing the IRD by a mean (95% CI) of 3.8 mm (1.2, 6.4) at gestational week 35-41 and widening the IRD by 3.0 mm (1.4, 4.6) at 6th to 8th, by 1.8 mm (0.6, 3.1) at 12th to 14th, and by 2.5 mm (1.4, 3.6) at 24th to 26th weeks postpartum ( $P < .01$ ).

Performing the AC exercise led to a significant narrowing of the IRD ( $P < .01$ ) at all 3 locations at all 4 time points, with the exception of 2 cm below the umbilicus at postpartum week 24-26. The average amount of narrowing varied from 1.6 to 20.9 mm, based on time and location.

**Conclusion** Overall, there was a contrasting effect of the 2 exercises, with the abdominal crunch exercise consistently producing a significant narrowing of the IRD. In contrast, the DI exercise generally led to small widening of the IRD. J Orthop Sports Phys Ther, Epub 24 Aug 2015. doi:10.2519/jospt.2015.5459

**Keyword:** abdominals, diastasis recti, ultrasound imaging Read

**Medications and pregnancy**

Obstet Gynecol. 2015 Sep;126(3):465-73. doi: 10.1097/AOG.0000000000000982.

**The Most Commonly Dispensed Prescription Medications Among Pregnant Women Enrolled in the U.S. Medicaid Program.**

Palmsten K<sup>1</sup>, Hernández-Díaz S, Chambers CD, Mogun H, Lai S, Gilmer TP, Huybrechts KF.  
Author information

Abstract

**OBJECTIVE:**

To characterize the 20 most common prescription medications and the 10 most common prescription medications classified in the former U.S. Food and Drug Administration categories D or X dispensed to pregnant women enrolled in the U.S. Medicaid program.

**METHODS:**

We conducted a cohort study of 1,106,757 pregnant women with live births using 2000-2007 Medicaid Analytic eXtract data. We used outpatient pharmacy records to identify medication dispensings and reported the proportion of pregnancies that were dispensed at least one prescription medication. Maternal age and race and ethnicity-stratified estimates were compared using prevalence ratios and 95% confidence intervals (CIs).

**RESULTS:**

During pregnancy, 82.5% of the cohort had a dispensing for one or more prescription medication. The most commonly dispensed medications during pregnancy included nitrofurantoin (21.6%), metronidazole (19.4%), amoxicillin (18.0%), azithromycin (16.9%), and promethazine (13.5%). Proportions were highest among younger women for several medications; eg, nitrofurantoin (23.9% compared with 15.4%; prevalence ratio 1.55, CI 1.52-1.58), metronidazole (20.7% compared with 12.0%; prevalence ratio 1.73, CI 1.69-1.77), and azithromycin (21.1% compared with 11.0%; prevalence ratio 1.93, CI 1.89-1.97) were more common among women younger than 20 years than among women aged 35 years or older. Proportions were highest among white women with some exceptions; eg, compared with white women, metronidazole was more common among black women (29.8% compared with 14.4%; prevalence ratio 2.07, CI 2.05-2.09). Excluding fertility treatments, 42.0% had at least one dispensing for a D or X medication during pregnancy. Codeine (11.9%) and hydrocodone (10.2%) were the most common D medications.

**CONCLUSION:**

Medications used to treat infections were the most commonly dispensed prescription medications. Dispensing of commonly used prescription medications during pregnancy varied by maternal age and race-ethnicity.

**LEVEL OF EVIDENCE: II.**

PMID: 26244530

**Diastasis****Validity of Inter-Rectus Distance Measurement in Postpartum Women Using Extended Field of View Ultrasound Imaging Techniques**

**Authors:** Nadia Keshwani, PT, MSc<sup>1</sup>, Sunita Mathur, BScPT, PhD<sup>2</sup>, Linda McLean, BScPT, PhD<sup>1,3</sup>

Published: *Journal of Orthopaedic & Sports Physical Therapy*, Ahead of Print **Pages:** 1-19  
doi:10.2519/jospt.2015.6143

**Abstract**

**Study Design:** Reliability and validity study.

**Objectives:** To investigate the criterion-related validity and reliability of inter-rectus distance (IRD) measurement using extended field of view (FOV) techniques during ultrasound imaging (USI) in parous women.

**Background:** USI is the gold standard for non-invasive IRD measurement in parous women when investigating diastasis recti, however, its use is limited when IRD is large. Extended FOV techniques (panoramic USI or using acoustic standoff pads) allow complete visualization of the linea alba when the IRD is large and conventional imaging is not sufficient; however, the validity of using these techniques has never been investigated.

**Methods:** Two-dimensional ultrasound images were acquired at the superior umbilical border from 21 women using conventional USI, panoramic USI, and using a standoff pad. Five images were captured using each method. IRD was measured offline. Criterion-related validity was investigated using repeated measures analyses of variance to test for bias, and linear regression, Pearson's correlation coefficients (r), and intraclass correlation coefficients (ICCs) to assess agreement. Standard error of measurement (SEM) for each extended FOV technique was calculated. The between-trial reliability of each technique was determined using ICCs.

**Results:** IRD from images acquired using extended FOV techniques did not differ from those acquired using conventional USI (P=.441). Images acquired using extended FOV techniques were highly correlated with those acquired using conventional imaging ( $r > 0.95$ ,  $P < .0001$ ). The SEM of each extended FOV technique was 0.170 - 0.180 cm. The between-trial reliability of all techniques was excellent ( $ICC_{3,1} > 0.90$ ).

**Conclusion:** Panoramic USI and acoustic standoff pads are valid methods of increasing FOV to measure IRD. In this study, USI measurements were limited to IRDs of less than 3 finger widths based on palpation. *J Orthop Sports Phys Ther*, Epub 24 Aug 2015. doi:10.2519/jospt.2015.6143

**Keyword:** abdominal muscles, diastasis recti, musculoskeletal ultrasound, outcome measures, pregnancy



**Dysmenorrhea and acupuncture****Efficacy of acupuncture versus combined oral contraceptive pill in treatment of moderate-to-severe dysmenorrhea: A randomized controlled trial**

Evidence-based Complementary and Alternative Medicine , 08/21/2015 Sriprasert I, et al.

This open-label randomized controlled trial was designed to compare the efficacy of acupuncture and combined oral contraceptive (COC) pill in treating moderate-to-severe primary dysmenorrhea. Acupuncture is an alternative option for relieving dysmenorrhea, especially when COC is not a favorable choice.

- Fifty-two participants were randomly assigned to receive either acupuncture (n = 27) or COC (n = 25) for three menstrual cycles.
- Mefenamic acid was prescribed as a rescue analgesic drug with both groups.
- The statistical approach used for efficacy and safety assessments was intention-to-treat analysis.
- By the end of the study, both treatments had resulted in significant improvement over baselines in all outcomes, that is, maximal dysmenorrhea pain scores, days suffering from dysmenorrhea, amount of rescue analgesic used, and quality of life assessed by SF-36 questionnaire.
- Over the three treatment cycles, COC caused greater reduction in maximal pain scores than acupuncture, while improvements in the remaining outcomes were comparable.
- Responders were defined as participants whose maximal dysmenorrhea pain scores decreased at least 33% below their baseline.
- Response rates following both interventions at the end of the study were not statistically different.
- Acupuncture commonly caused minimal local side effects but did not cause any hormone-related side effects as did COC.

## 8. VISCERA

### Vit D deficiency and diarrhea

Pediatr Int. 2015 Aug 19. doi: 10.1111/ped.12809.

#### Is there a relationship between low vitamin D levels and rotaviral diarrhea?

Bucak IH<sup>1</sup>, Alm Ş H<sup>1</sup>, Çevik MÖ<sup>2</sup>, Bülbül M<sup>3</sup>, Tekin M<sup>1</sup>, Konca Ç<sup>1</sup>, Turgut M<sup>1</sup>, Öztürk AB<sup>4</sup>.  
Author information

Abstract

#### **BACKGROUND:**

For children under five years of age, one-billion seven-hundred million episodes of diarrhea were seen worldwide, and seven-hundred thousand of these cases died due to diarrhea. Rotavirus is an important cause of diarrhea in this age group, and many studies have shown that Vitamin D plays a pivotal role for the immune system, as well as directing antimicrobial peptide gene expression. In addition, lower vitamin D levels were correlated with higher infectious diseases rates, such as respiratory tract infections, tuberculosis, and viral infections.

#### **METHODS:**

Seventy patients with rotaviral diarrhea and sixty-seven healthy patients were included in this study. In this research we compared serum 25-hydroxy vitamin D<sub>3</sub> [25(OH)D<sub>3</sub>], parathormone, calcium, phosphate, alkaline phosphatase, complete blood count parameters, and C-reactive protein levels of pre-school children hospitalized due to rotaviral diarrhea and healthy children. Additionally, the birth weight, feeding properties of the first six months of life, vitamin D and multivitamin supplements, and rotaviral vaccinations were evaluated in each group.

#### **RESULTS:**

There were no differences between the groups regarding gender and age. However, the 25(OH)D<sub>3</sub> levels in the patients with rotaviral diarrhea and the healthy group were significantly different:  $14.6 \pm 8.7$  and  $29.06 \pm 6.51$ , respectively ( $p < 0.001$ ). The results showed that serum 25(OH)D<sub>3</sub> levels of  $<20$  ng/ml (odds ratio: 6.3; 95% CI: 3.638-10.909;  $p < 0.001$ ) were associated with rotaviral diarrhea.

#### **CONCLUSIONS:**

This study proves that low vitamin D is associated with rotaviral diarrhea. This result is the first in the literature, and should be repeated in larger controlled clinical studies. This article is protected by copyright. All rights reserved.

**KEYWORDS:** childhood; diarrhea; parathormone; rotavirus; vitamin D  
PMID: 26287796

## IBS and asthma

Allergy Asthma Proc. 2015 Sep;36(5):92-8. doi: 10.2500/aap.2015.36.3869.

**Association of inflammatory bowel disease with asthma risk: A nationwide cohort study.**

Peng YH<sup>1</sup>, Liao WC, Su CH, Chen HJ, Hsia TC, Chu CC, Liu CJ, Kao CH.  
Author information

## Abstract

**OBJECTIVE:** We evaluated the risk of asthma development in adult patients with inflammatory bowel disease (IBD) in a nationwide population.

**METHODS:** A retrospective cohort study was conducted by using data retrieved from the Taiwan National Health Insurance Research Database. Patients, ages 20 year or older, with newly diagnosed IBD between 2000 and 2005 were identified and randomly frequency-matched (based on sex, age, and index year) with four times the number of enrollees without IBD from the general population. Both cohorts were followed up until the end of 2011 to examine the incidence of asthma. Cox proportional hazard regression analysis was used to measure the hazard ratios (HR) of asthma in the IBD cohort compared with that in the non-IBD cohort.

**RESULTS:** The IBD and non-IBD cohorts comprised 5260 patients with IBD and 21,040 participants, respectively. After adjustment for covariates, the IBD cohort exhibited a 1.50-fold increased risk for asthma (HR 1.50, [95% confidence interval {CI}, 1.32-1.71]). Further analysis according to the two major forms of IBD revealed that the adjusted HR of asthma was 1.46 (95% CI, 1.03-2.07) and 1.50 (95% CI, 1.31-1.72) in patients with ulcerative colitis and Crohn's disease, respectively, compared with the non-IBD cohort.

**CONCLUSION:** After adjustment for comorbidities, patients with IBD were associated with a higher subsequent risk of asthma.

PMID: 26314810

**IBS and depression**

CNS Spectr. 2015 Aug 26:1-15.

**Comorbidity between depression and inflammatory bowel disease explained by immune-inflammatory, oxidative, and nitrosative stress; tryptophan catabolite; and gut-brain pathways.**

Martin-Subero M<sup>1</sup>, Anderson G<sup>2</sup>, Kanchanatawan B<sup>3</sup>, Berk M<sup>4</sup>, Maes M<sup>3</sup>.

Author information

## Abstract

The nature of depression has recently been reconceptualized, being conceived as the clinical expression of activated immune-inflammatory, oxidative, and nitrosative stress (IO&NS) pathways, including tryptophan catabolite (TRYCAT), autoimmune, and gut-brain pathways. IO&NS pathways are similarly integral to the pathogenesis of inflammatory bowel disease (IBD). The increased depression prevalence in IBD associates with a lower quality of life and increased morbidity in IBD, highlighting the role of depression in modulating the pathophysiology of IBD. This review covers data within such a wider conceptualization that better explains the heightened co-occurrence of IBD and depression. Common IO&NS underpinning between both disorders is evidenced by increased pro-inflammatory cytokine levels, eg, interleukin-1 (IL-1) and tumor necrosis factor- $\alpha$ , IL-6 trans-signalling; Th-1- and Th-17-like responses; neopterin and soluble IL-2 receptor levels; positive acute phase reactants (haptoglobin and C-reactive protein); lowered levels of negative acute phase reactants (albumin, transferrin, zinc) and anti-inflammatory cytokines (IL-10 and transforming growth factor- $\beta$ ); increased O&NS with damage to lipids, proteins and DNA; increased production of nitric oxide (NO) and inducible NO synthase; lowered plasma tryptophan but increased TRYCAT levels; autoimmune responses; and increased bacterial translocation. As such, heightened IO&NS processes in depression overlap with the biological underpinnings of IBD, potentially explaining their increased co-occurrence.

This supports the perspective that there is a spectrum of IO&NS disorders that includes depression, both as an emergent comorbidity and as a contributor to IO&NS processes. Such a frame of reference has treatment implications for IBD when "comorbid" with depression.

**KEYWORDS:** Comorbidity; haptoglobin; immunology; inflammatory bowel disease; major depression; oxidative stress

PMID: 26307347

## IBS and fermentation

Am J Gastroenterol. 2015 Aug 25. doi: 10.1038/ajg.2015.220.

**Altered Colonic Bacterial Fermentation as a Potential Pathophysiological Factor in Irritable Bowel Syndrome.**

Ringel-Kulka T<sup>1</sup>, Choi CH<sup>2,3</sup>, Teras D<sup>2</sup>, Kim A<sup>1,4</sup>, Maier DM<sup>2</sup>, Scott K<sup>5</sup>, Galanko JA<sup>2</sup>, Ringel Y<sup>2</sup>.  
Author information

Abstract

**OBJECTIVES:**

Dysbiosis leading to abnormal intestinal fermentation has been suggested as a possible etiological mechanism in irritable bowel syndrome (IBS). We aimed to investigate the location and magnitude of altered intestinal bacterial fermentation in IBS and its clinical subtypes.

**METHODS:**

IBS patients who satisfied the Rome III criteria (114) and 33 healthy controls (HC) were investigated. Intestinal fermentation was assessed using two surrogate measures: intestinal intraluminal pH and fecal short-chain fatty acids (SCFAs). Intraluminal pH and intestinal transit times were measured in the small and large bowel using a wireless motility capsule (SmartPill) in 47 IBS and 10 HC. Fecal SCFAs including acetate, propionate, butyrate, and lactate were analyzed by capillary gas chromatography in all enrolled subjects. Correlations between intestinal pH, fecal SCFAs, intestinal transit time, and IBS symptom scores were analyzed.

**RESULTS:**

Colonic intraluminal pH levels were significantly lower in IBS patients compared with HC (total colonic pH, 6.8 for IBS vs. 7.3 for HC,  $P=0.042$ ). There were no differences in total and segmental pH levels in the small bowel between IBS patients and HC (6.8 vs. 6.8,  $P$ =not significant). The intraluminal colonic pH differences were consistent in all IBS subtypes. Total SCFA level was significantly lower in C-IBS patients than in D-IBS and M-IBS patients and HC. The total SCFA level in all IBS subjects was similar with that of HC. Colonic pH levels correlated positively with colon transit time (CTT) and IBS symptoms severity. Total fecal SCFAs levels correlated negatively with CTT and positively with stool frequency.

**CONCLUSIONS:** Colonic intraluminal pH is decreased, suggesting higher colonic fermentation, in IBS patients compared with HC. Fecal SCFAs are not a sensitive marker to estimate intraluminal bacterial fermentation. Am J Gastroenterol advance online publication, 25 August 2015; doi:10.1038/ajg.2015.220.

PMID: 26303129

## Gas and residual fecal material

Neurogastroenterol Motil. 2015 Aug 25. doi: 10.1111/nmo.12662.

**Accumulative effect of food residues on intestinal gas production.**

Mego M<sup>1</sup>, Accarino A<sup>1</sup>, Malagelada JR<sup>1</sup>, Guarner F<sup>1</sup>, Azpiroz F<sup>1</sup>.  
Author information

## Abstract

**BACKGROUND:** As mean transit time in the colon is longer than the interval between meals, several consecutive meal loads accumulate, and contribute to colonic biomass. Our aim was to determine the summation effect of fermentable food residues on intestinal gas production.

**METHODS:** In eight healthy subjects, the volume of endogenous intestinal gas produced in the intestine over a 4-h period was measured by means of a wash-out technique, using an exogenous gas infusion into the jejunum (24 mL/min) and collection of the effluent via a rectal Foley catheter. The exogenous gas infused was labeled (5% SF<sub>6</sub>) to calculate the proportion of endogenous intestinal gas evacuated. In each subject, four experiments were performed  $\geq 1$  week apart combining a 1-day high- or low-flatulogenic diet with a test meal or fast.

**KEY RESULTS:** Basal conditions: on the low-flatulogenic diet, intestinal gas production during fasting over the 4-h study period was  $609 \pm 63$  mL. Effect of diet: during fasting, intestinal gas production on the high-flatulogenic diet was  $370 \pm 146$  mL greater than on the low-flatulogenic diet ( $p = 0.040$ ). Effect of test meal: on the low-flatulogenic diet, intestinal gas production after the test meal was  $681 \pm 114$  mL greater than during fasting ( $p = 0.001$ ); a similar effect was observed on the high-flatulogenic diet ( $599 \pm 174$  mL more intestinal gas production after the test meal than during fasting;  $p = 0.021$ ).

**CONCLUSIONS & INFERENCES:** Our data demonstrate temporal summation effects of food residues on intestinal gas production. Hence, intestinal gas production depends on pre-existing and on recent colonic loads of fermentable foodstuffs.

**KEYWORDS:** abdominal distension; abdominal perception; colonic fermentation; diet; food residues; intestinal gas

PMID:26303858

## 10 A. CERVICAL SPINE

## MRI consistency of findings

Spine J. 2015 Aug 17. pii: S1529-9430(15)01236-X. doi: 10.1016/j.spinee.2015.08.026.

**Comparison of agreement of cervical spine degenerative pathology findings in magnetic resonance imaging studies.**

Fu MC<sup>1</sup>, Webb ML<sup>2</sup>, Buerba RA<sup>3</sup>, Neway WE<sup>4</sup>, Brown JE<sup>5</sup>, Trivedi M<sup>5</sup>, Lischuk AW<sup>5</sup>, Haims AH<sup>5</sup>, Grauer JN<sup>6</sup>.

Author information

Abstract

**BACKGROUND CONTEXT:** Magnetic resonance imaging (MRI) is often used in the evaluation of degenerative conditions of the cervical spine. However, the agreement of interpreting and reporting varying degenerative findings on cervical MRI has not been well assessed.

**PURPOSE:** To compare the inter-rater and intra-rater agreement of MRI findings between common degenerative findings of the cervical spine.

**STUDY DESIGN:** Retrospective diagnostic study.

**PATIENT SAMPLE:** Forty-eight patients who underwent routine cervical spine MRI at our institution between January 2011 and June 2012.

**OUTCOME MEASURES:** Reviewers evaluated each MRI study at each vertebral level for disc hydration, disc space height, central stenosis, foraminal stenosis, endplate changes, spondylolithesis, and cord signal change.

**METHODS:** A panel of two orthopaedic spine surgeons and four musculoskeletal radiologists independently reviewed 48 sets of T2-weighted axial and sagittal MRI sequences for a series of pre-selected criteria, and their findings were compared with those of the other panelists to determine inter-rater agreement. Each panelist also re-reviewed the first ten studies to determine intra-rater agreement. Absolute inter-rater and intra-rater agreements were then calculated and compared for different findings. A modified analysis ignored disagreements between the least severe grades of findings in order to determine the inter-rater and intra-rater agreements of the most clinically important severity grades. There were no sources of funding or conflicts of interest related to this study.

**RESULTS:** Absolute inter-rater agreement ranged from 54.6% to 95.0%. Disc hydration (54.6%), central stenosis (72.7%), and foraminal stenosis (73.1%) demonstrated the lowest inter-rater agreement, while spondylolithesis (95.0%) and cord signal change (92.9%) demonstrated the highest agreement. The modified analysis found better inter-rater agreement, ranging from 80.9%-95.0%. Absolute intra-rater agreement ranged from 74.2% to 94.7%. The modified analysis again found better agreement, ranging from 85.0%-94.7%. As would be expected, overall intra-rater agreement (81.6%, 95% C.I., 78.9%-84.3%) was higher than inter-rater agreement (75.7%, 95% C.I., 74.4%-77.0%). The clinical specialty of the reviewer had no significant impact on inter- or intra-rater agreement.

**CONCLUSIONS:** MRI findings play an important role in the management of patients with cervical spine conditions. For this reason, consistent descriptions of these findings are essential and physicians should be aware of the relative reliability of these findings. This systematic study developed standardized grading criteria and nomenclature for common clinically significant MRI findings in the cervical spine. Even in this optimized research setting, we found significant ranges in agreement across these MRI findings. In the clinical setting inter- and intra-rater agreements may be lower and the range of agreements between findings may be greater. Physicians should be aware of inconsistencies inherent in the interpretation of cervical MRI findings and should be aware that some findings demonstrate lower agreement than others.

**KEYWORDS:** cervical vertebrae; intervertebral disc; intervertebral disc degeneration; magnetic resonance imaging; radiology; reproducibility of results  
PMID:26291398

## Testing C pain

Phys Ther. 2015 May 28.

**Clinical Ratings of Pain Sensitivity Correlate With Quantitative Measures in People With Chronic Neck Pain and Healthy Controls: Cross-Sectional Study.**

Rebbeck T<sup>1</sup>, Moloney N<sup>2</sup>, Azoory R<sup>3</sup>, Hübscher M<sup>4</sup>, Waller R<sup>5</sup>, Gibbons R<sup>6</sup>, Beales D<sup>7</sup>.  
Author information

## Abstract

**BACKGROUND:** Correlations between clinical and quantitative measures of pain sensitivity are poor, making it difficult for clinicians to detect people with pain sensitivity. Clinical detection of pain sensitivity is important because these people have a different prognosis and may require different treatment.

**OBJECTIVE:** The purpose of this study was to investigate the relationship between clinical and quantitative measures of pain sensitivity across individuals with and without neck pain.

**METHODS:** This cross-sectional study included 40 participants with chronic neck pain and 40 age- and sex-matched controls. Participants underwent quantitative sensory testing of cold pain thresholds (CPTs) and pressure pain thresholds (PPTs). Clinical tests for pain sensitivity were the ice pain test and the pressure pain test. All tests were undertaken at standardized local (neck and upper trapezius muscles) and remote (wrist and tibialis anterior muscles) sites. Median and interquartile range (IQR) were calculated for neck pain and control groups, and parametric and nonparametric tests were used to compare groups. Correlation coefficients were calculated between quantitative and clinical measures.

**RESULTS:** There were significant differences for clinical and quantitative measures of cold and pressure sensitivity between the neck pain and control groups (eg, CPT neck pain group: median=22.31°C, IQR=18.58°C; control group: median=5.0°C, IQR=0.74°C). Moderate-to-good correlations were found between the clinical ice pain test and CPT at all sites (.46 to .68) except at the wrist (.29 to .40). Fair correlations were found for the clinical pressure pain test and PPT (-.26 to -.45). Psychological variables contributing to quantitative measures of pain sensitivity included catastrophization, sleep quality, and female sex.

**LIMITATIONS:** Clinical pressure pain tests were not quantitatively standardized in this study.

**CONCLUSIONS:** The ice pain test may be useful as a clinical correlate of CPT at all sites except the wrist, whereas the pressure pain test is less convincing as a clinical correlate of PPT.

PMID: 26023218



**10 B. CERVICAL EXERCISES****Selectivity of muscle training****Can neck exercises enhance the activation of the semispinalis cervicis relative to the splenius capitis at specific spinal levels?**

Jochen Schomacher Joachim Erlenwein Angela Dieterich Frank Petzke Deborah Falla

DOI: <http://dx.doi.org/10.1016/j.math.2015.04.010>

**Highlights**

- Activation of the semispinalis cervicis can be emphasized relative to the splenius capitis at selected spinal levels.
- Isometric lower cervical spine extension emphasises the activation of semispinalis cervicis and splenius capitis at C5.
- Isometric resistance against traction/compression increases semispinalis cervicis and splenius capitis activation equally.

**Abstract**

The deep cervical extensor, semispinalis cervicis, displays changes in behaviour and structure in people with chronic neck pain yet there is limited knowledge on how activation of this muscle can be emphasized during training. Using intramuscular electromyography (EMG), this study investigated the activity of the deep semispinalis cervicis and the superficial splenius capitis muscle at two spinal levels (C2 and C5) in ten healthy volunteers during a series of neck exercises: 1. Traction and compression, 2. Resistance applied in either flexion or extension at the occiput, at the level of the vertebral arch of C1 and of C4, and 3. Maintaining the neck in neutral while inclined on the elbows, with and without resistance at C4. The ratio between semispinalis cervicis and the splenius capitis EMG amplitude was quantified as an indication of whether the exercise could emphasize the activation of the semispinalis cervicis muscle relative to the splenius capitis. Manual resistance applied in extension over the vertebral arch emphasized the activation of the semispinalis cervicis relative to the splenius capitis at the spinal level directly caudal to the site of resistance (ratio:  $2.0 \pm 1.1$  measured at C5 with resistance at C4 and  $2.1 \pm 1.2$  measured at C2 with resistance at C1). This study confirmed the possibility of emphasizing the activation of the semispinalis cervicis relative to the splenius capitis which may be relevant for targeted exercise interventions for this deep extensor muscle. Further studies are required to investigate the clinical efficacy of these exercises for people with neck pain.

**Keywords:**

EMG, Semispinalis cervicis, Splenius capitis, Therapeutic exercise, Cervical spine

**Pain education and exercise****Pain education combined with neck- and aerobic training is more effective at relieving chronic neck pain than pain education alone – A preliminary randomized controlled trial☆**

K. Brage I. Ris D. Falla K. Sjøgaard B. Juul-Kristensen

DOI: <http://dx.doi.org/10.1016/j.math.2015.06.003>

**Highlights**

- Pain education and specific training reduce neck pain more than pain education.
- Specific neck exercises reduce sternocleidomastoid activity in the CCFT.
- Reduced sway length seem to follow this combined intervention.

**Abstract****Objective**

To evaluate the effect of training and pain education vs pain education alone, on neck pain, neck muscle activity and postural sway in patients with chronic neck pain.

**Methods**

Twenty women with chronic neck pain were randomized to receive pain education and specific training (neck–shoulder exercises, balance and aerobic training) (INV), or pain education alone (CTRL). Effect on neck pain, function and Global Perceived Effect (GPE) were measured.

Surface electromyography (EMG) was recorded from neck flexor and extensor muscles during performance of the Cranio-Cervical Flexion Test (CCFT) and three postural control tests (two-legged: eyes open and closed, one-legged: eyes open). Sway parameters were calculated.

**Results**

Fifteen participants (CTRL: eight; INV: seven) completed the study. Per protocol analyses showed a larger pain reduction ( $p = 0.002$ ) for the INV group with tendencies for increased GPE ( $p = 0.06$ ), reduced sternocleidomastoid activity during the CCFT ( $p = 0.09$ ), reduced sway length ( $p = 0.09$ ), and increased neck extensor activity ( $p = 0.02$ ) during sway compared to the CTRL group.

**Conclusion**

Pain education and specific training reduce neck pain more than pain education alone in patients with chronic neck pain. These results provide encouragement for a larger clinical trial to corroborate these observations.

Keywords: Neck pain, Electromyography, Physiotherapy, Cranio-cervical flexion

**12 A. WHIPLASH****Changes in upper trap in whiplash victims****Mechanical properties of the trapezius during scapular elevation in people with chronic whiplash associated disorders – A case-control ultrasound speckle tracking analysis**

Maria Landén Ludvigsson Gunnel Peterson Gwendolen Jull Johan Trygg Anneli Peolsson

**Abstract****Background**

Approximately 50% of people with Whiplash Associated Disorders (WAD) report longstanding symptoms. The upper trapezius is commonly painful yet its mechanical properties are not fully understood.

**Objectives**

This study examined the deformation of different depths of the upper trapezius muscle during a scapular elevation task (shoulder shrugging) before and following loaded arm abduction.

**Design and Methods**

A cross-sectional case-control study of 36 people (26 female and 10 male, mean age 38 (SD 11)) with chronic WAD and 36 controls, matched for age and gender. Real-time ultrasound recordings of upper trapezius were taken during both scapular elevation tasks. Post-process speckle tracking analysis was undertaken of three different sections of the upper trapezius muscle (superficial, middle, deep).

**Results**

The WAD group had lower deformation of the superficial section of the upper trapezius compared to the control group in both concentric and eccentric phases of scapular elevation ( $p < 0.05$ ) especially before the loaded arm abduction. After arm abduction, the deformation of the trapezius was reduced in both groups but only significantly in the WAD-group ( $p = 0.03$ ). Within-group analysis revealed that the control group least engaged the deep section of upper trapezius during the task ( $p < 0.01$ ).

**Conclusion**

This study, measuring mechanical deformation of the upper trapezius during a scapular elevation task indicates that persons with WAD may display different patterns in engagement of the muscle sections than those in the control group. Further research is needed to replicate and understand the reasons for and implications of this possible change in motor strategy within upper trapezius.

Clinical Trials.gov, Number: NCT01547624. Keywords: Whiplash, Chronic, Trapezius

**13. CRANIUM/TMJ****Accuracy for tests for TMJ****Validation of clinical tests for patients with long-lasting painful temporomandibular disorders with anterior disc displacement without reduction☆**

Elisabeth Heggem Julsvoll Nina Kjøpke Vøllestad Hilde Stendal Robinson

**Highlights**

- A cluster of 7 clinical tests (5 positive) is suitable to reveal ADDWOR in TMD patients.
- The cluster of tests has sensitivity of 71% and specificity of 91%.
- The dental stick test has equal sensitivity as the cluster, but lower specificity.
- The tests are easy to perform and suitable for use in clinical settings.
- MRI; a supplement to clinical tests, not a necessity to start treatment.

**Abstract****Objective**

To evaluate the validity of single clinical tests and cluster of tests used to identify anterior disc displacement without reduction (ADDWOR).

**Methods**

Treatment-seeking patients with temporomandibular pain and limited mouth-opening were recruited among patients from health-professionals in the region of Oslo in 2012. Thirty-five persons, aged 18–70 years, with 58 symptomatic joints or pain in surrounding area were included. The examinations were performed by one experienced manual therapist. Magnetic resonance imaging (MRI) was used as reference standard. Sensitivity, specificity, false positive, false negative and likelihood-ratios (LRs) with 95% confidence intervals (CIs) were calculated for single and cluster of tests. Receiver Operating Curve – ROC analysis were used to see how well pain provocation tests discriminated between positive and negative ADDWOR.

**Results**

The main result is that a cluster of 7 clinical tests (5 positive) can be used to diagnose ADDWOR with an accuracy of 71%. The dental stick test is the best single test with equal sensitivity as the cluster, but with lower specificity.

**Conclusion**

To reveal ADDWOR in patients with TMD, we recommend using the cluster of the dental stick test, the isometric test, the joint provocation test, the joint sound test, the deviation test, the laterotrusion test and joint mobility test.

**Practice and implications**

The tests require no advanced equipment, they are easy to perform and suitable for use in clinical settings. MRI can be seen as more of a supplement to the clinical tests than a necessity to start a clinical intervention.

**Keywords:** Temporomandibular disorders – TMD, Anterior disc displacement without reduction – ADDWOR, Clinical tests, Validity

## TMJ Manipulation

### **Efficacy of musculoskeletal manual approach in the treatment of temporomandibular joint disorder: A systematic review with meta-analysis**

Wagner Rodrigues Martins Juscelino Castro Blasczyk<sup>1</sup> Micaele Aparecida Furlan de Oliveira<sup>2</sup> Karina Ferreira Lagôa Gonçalves<sup>3</sup> Ana Clara Bonini-Rocha<sup>4</sup> Pierre-Michel Dugailly

#### Highlights

- Musculoskeletal manipulations approaches are effective for the treatment of TMJ.
- There is a larger effect for MMA compared to other conservative treatments.
- MMA have biomechanical and neurophysiological effects for the treatment of TMJ.

#### Abstract

##### Background

Temporomandibular joint disorder (TMD) requires a complex diagnostic and therapeutic approach, which usually involves a multidisciplinary management. Among these treatments, musculoskeletal manual techniques are used to improve health and healing.

##### Objectives

To assess the effectiveness of musculoskeletal manual approach in temporomandibular joint disorder patients.

##### Design

A systematic review with meta-analysis.

##### Methods

During August 2014 a systematic review of relevant databases (PubMed, The Cochrane Library, PEDro and ISI web of knowledge) was performed to identify controlled clinical trials without date restriction and restricted to the English language. Clinical outcomes were pain and range of motion focalized in temporomandibular joint. The mean difference (MD) or standard mean difference (SMD) with 95% confidence intervals (CIs) and overall effect size were calculated at every post treatment. The PEDro scale was used to demonstrate the quality of the included studies.

##### Results/findings

From the 308 articles identified by the search strategy, 8 articles met the inclusion criteria. The meta-analysis showed a significant difference ( $p < 0.0001$ ) and large effect on active mouth opening (SMD, 0.83; 95% CI, 0.42 to 1.25) and on pain during active mouth opening (MD, 1.69; 95% CI, 1.09 to 2.30) in favor of musculoskeletal manual techniques when compared to other conservative treatments for TMD.

##### Conclusions

Musculoskeletal manual approaches are effective for treating TMD. In the short term, there is a larger effect regarding the latter when compared to other conservative treatments for TMD.

Keywords: Temporomandibular joint disorder, Manual therapy, Pain, Range of motion

## 14. HEADACHES

### Neck pain and migraine

J Headache Pain. 2015 Dec;16(1):566. doi: 10.1186/s10194-015-0566-9. Epub 2015 Sep 2.

#### Neck pain in episodic migraine: premonitory symptom or part of the attack?

Lampl C<sup>1</sup>, Rudolph M, Deligianni CI, Mitsikostas DD.

Author information

#### Abstract

**BACKGROUND:** Whether neck pain (NP) is a prodromal migraine symptom or belongs to the migraine attack feature remains controversial.

**METHODS:** In order to prospectively record neck pain (NP) and non-headache symptoms and to evaluate the percentage of patients having NP as clear premonitory, non-headache symptom of their migraine, a specific self fulfilled questionnaire was designed to record NP and premonitory symptoms in a migraine cohort. All patients who reported NP anytime during the migraine phase were allocated to 3 groups: A = NP starts with the onset of headache; B = NP starts < 2 h before the onset of headache; C = NP starts 2-48 h before the onset of headache.

**RESULTS:** Data were evaluated from 487 migraineurs with episodic migraine (73.1 % females; 77 % had migraine without aura). 338 patients (69.4 %) reported NP anytime during the migraine phase. 184 patients (group A; 54.4 %) noticed NP with the start of the headache phase; 118 patients (group B; 24.2 %) reported NP within 2 h before the headache phase; 36 patients (group C; 7.4 %) experienced NP 2-48 h before the headache phase. In group B we found a high proportion of typical migraine associated symptoms and NP progressed into the headache phase in 82.2 %.

**CONCLUSIONS:** These data indicate that NP is a very common feature of migraine attacks and is more likely to be part of the migraine attack than a prodromal migraine symptom.

PMID: 26329488

**Visual snow in migraine**

Headache. 2015 Aug 26. doi: 10.1111/head.12628.

**Visual Snow in Migraine With Aura: Further Characterization by Brain Imaging, Electrophysiology, and Treatment - Case Report.**

Unal-Cevik I<sup>1</sup>, Yildiz FG<sup>2</sup>.

Author information

**Abstract**

**OBJECTIVE:** This study aims to investigate characteristics of visual snow accompanied by migraine and special interest on occipital bending, electrophysiological properties, and response to treatment.

**BACKGROUND:** Visual snow is characterized by continuous dynamically flickering dots in the visual field. Most patients also have comorbid migraine. Cortical hyperexcitability is a feature of migraine. Recent studies indicate an association between occipital bending with psychiatric disorders such as depression. Here, we demonstrate a patient with visual snow, migraine with aura, left occipital bending, and cortical hyperexcitability. Treatment response to lamotrigine was objectively assessed by repetitive pattern reversal visual evoked potentials (rVEP).

**METHODS:** A 25-year-old woman with a 10-year history of migraine with aura (2-3 attacks/week) admitted for 1-year history of visual snow. She reported continuous bright and colorful lights, palinopsia, floaters, nyctalopsia, and photopsia. Brain magnetic resonance imaging (MRI) was performed. Visual habituation response was assessed before and after lamotrigine treatment by rVEP.

**RESULTS:** Brain MRI revealed left occipital bending. On rVEP study, there was potentiation response. After lamotrigine treatment, the patient had no more complaints of visual snow, was able to sleep, and the frequency of migraine decreased to 2 attacks/month.

Electrophysiologically, the cortical hyperexcitability was improved.

**CONCLUSIONS:** The visual snow and loss of habituation ability in migraine associated with occipital bending can be improved with lamotrigine treatment. This report may provide new insights on "visual snow" pathophysiology in migraine.

**KEYWORDS:** anticonvulsant; cortical excitability; headache; magnetic resonance imaging; occipital bending; repetitive pattern-reversal visual evoked potential

PMID: 26307008

**Menstrual Migraine**

Headache. 2015 Aug 12. doi: 10.1111/head.12640.

**Systematic Review of Preventive and Acute Treatment of Menstrual Migraine.**

Nierenburg HD<sup>1</sup>, Ailani J<sup>1</sup>, Malloy M<sup>2</sup>, Siavoshi S<sup>1</sup>, Hu NN<sup>1</sup>, Yusuf N<sup>1</sup>.

Author information

Abstract

**OBJECTIVE:**

The aim of this systematic review is to identify the efficacy of different categories of treatments for menstrual migraines as found in randomized controlled trials or open label studies with similar efficacy endpoints.

**BACKGROUND:**

Menstrual migraine is very common and approximately 50% of women have increased risk of developing migraines related to the menstrual cycle. Attacks of menstrual migraine are usually more debilitating, of longer duration, more prone to recurrence, and less responsive to acute treatment than nonmenstrual migraine attacks.

**METHODS:**

Search for evidence was done in 4 databases that included PubMed, EMBASE, Science Direct, and Web of Science. Eighty-four articles were selected for full text review by 2 separate readers. Thirty-six of the 84 articles were selected for final inclusion. Articles included randomized controlled and open label trials that focused on efficacy of acute and preventative therapies for menstrual migraine. Secondary analyses were excluded because the initial study population was not women with menstrual migraine.

**RESULTS:**

After final screening, 11 articles were selected for acute and 25 for preventive treatment of menstrual migraine. These were further subdivided into treatment categories. For acute treatment: triptans, combination therapy, prostaglandin synthesis inhibitor, and ergot alkaloids. For preventive treatment: triptans, combined therapy, oral contraceptives, estrogen, nonsteroidal anti-inflammatory drug, phytoestrogen, gonadotropin-releasing hormone agonist, dopamine agonist, vitamin, mineral, and nonpharmacological therapy were selected. Overall, triptans had strong evidence for treatment in both acute and short term prevention of menstrual migraine.

**CONCLUSIONS:**

Based on this literature search, of all categories of treatment for menstrual migraine, triptans have the most extensive research with strong evidence for both acute and preventive treatment of menstrual migraine. Further randomized controlled trials should be performed for other therapies to strengthen their use in the care of menstrual migraine patients.

**KEYWORDS:** acute treatment; menstrual migraine; menstrually related migraine; oral contraceptive; preventive treatment; systematic review; triptan

PMID: 26264117



**22 A. IMPINGEMENT****Management models of care**

Knee Surg Sports Traumatol Arthrosc. 2015 Sep;23(9):2583-9. doi: 10.1007/s00167-014-3151-x. Epub 2014 Jul 19.

**Methodological quality of systematic reviews addressing femoroacetabular impingement.**

Kowalczyk M<sup>1</sup>, Adamich J, Simunovic N, Farrokhyar F, Ayeni OR.  
Author information

Abstract

**PURPOSE:**

As the body of literature on femoroacetabular impingement (FAI) continues to grow, clinicians turn to systematic reviews to remain current with the best available evidence. The quality of systematic reviews in the FAI literature is currently unknown. The goal of this study was to assess the quality of the reporting of systematic reviews addressing FAI over the last 11 years (2003-2014) and to identify the specific methodological shortcomings and strengths.

**METHODS:**

A search of the electronic databases, MEDLINE, EMBASE and PubMed, was performed to identify relevant systematic reviews. Methodological quality was assessed by two reviewers using the revised assessment of multiple systematic reviews (R-AMSTAR) scoring tool. An intraclass correlation coefficient (ICC) with 95 % confidence intervals (CI) was used to determine agreement between reviewers on R-AMSTAR quality scores.

**RESULTS:**

A total of 22 systematic reviews were assessed for methodological quality. The mean consensus R-AMSTAR score across all studies was 26.7 out of 40.0, indicating fair methodological quality. An ICC of 0.931, 95 % CI 0.843-0.971 indicated excellent agreement between reviewers during the scoring process.

**CONCLUSIONS:**

The systematic reviews addressing FAI are generally of fair methodological quality. Use of tools such as the R-AMSTAR score or PRISMA guidelines while designing future systematic reviews can assist in eliminating methodological shortcomings identified in this review. These shortcomings need to be kept in mind by clinicians when applying the current literature to their patient populations and making treatment decisions. Systematic reviews of highest methodological quality should be used by clinicians when possible to answer clinical questions.

**LEVEL OF EVIDENCE: IV.**

PMID: 25037984

**Pain mapping****Topographical pressure pain sensitivity maps of the shoulder region in individuals with subacromial pain syndrome**

I.L. Ribeiro P.R. Camargo F. Albuquerque-Sendín P. Madeleine C. Fernández-de-las-Peñas T.F. Salvini

DOI: <http://dx.doi.org/10.1016/j.math.2015.07.002>

**Highlights**

- The topographical map proposed revealed an excellent intra-rater reliability.
- There is no alteration in mechanical sensitivity in individuals with SAPS.
- The shoulder area showed a heterogeneous distribution in mechanical sensitivity.
- Women exhibited higher mechanical sensitivity compared to men.
- Results would not support the presence of central sensitization in SAPS.

**Abstract****Background**

Topographical pain maps (TPM) are useful tools to assess deep tissue sensitivity in musculoskeletal pain conditions. There is evidence suggesting bilateral sensitivity in subacromial pain syndrome (SAPS), although it is not widely accepted. No previous study has investigated TPM of the shoulder in SAPS.

**Objective**

To investigate whether differences for TPM of the shoulder are evident among patients with unilateral SAPS and controls.

**Methods**

Pressure pain thresholds (PPTs) were assessed 3 times at each point and there was a 20 s rest period between each one. The TPM were calculated using 29 pre-determined points on both shoulders in all groups by inverse distance weighted interpolation of PPT data. Multivariate Analysis of Covariance was applied to detect differences in PPTs between groups, sides, points (gender as covariate).

**Results**

The results revealed significant differences between points and genders (both,  $P < 0.001$ ), but not between groups ( $P = 0.243$ ) and sides ( $P = 0.812$ ). Heterogeneous distribution of mechanical pain sensitivity was found in both groups as the PPTs were lower on the root spine of the scapula and the posterior border of the acromion (points 5–8,  $P < 0.05$ ), glenohumeral joint (points 17–20,  $P < 0.01$ ) and the anterior deltoid muscle (points 21–25,  $P < 0.001$ ) compared to the average of the other sites on the shoulder. Women exhibited bilateral lower PPTs in all points than men in both groups (all,  $P < 0.01$ ).

**Conclusions**

This study revealed no differences for mechanical pain sensitivity in patients with SAPS experiencing lower levels of pain compared with matched controls, but showed heterogeneous distribution of PPTs in the shoulder.

**Keywords:** Glenohumeral, Pressure pain threshold, Scapula, Subacromial

**Test for posterior capsular tightness****Validity and Reliability of the Low Flexion Measurement for Posterior Glenohumeral Joint Capsule Tightness**

John D. Borstad, PT, PhD (Associate Professor) Amitabh Dashottar, PT, PhD (Assistant Professor) Thomas Stoughton, MS

**Highlights**

- Low Flexion captures the shoulder range of motion adaptations expected in throwing athletes.
- A single rater can reliably estimate posterior capsule tightness in people with shoulder pain.
- Low Flexion provides a valid estimate of glenohumeral joint posterior capsule tightness.

**Abstract**

Posterior shoulder tightness is a problem in many patients with shoulder pain. Tightness manifests as decreased ROM caused by loss of posterior capsule or posterior shoulder muscle flexibility. The posterior capsule often loses flexibility in throwing athletes and may also be present in patients with impingement symptoms. A valid and reliable measurement of posterior capsule tightness is critical to making informed decisions about interventions to improve capsule flexibility.

Low Flexion (LF) is a new test shown to be valid for assessing change in posterior capsule flexibility. This report describes three independent projects used to evaluate validity and reliability of LF to determine its clinical usefulness. In Study 1, overhead athletes (n=13) were compared to non-overhead athletes (n=13) to examine content validity, and in Study 2 pitchers (n=18) were measured before and after throwing to assess the stability of LF. T-tests were used to compare mean LF in both analyses. In Study 3 patients receiving rehabilitation (n=25) were measured twice bilaterally by a single rater to estimate overall reliability and reliability in those with shoulder pain (n=19) using ICC(3,1) and SEM. The overhead athletes had dominant arm deficits in LF that were statistically different than the non-overhead athletes, but LF was not significantly different after throwing. ICC's were all above 0.90 and SEM below 3.0°. The Low Flexion test is shown to have acceptable content validity and excellent intra-rater reliability and can be used clinically by one rater to assess posterior capsule tightness.

Keywords: Shoulder, Posterior Capsule, Validity, Reliability

**Scapula taping**

J Sport Rehabil. 2015 Aug 10.

**The Effects of Rigid Scapular Taping on Acromio-Humeral Distance in Healthy Shoulders: An Observational Study.**

Bdaiwi AH<sup>1</sup>, Mackenzie TA, Heerington L, Horlsey I, Cools A.  
Author information

Abstract

**CONTEXT:**

Compromise to the acromio-humeral distance has been reported in subjects with subacromial impingement syndrome when compared to healthy subjects. In clinical practice patients are taped with the intention of altering scapular position and influencing the acromio-humeral distance. However, research to determine the effects of taping on acromio-humeral distance is exiguous.

**OBJECTIVES:**

To evaluate the effect of ridged taping techniques to increase posterior scapular tilt and upward scapular rotation on the acromio-humeral distance.

**DESIGN:**

A one-group pre-test/post-test repeated measures design.

**SETTING:**

human performance laboratory.

**PARTICIPANTS:**

Twenty asymptomatic participants (10 males and 10 females) age 27 years (STD = 8.0 years).

**INTERVENTION:**

ridged tapping of the scapular into posterior tilt and upward scapular rotation.

**MAIN OUTCOME MEASURE:**

ultrasound measurement of the acromio-humeral distance.

**RESULTS:**

Acromio-humeral distance increased significantly after rigid tape application to the scapula ( $p < 0.003$ ) in healthy shoulders in 60 degrees of passive arm abduction.

**CONCLUSION:**

Taping techniques applied to the scapula had an immediate effect of increasing the acromio-humeral distance in healthy shoulders in 60 degrees of passive arm abduction. Results suggest that the use of taping to increasing posterior scapular tilt and increasing scapular upward rotation can influence the acromio-humeral distance and is a useful adjunct to rehabilitation in patients with subacromial impingement syndrome.

PMID: 26261938

**24. ELBOW****Epicondylitis and stretching**

J Orthop Sci. 2015 Aug 11.

**Effect of simultaneous stretching of the wrist and finger extensors for lateral epicondylitis: a gross anatomical study of the tendinous origins of the extensor carpi radialis brevis and extensor digitorum communis.**

Shirato R<sup>1</sup>, Wada T, Aoki M, Iba K, Kanaya K, Fujimiya M, Yamashita T.  
Author information

Abstract

**BACKGROUND:**

Pulling the wrist into flexion with the elbow in extension and forearm in pronation has been used as the stretching technique of wrist extensors for lateral epicondylitis. Simultaneous stretching of the fingers in addition to the wrist flexion has also been applied. However, the mechanism of this simultaneous stretching has not been clarified. This study is designed to clarify the mechanism underlying this simultaneous stretching technique based on the anatomical features of the origins of the extensor carpi radialis brevis (ECRB) and extensor digitorum communis (EDC).

**METHODS:**

Thirty-nine arms from formalin-embalmed Japanese human specimens were dissected. The features of the origins of the ECRB and EDC were macroscopically observed, and the locations of each origin on the lateral epicondyle were measured.

**RESULTS:**

The ECRB had a long and wide, purely tendinous origin which originated from the anterior slope of the lateral epicondyle. The tendinous origin of the index finger of the EDC (EDC-IF) arose from the posterior aspect of the ECRB tendinous origin, with a coexisting muscular portion observed at the level of the proximal forearm. The middle finger of the EDC (EDC-MF) had a short tendinous origin with an associated muscular portion and originated proximo-laterally to the origin of the ECRB on the lateral epicondyle. In addition, the muscular origin of the EDC-MF arose on the superficial and posterior aspect of the ECRB tendinous origin. In contrast, the ring and little fingers of the EDC originated from the tendinous septum of the extensor digiti minimi and extensor carpi ulnaris, and had no connection with the ECRB tendinous origin.

**CONCLUSIONS:**

On the basis of our anatomical findings, simultaneous stretching of the wrist extensors by wrist, index and middle fingers flexion could provide stretching force to both the tendinous origins of the ECRB and EDC through the EDC-IF and EDC-MF.

PMID: 26260257

**32 A. KNEE/ACL****Training/motor learning/prevention**

Knee Surg Sports Traumatol Arthrosc. 2015 Aug 11.

**Motor learning strategies in basketball players and its implications for ACL injury prevention: a randomized controlled trial.**

Benjaminse A<sup>1</sup>, Otten B, Gokeler A, Diercks RL, Lemmink KA.  
Author information

## Abstract

**PURPOSE:**

Adding external focus of attention (EF, focus on the movement effect) may optimize current anterior cruciate ligament (ACL) injury prevention programmes. The purpose of the current study was to investigate the effects of an EF, by a visual stimulus and an internal focus, by a verbal stimulus during unexpected sidestep cutting in female and male athletes and how these effects remained over time.

**METHODS:**

Ninety experienced basketball athletes performed sidestep cutting manoeuvres in three sessions (S1, S2 and S3). In this randomized controlled trial, athletes were allocated to three groups: visual (VIS), verbal (VER) and control (CTRL). Kinematics and kinetics were collected at the time of peak knee frontal plane moment.

**RESULTS:**

Males in the VIS group showed a larger vertical ground reaction force (S1:  $25.4 \pm 3.1$  N/kg, S2:  $25.8 \pm 2.9$  N/kg, S3:  $25.2 \pm 3.2$  N/kg) and knee flexion moments (S1:  $-3.8 \pm 0.9$  Nm/kg, S2:  $-4.0 \pm 1.2$  Nm/kg, S3:  $-3.9 \pm 1.3$  Nm/kg) compared to the males in the VER and CTRL groups and to the females in the VIS group ( $p < 0.05$ ). Additionally, the males in the VIS group reduced knee valgus moment and the females in the VER group reduced knee varus moment over time (n.s.).

**CONCLUSION:**

Male subjects clearly benefit from visual feedback. Females may need different feedback modes to learn a correct movement pattern. Sex-specific learning preferences may have to be acknowledged in day by day practice. Adding video instruction or feedback to regular training regimens when teaching athletes safe movement patterns and providing individual feedback might target suboptimal long-term results and optimize ACL injury prevention programmes.

**LEVEL OF EVIDENCE: I.**

PMID: 26259551

**33. MENISCUS****Meniscal tests****Detecting Meniscal Tears in Primary Care: Reproducibility and Accuracy of 2 Weight-Bearing Tests and 1 Non-Weight-Bearing Test**

Authors: Barbara A.M. Snoeker, MSc1, Robert Lindeboom, PhD1, Aeilko H. Zwinderman, PhD1, Patrice W.J. Vincken, MD, PhD2, Joris A. Jansen, MD3, Cees Lucas, PhD1

Published: Journal of Orthopaedic & Sports Physical Therapy,

Study Design: Diagnostic accuracy study using a cross-sectional design.

**Objectives:** To determine the interexaminer reliability and the diagnostic accuracy in primary care of 1 existing weight-bearing meniscal test, the Thessaly test, 1 new weight-bearing test, the deep squat test, and 1 non-weight-bearing test, the joint-line tenderness test.

**Background:** Meniscal tears are difficult to detect in primary care. Although valuable in secondary care, weight-bearing physical examination tests require validation in primary care in unselected patients.

**Methods:** Between October 2009 and December 2013, 121 patients (age range, 18–65 years) seen in primary care and suspected of having internal derangement of the knee of less than 6 months in duration were included in the study. Diagnostic accuracy of the 3 meniscal tests was determined based on assessment with magnetic resonance imaging. The meniscal tests were performed by 3 trained physical therapists, who were not informed about the patient history and magnetic resonance imaging results. Each test was performed independently by 2 of the 3 trained physical therapists in alternating pairs.

**Results:** The Thessaly test and the deep squat test had a moderate level of interexaminer reliability, with kappas of 0.54 and 0.46, respectively. The joint-line tenderness test had poor interexaminer reliability and was therefore not assessed for diagnostic accuracy. The following results are reported separately for both examiners. The Thessaly test had a sensitivity of 66.7% (95% confidence interval [CI]: 53.0%, 78.0%) and 51.2% (95% CI: 36.8%, 65.4%), a specificity of 37.9% (95% CI: 27.2%, 50.0%) and 43.5% (95% CI: 30.2%, 57.8%), a positive likelihood ratio of 1.07 (95% CI: 0.82, 1.41) and 0.91 (95% CI: 0.62, 1.33), and a negative likelihood ratio of 0.88 (95% CI: 0.54, 1.45) and 1.12 (95% CI: 0.72, 1.76). Similarly, the deep squat test had a sensitivity of 74.5% (95% CI: 61.1%, 84.5%) and 76.7% (95% CI: 62.3%, 86.9%), a specificity of 42.4% (95% CI: 31.2%, 54.4%) and 36.2% (95% CI: 24.0%, 50.5%), a positive likelihood ratio of 1.29 (95% CI: 0.97, 1.68) and 1.20 (95% CI: 0.92, 1.58), and a negative likelihood ratio of 0.60 (95% CI: 0.35, 1.04) and 0.64 (95% CI: 0.33, 1.25).

**Conclusion:** Although the Thessaly and deep squat tests have a moderate level of reliability, neither test is sufficiently accurate to help in the diagnosis of meniscal tears in primary care. Future research should focus on other relevant patient variables instead of on physical examination tests in the detection of meniscal tears.

**Meniscal tears and ACL injuries**

Arch Orthop Trauma Surg. 2015 Aug 19.

**Meniscal tears associated with anterior cruciate ligament injury.**

Hagino T<sup>1</sup>, Ochiai S, Senga S, Yamashita T, Wako M, Ando T, Haro H.  
Author information

Abstract

**PURPOSE:**

To investigate the frequency of meniscal tear and the location of tear associated with anterior cruciate ligament (ACL) injury.

**SUBJECTS AND METHODS:**

We studied 549 patients (552 knees) who were diagnosed with ACL injury by arthroscopy at our center between January 2006 and March 2014 (8 years and 3 months). The subjects comprised 289 males and 263 females ranging in age from 13 to 66 (mean 26.1) years. The cause of injury was sports-related in 89.1 %, and the mean interval from injury to initial arthroscopy was 23 months. The patients were divided into two groups: arthroscopy performed within 8 weeks after injury (acute group; 256 knees) and more than 8 weeks after injury (chronic group; 296 knees). Frequency of meniscal tear and location of tear were compared between two groups.

**RESULTS:**

The incidence of meniscal tear diagnosed by arthroscopic examination was 79.2 % (437 of 552 knees) in all subjects; 72.7 % (186 of 256 knees) in acute group and 84.8 % (251 of 296 knees) in chronic group, and was significantly higher in chronic group. Regarding the locations of meniscal tears, in acute group (186 knees), medial meniscal tear only was found in 20 knees (10.8 %), lateral meniscal tear only in 129 knees (69.4 %), and bilateral (including medial and lateral) meniscal tears in 37 knees (19.9 %). In chronic group (251 knees), medial meniscal tear only was found in 62 knees (24.7 %), lateral meniscal tear only in 85 knees (33.9 %), and bilateral meniscal tears in 104 knees (41.4 %). Lateral meniscal tear was commonly associated with acute ACL injury, while medial meniscal tear with chronic ACL injury. Bucket handle tear was observed in 25 knees (medial: 17 knees, lateral: 8 knees) in acute group, and 81 knees (medial: 69 knees, lateral: 12 knees) in chronic group, and was more common in the chronic group.

**CONCLUSION:**

The incidence of meniscal tear associated with ACL injury is higher in chronic cases; the number of medial meniscal tears is particularly high, many of which require meniscectomy. Early ACL reconstruction is recommended also for the prevention of secondary meniscal tear.

PMID: 26286641



**34. PATELLA****PFM changes in women****Kinematic and Kinetic Analysis of the Single-Leg Triple Hop Test in Women With and Without Patellofemoral Pain**

**Authors:** Amir Curcio dos Reis, PT, MS<sup>1</sup>, João Carlos Ferrari Correa, PT, PhD<sup>1</sup>, André Serra Bley, PT, MS<sup>1</sup>, Nayra Deise dos Anjos Rabelo, PT MS<sup>1</sup>, Thiago Yukio Fukuda, PT, PhD<sup>2</sup>, Paulo Roberto Garcia Lucareli, PT, PhD<sup>1</sup>

**Published:** *Journal of Orthopaedic & Sports Physical Therapy*, Ahead of Print **Pages:** 1-26 doi:10.2519/jospt.2015.5011

**Study Design:** Cross-sectional study.

**Objectives:** To compare the biomechanical strategies of the trunk and lower extremity during the transition period between the first and second hop of a single-leg triple-hop test (SLTHT) in women with and without patellofemoral pain (PFM).

**Background:** Recent literature has shown that PFM is associated with biomechanical impairments of the lower extremities. A number of studies have analyzed the position of the trunk and lower extremities for functional activities such as walking, squatting, jumping, and the step-down test. However, studies on more challenging activities, such as the SLTHT, may be more representative of sports requiring jumping movements.

**Methods:** Females between 18 and 35 years of age (control group, n=20; PFM group, n=20) participated in the study. Three dimensional kinematic and kinetic data were collected during the transition period between the first and second hop while participants performed the SLTHT.

**Results:** Compared to the control group, women with PFM exhibited greater ( $P<.05$ ) anterior and ipsilateral trunk lean, contralateral pelvic drop, hip internal rotation and adduction, and ankle eversion. A significant difference ( $P<.05$ ) was also found between groups for all time to peak joint angle analyzed, with the exception of anterior pelvic tilt and hip flexion. In addition, women with PFM exhibited greater ( $P<.05$ ) hip and knee abductor internal moments.

**Conclusion:** Compared to the control group, women with PFM exhibited altered trunk, pelvis, hip, knee, and ankle kinematics and kinetics. *J Orthop Sports Phys Ther*, Epub 24 Aug 2015. doi:10.2519/jospt.2015.5011

**Keyword:** anterior knee pain, biomechanics, hip, patella

**35. KNEE/TOTAL****CPM effective in increasing knee flexion**

Knee Surg Sports Traumatol Arthrosc. 2015 Aug 19.

**Continuous passive motion and its effects on knee flexion after total knee arthroplasty in patients with knee osteoarthritis.**

Liao CD<sup>1</sup>, Huang YC, Lin LF, Chiu YS, Tsai JC, Chen CL, Liou TH.  
Author information

## Abstract

**PURPOSE:** This study evaluated the effects of continuous passive motion (CPM) on accelerated flexion after total knee arthroplasty (TKA) and whether CPM application measures (i.e. initial angle and daily increment) are associated with functional outcomes.

**METHODS:** A retrospective investigation was conducted at the rehabilitation centre of a university-based teaching hospital. Patients who received CPM therapy immediately after TKA surgery were categorized into rapid-, normal-, and slow-progress groups according to their response to CPM during their acute inpatient stay. Knee pain, passive knee flexion, and knee function-measured using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC)-were assessed preoperatively at discharge and at 3- and 6-month outpatient follow-up visits.

**RESULTS:** A total of 354 patients were followed for 6 months after inpatient-stay discharge. The patients in the rapid-progress group (n = 119) exhibited significantly greater knee flexions than those in the slow-progress group did (n = 103) at the 3-month follow-up [mean difference (MD) = 10.3°, 95 % confidence interval (CI) 4.3°-16.3°, p < 0.001] and 6-month follow-up (MD = 10.9°, 95 % CI 6.3°-15.6°, p < 0.001). Significant WOMAC score differences between the rapid- and slow-progress groups were observed at the 3-month follow-up (MD = 7.2, 95 % CI 5.4-9.1, p < 0.001) and 6-month follow-up (MD = 16.1, 95 % CI 13.4-18.7, p < 0.001). CPM initial angles and rapid progress significantly predicted short- and long-term outcomes in knee flexion and WOMAC scores (p < 0.001).

**CONCLUSION:** When CPM is used, early application with initial high flexion and rapid progress benefits knee function up to 6 months after TKA.

**LEVEL OF EVIDENCE:** II.

PMID: 26286622

**37. OSTEOARTHRITIS/KNEE****Mesenchymal stem cells enhance cartilage**

Osteoarthritis Cartilage. 2015 Aug 26. pii: S1063-4584(15)01292-3. doi: 10.1016/j.joca.2015.08.009.

**Assessment of clinical and MRI outcomes after mesenchymal stem cell implantation in patients with knee osteoarthritis: a prospective study.**

Kim YS<sup>1</sup>, Choi YJ<sup>2</sup>, Lee SW<sup>3</sup>, Kwon OR<sup>4</sup>, Suh DS<sup>5</sup>, Heo DB<sup>6</sup>, Koh YG<sup>7</sup>.  
Author information

Abstract

**OBJECTIVE:**

Cartilage regenerative procedures using the cell-based tissue engineering approach involving mesenchymal stem cells (MSCs) have been receiving increased interest because of their potential for altering the progression of osteoarthritis (OA) by repairing cartilage lesions. The aim of this study was to investigate the clinical and magnetic resonance imaging (MRI) outcomes of MSC implantation in OA knees and to determine the association between clinical and MRI outcomes.

**DESIGN:**

Twenty patients (24 knees) who underwent arthroscopic MSC implantation for cartilage lesions in their OA knees were evaluated at 2 years after surgery. Clinical outcomes were evaluated according to the International Knee Documentation Committee (IKDC) score and the Tegner activity scale, and cartilage repair was assessed according to the MRI Osteoarthritis Knee Score (MOAKS) and Magnetic Resonance Observation of Cartilage Repair Tissue (MOCART) score.

**RESULTS:**

The clinical outcomes significantly improved ( $P < 0.001$  for both). The cartilage lesion grades (as described in MOAKS [grades for size of cartilage-loss area and percentage of full-thickness cartilage loss]) at follow-up MRI were significantly better than the preoperative values ( $P < 0.001$  for both). The clinical outcomes at final follow-up were significantly correlated with the MOAKS and MOCART score at follow-up MRI ( $P < 0.05$  for all).

**CONCLUSIONS:**

Considering the encouraging clinical and MRI outcomes obtained and the significant correlations noted between the clinical and MRI outcomes, MSC implantation seems to be useful for repairing cartilage lesions in OA knees. However, a larger sample size and long-term studies are needed to confirm our findings.

**KEYWORDS:** fibrin glue; implantation; knee; mesenchymal stem cell; osteoarthritis  
PMID: 26318655

**Quad contractions and OA****Increased duration of co-contraction of medial knee muscles is associated with greater progression of knee osteoarthritis**

Paul W. Hodges Wolbert van den Hoorn Tim V. Wrigley Rana S. Hinman Kelly-Ann Bowles Flavia Cicuttini Yuanyuan Wang Kim Bennell

**Highlights**

- Prospective study of cartilage loss and co-contraction of knee muscles in knee OA.
- Temporal parameters of knee muscle EMG during gait were measured at baseline.
- Change in medial tibial cartilage volume measured over 12 months.
- Longer medial knee muscle co-contraction duration relates to greater cartilage loss.
- Longer duration of lateral muscle co-contraction relates to slower OA progression.

**Abstract****Background**

As knee osteoarthritis (OA) cannot be cured, treatments that slow structural disease progression are a priority. Knee muscle activation has a potential role in OA pathogenesis. Although enhanced knee muscle co-contraction augments joint stability; this may speed structural disease progression by increased joint load.

**Objective**

This study investigated the relationship between cartilage loss and duration of co-contraction of medial/lateral knee muscles in medial knee OA.

**Design**

Prospective cohort study.

**Methods**

Medial (vastus medialis; semimembranosus) and lateral (vastus lateralis; biceps femoris) knee muscle myoelectric activity was recorded in 50 people with medial knee OA during natural speed walking at baseline. Medial tibial cartilage volume was measured from MRI at baseline and 12 months. Relationships between percent volume loss and duration of co-contraction of medial/lateral muscles around stance phase and ratio of duration of medial to lateral muscle co-contraction were evaluated with multiple linear regression.

**Results**

Greater duration of medial muscle co-contraction and greater duration of medial relative to lateral co-contraction correlated positively with annual percent loss of medial tibial cartilage volume ( $P = 0.003$ ). Estimated cartilage loss was 0.14 (95% confidence interval  $-0.23$  to  $-0.05$ ) greater for each increase in medial muscle co-contraction duration of 1% of the gait cycle. Lateral muscle co-contraction inversely correlated with cartilage loss.

**Conclusion**

Data support the hypothesis that augmented medial knee muscle co-contraction underpins faster progression of medial knee OA. Increased duration of lateral muscle co-contraction protected against medial cartilage loss. Exercise and biomechanical interventions to change knee muscle activation patterns provide possible candidates to slow progression of knee OA.

**Keywords:** Disease progression, Knee osteoarthritis, Electromyography, Co-contraction

**38 B. FOOT TYPES****Static vs dynamic****Predicting Dynamic Foot Function From Static Foot Posture: Comparison Between Visual Assessment, Motion Analysis and a Commercially Available Depth Camera**

Authors: Kade Paterson, PhD1, Ross Clark, PhD2, Alexandra Mullins, BExSci(Hons)2, Adam Bryant, PhD1, Benjamin Mentiplay, BExSci(Hons)2

## Abstract

Study Design Controlled laboratory study.

Objective To evaluate the ability of 3 methods to assess static foot posture to predict rearfoot and midfoot kinematics during gait.

Background Static foot posture is commonly used clinically to infer dynamic function.

Limitations of static clinical assessments may be overcome through advances in technologies including commercially available depth cameras.

Methods The Foot Posture Index (FPI) of 31 males (average 22.5 years) was assessed using visual observation, a three dimensional (3D) motion analysis system and a depth camera. Pearson correlations were used to evaluate relationships between FPI items and rearfoot and midfoot kinematics during walking. The ability of the static variables to predict dynamic function was assessed using multiple linear regression.

Results Most FPI items (85%) were not correlated with foot kinematics regardless of assessment method. There were 6 fair to moderate correlations between visual FPI items and total rearfoot ( $r=-0.36-0.39$ ,  $p<0.05$ ) and midfoot ( $r=0.37-0.61$ ,  $p<0.05$ ) motion, 2 fair correlations between 3D motion analysis FPI items and total midfoot ( $r=-0.43$ ,  $p=0.02$ ) and peak rearfoot ( $r=-0.40$ ,  $p=0.03$ ) motion, and 2 fair correlations between the depth camera FPI items and average ( $r=-0.38-0.44$ ,  $p<0.05$ ) rearfoot motion. Visual assessment of the FPI provided the best prediction model, explaining 37% of the variance in total midfoot inversion/eversion.

**Conclusions** Static measures of foot posture are weakly correlated with rearfoot or midfoot kinematics, and have limited dynamic prediction ability. Our findings suggest that the FPI may not be an accurate representation of rearfoot or midfoot movement during walking regardless of the measurement technique employed. *J Orthop Sports Phys Ther*, Epub 24 Aug 2015.

doi:10.2519/jospt.2015.5616

Keyword: biomechanics, FPI, gait, gaming, kinematic, posture Read

## 40. ANKLE SPRAINS AND INSTABILITY

### Impact of ankle sprain

#### **The Consequence of a Medial Ankle Sprain on Physical and Self-Reported Functional Limitations: A Case Study Over a 5 Month Period**

Authors: Masafumi Terada, PhD, ATC1, Abbey C. Thomas, PhD, ATC2, Brian Pietrosimone, PhD, ATC3, Claire E. Hiller, PhD, MAppSc4, Samantha Bowker, MS, ATC5, Phillip A. Gribble, PhD, ATC1

Published: Journal of Orthopaedic & Sports Physical Therapy, Ahead of Print Pages: 1-32 doi:10.2519/jospt.2015.6097

#### Abstract

Study Design Case report.

Background: Little evidence exists about impairments and perceived disability following eversion injury to the deltoid ligament. This case study prospectively examined the neuromuscular, biomechanical, and psychological consequences of a case of a medial ankle sprain.

Case Description: A recreationally active male with a history of a lateral ankle sprain (Grade I) was participating in a university IRB approved research study examining neuromuscular and mechanical characteristics associated with chronic ankle instability. Twenty-two days after the testing session, the participant sustained an eversion injury to his left ankle while playing basketball.

Outcomes: Outcomes of this case are presented using the International Classification of Functioning, Disability and Health model. Outcome variables were assessed at 3 different points: 1) pre-injury (medial ankle sprain); 2) 3 months post-injury; and 3) 5 months post-injury.

Measurements included neural excitability of the soleus, balance assessment, joint stability, and psychological assessments. Data from this case study revealed that a medial ankle sprain reduces joint mobility and alters neural excitability of the soleus with concurrent deficits in balance and self-reported function. These impairments forced the participant to downgrade his physical activity lifestyle up to 5 months post-injury.

**Discussion** These data suggest the need for the development of intervention strategies to address impairments in neural excitability and joint mobility at the ankle to help patients meet the goal of maintaining long-term joint health.

Level of Evidence: 4.

Keyword: medial ankle sprain, participant restrictions, perceived disability, sensorimotor control

Read More: <http://www.jospt.org/doi/abs/10.2519/jospt.2015.6097#.VeM16LxVhHw>

**45 A. MANUAL THERAPY LUMBAR & GENERAL**

Student apply less pressure

**Do experienced physiotherapists and final year physiotherapy trainees apply similar force during posterior-to-anterior lumbar mobilization techniques?**

Dany H. Gagnon Christian Longtin Djamal Berbiche Nathaly Gaudreault

DOI: <http://dx.doi.org/10.1016/j.math.2015.05.002>

**Abstract**

This study aims to quantify the force applied during posterior-to-anterior lumbar vertebrae mobilizations of different grades (I to IV) and compare that force between experienced physiotherapists and final year physiotherapy students. Four experienced physiotherapists and four final year physiotherapy students participated in this study along with five healthy asymptomatic individuals. A manual therapy table positioned over three force plates allowed for measurements of the force oscillation frequency and intensity applied during grade I, II, III and IV posterior-to-anterior (PA) mobilizations at two lumbar vertebral levels (L2 and L4). Mixed model ANOVAs were used to compare the force applied between the experienced physiotherapists and students, and between the various grades. The results showed that the mean oscillation frequency was similar between the groups for all grades. Grade I and grade IV PA mobilizations showed similar mean oscillation frequency as did grade II and III PA mobilizations. The minimum and maximum force applied was higher for the physiotherapists than for the students for all mobilization grades ( $p$  values  $< 0.05$ ). Similar mean maximum force values were recorded for PA mobilizations between grade I and II and between grade III and grade IV. Grade III and IV PA mobilizations yielded higher mean maximum force values than those recorded during grade I and grade II PA mobilizations. The method used in this study allowed for quantification of the force applied during lumbar PA mobilizations. Experienced physiotherapists apply greater force than physiotherapy students across all grades, despite similar oscillation frequency.

Keywords: Physiotherapy, Force, Spinal mobilization, Rehabilitation, Manual therapy

**Clinical reasoning****The role of clinician emotion in clinical reasoning: Balancing the analytical process**

Neil Langridge Lisa Roberts Catherine Pope

DOI: <http://dx.doi.org/10.1016/j.math.2015.06.007>

**Highlights**

- This review paper is a novel review of clinical reasoning.
- It provides an argument for emotions and physical responses in reasoning.
- It demonstrates gaps in the musculoskeletal physiotherapy literature.
- It suggests how to enhance reflective practice.
- It gives credibility for gut-feeling and intuition.

**Abstract****Introduction**

This review paper identifies and describes the role of clinicians' memory, emotions and physical responses in clinical reasoning processes. Clinical reasoning is complex and multi-factorial and key models of clinical reasoning within musculoskeletal physiotherapy are discussed, highlighting the omission of emotion and subsequent physical responses and how these can impact upon a clinician when making a decision.

**Discussion**

It is proposed that clinicians should consider the emotions associated with decision-making, especially when there is concern surrounding a presentation. Reflecting on practice in the clinical environment and subsequently applying this to a patient presentation should involve some acknowledgement of clinicians' physical responses, emotions and how they may play a part in any decision made. Presenting intuition and gut-feeling as separate reasoning methods and how these processes co-exist with other more accepted reasoning such as hypothetico-deductive is also discussed.

**Conclusion**

Musculoskeletal physiotherapy should consider the elements of feelings, emotions and physical responses when applying reflective practice principles. Furthermore, clinicians dealing with difficult and challenging presentations should look at the emotional as well as the analytical experience when justifying decisions and learning from practice.

**Keywords:** Memory, Emotion, Physiotherapy, Reasoning



**Sensory motor function after manipulation****Effects of spinal manipulation on sensorimotor function in low back pain patients – A randomized controlled trial☆**

Christine M. Goertz Ting Xia Cynthia R. Long Robert D. Vining Katherine A. Pohlman James W. DeVocht Maruti R. Gudavalli Edward F. Owens Jr. William C. Meeker David G. Wilder

**Highlights**

- Two distinct types of spinal manipulation were applied to treat low back pain.
- Sensorimotor function was studied using postural sway and response to sudden load.
- Two weeks of spinal manipulation did not affect these two sensorimotor functions.
- The neurophysiological effects of spinal manipulation remain unclear.

**Abstract****Background**

Low back pain (LBP) is a major health problem in industrialized societies. Spinal manipulation (SM) is often used for treating LBP, though the therapeutic mechanisms remain elusive. Research suggests that sensorimotor changes may be involved in LBP. It is hypothesized that SM may generate its beneficial effects by affecting sensorimotor functions.

**Objectives**

To compare changes in sensorimotor function, as measured by postural sway and response to sudden load, in LBP patients following the delivery of high-velocity low amplitude (HVLA)-SM or low-velocity variable amplitude (LVVA)-SM versus a sham control intervention.

**Design**

A three-arm (1:1:1 ratio) randomized controlled trial.

**Methods**

A total of 221 participants who were between 21 and 65 years, having LBP intensity (numerical rating scale)  $\geq 4$  at either phone screen or the first baseline visit and  $\geq 2$  at phone screen and both baseline visits, and Quebec Task Force diagnostic classifications of 1, 2, 3 or 7 were enrolled to receive four SM treatments over two weeks. Study outcomes were measured at the first and fifth visits with the examiners blinded from participant group assignment.

**Results**

The LVVA-SM group demonstrated a significant increase in medial-to-lateral postural excursion on the soft surface at the first visit when compared to the control group. No other significant between-group differences were found for the two sensorimotor tests, whether during the first visit or over two weeks.

**Conclusions**

It appears that short-term SM does not affect the sensorimotor functions as measured by postural sway and response to sudden load in this study.

**Keywords:** Low back pain, Clinical trial, Spinal manipulation, Sensorimotor function

**Somatization and poor outcomes****Somatization is associated with worse outcome in a chiropractic patient population with neck pain and low back pain**

L. Ailliet S.M. Rubinstein D. Knol M.W. van Tulder H.C.W. de Vet

DOI: <http://dx.doi.org/10.1016/j.math.2015.07.007>

**Highlights**

- Chiropractic patients do not present with complicated psychological profiles.
- Outcome measures in this study are pain, functional status and perceived recovery.
- Somatization was associated with worse outcome in patients with neck pain.
- Somatization was also associated with worse outcome in patients with LBP.
- Depression is only associated with decreased functional status for patients with LBP.

**Abstract****Aim**

To determine if psychosocial factors are associated with outcome in patients with neck pain or low back pain.

**Methods**

In a prospective, multi-center chiropractic practice-based cohort study in Belgium and The Netherlands, 917 patients, of which 326 with neck pain and 591 with low back pain, completed self-administered questionnaires at baseline, following the second visit, and at 1, 3, 6 and 12 months. Psychosocial factors assessed at baseline were: distress, depression, anxiety and somatization via the Four Dimensional Symptom Questionnaire, patient's beliefs regarding the effect of physical activity and work on their complaint via the Fear Avoidance Beliefs Questionnaire, and social support via the Feij social support scale. Primary outcome measures were perceived recovery, pain intensity, and functional status which was measured with the Neck Disability Index and Oswestry Disability Index. A univariable regression analysis to estimate the relation between each psychological variable and outcome was followed by a multivariable multilevel regression analysis.

**Results**

There were no differences in baseline patient characteristics between the patient population from Belgium and the Netherlands. Somatization scores are consistently associated with perceived recovery, functional status and pain for both neck pain and low-back pain. Depression was associated with poorer functioning in patients with LBP. There was a small association between fear and function and pain for patients with neck pain or low-back pain.

**Conclusion**

Somatization was the only variable consistently found to be associated with diminished perceived recovery, higher degree of neck or low back disability, and increased neck or low back pain.

Keywords: Biopsychosocial factors, Somatization, Chiropractic, Neck pain and low-back pain

## Vascular changes with MT

### Effects of Pressure Applied During Standardized Spinal Mobilizations on Peripheral Skin Blood Flow: A Randomized Cross-Over Study

Rafael Zegarra-Parodi, DO (England) Vanessa K. Pazdernik, MS Matthieu Roustit, PharmD, PhD Peter Yong Soo Park IV, BS, OMS Brian F. Degenhardt, DO

#### Highlights

- Unilateral spinal mobilizations induce equal, significant bilateral vasodilation.
- Post-mobilization vasodilation persisted after high-pressure spinal mobilizations.
- Pressure-dependent mechanisms may explain high-pressure mobilization results.

#### Abstract

##### Background

Peripheral skin blood flow (SBF) changes during and after spinal mobilization (SM), evaluated with laser Doppler flowmetry, may document physiological responses associated with SM.

##### Objectives

To document variations in SBF during and after application of an SM and evaluate influence of pressure on SBF by applying the same standardized SM with 3 different nonnoxious pressures.

##### Design

Cross-over design with 4 interventions on 4 different days: control (no touch) and 3 SMs applied rhythmically at 5%, 40%, or 80% of pain pressure threshold (sham SM, low-pressure SM, or high-pressure SM, respectively).

##### Method

Thirty-two individuals participated. The inspiratory gasp (IG) test was our positive control of vasoconstriction through excitation of the skin sympathetic nervous activity (SSNA). Each session comprised 5 phases: (1) baseline at the end of a 20-minute acclimatization, (2) IG test, (3) post-IG phase, (4) SM phase or no manual contact for control, and (5) post-SM phase. A Biopac MP36 system collected SBF data, and a Novel Pliance-X system recorded pressure data.

##### Results

/findings: Equal and significant bilateral vasodilation occurred during application of unilateral sham SM, low-pressure SM, and high-pressure SM. Post-SM significant vasodilation persisted after high-pressure SM.

##### Conclusions

The current study is the first to describe bilateral peripheral SBF changes occurring during and 5 minutes after application of standardized SMs. Our post-SM vasodilation suggests involvement of mechanisms other than the putative SSNA-excitatory mechanism proposed with skin conductance measurements. Persistence of post-SM vasodilation following only high-pressure SM suggests possible pressure-dependent mechanisms. However, further research is warranted to clarify our findings.

**Keywords:** dose-response effect, peripheral skin blood flow, randomized cross-over study, spinal mobilization

**45 B. MANUAL THERAPY CERVICAL****TMJ Manipulation****Efficacy of musculoskeletal manual approach in the treatment of temporomandibular joint disorder: A systematic review with meta-analysis**

Wagner Rodrigues Martins Juscelino Castro Blasczyk<sup>1</sup> Micaele Aparecida Furlan de Oliveira<sup>2</sup>  
 Karina Ferreira Lagôa Gonçalves<sup>3</sup> Ana Clara Bonini-Rocha<sup>4</sup> Pierre-Michel Dugailly

**Highlights**

- Musculoskeletal manipulations approaches are effective for the treatment of TMJ.
- There is a larger effect for MMA compared to other conservative treatments.
- MMA have biomechanical and neurophysiological effects for the treatment of TMJ.

**Abstract****Background**

Temporomandibular joint disorder (TMD) requires a complex diagnostic and therapeutic approach, which usually involves a multidisciplinary management. Among these treatments, musculoskeletal manual techniques are used to improve health and healing.

**Objectives**

To assess the effectiveness of musculoskeletal manual approach in temporomandibular joint disorder patients.

**Design**

A systematic review with meta-analysis.

**Methods**

During August 2014 a systematic review of relevant databases (PubMed, The Cochrane Library, PEDro and ISI web of knowledge) was performed to identify controlled clinical trials without date restriction and restricted to the English language. Clinical outcomes were pain and range of motion focalized in temporomandibular joint. The mean difference (MD) or standard mean difference (SMD) with 95% confidence intervals (CIs) and overall effect size were calculated at every post treatment. The PEDro scale was used to demonstrate the quality of the included studies.

**Results/Findings**

From the 308 articles identified by the search strategy, 8 articles met the inclusion criteria. The meta-analysis showed a significant difference ( $p < 0.0001$ ) and large effect on active mouth opening (SMD, 0.83; 95% CI, 0.42 to 1.25) and on pain during active mouth opening (MD, 1.69; 95% CI, 1.09 to 2.30) in favor of musculoskeletal manual techniques when compared to other conservative treatments for TMD.

**Conclusions**

Musculoskeletal manual approaches are effective for treating TMD. In the short term, there is a larger effect regarding the latter when compared to other conservative treatments for TMD.

**Keywords:** Temporomandibular joint disorder, Manual therapy, Pain, Range of motion

**Arterial dissection****Cervical arterial dissection: An overview and implications for manipulative therapy practice**

Lucy C. Thomas

DOI: <http://dx.doi.org/10.1016/j.math.2015.07.008>

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Abstract

**Introduction**

Cervical arterial dissection (CAD) is a common cause of stroke in young people under 55 years. It can occur spontaneously or subsequent to minor trauma or infection. The incidence is difficult to determine accurately as not all CAD progress to stroke. CAD is the most catastrophic adverse event associated with cervical manipulative therapy but it is rare. Early features of CAD can mimic a painful musculoskeletal presentation and a patient may present for treatment of neck pain and headache with a dissection in progress. Whether the manipulative technique is responsible for dissection or whether the diagnosis of CAD has been missed is unclear. Identification of individuals at risk, or early recognition of CAD could help expedite medical intervention and avoid inappropriate treatment.

**Purpose**

The aims of this masterclass are to outline current research into the pathophysiology, aetiology and clinical presentation of CAD, to place the risk in context in a manipulative therapy setting and to discuss its possible clinical recognition.

**Implications**

For those patients presenting with recent onset, moderate to severe unusual headache or neck pain, clinicians should perform a careful history, in particular questioning about recent exposure to head/neck trauma or neck strain. Cardiovascular factors may not be particularly useful indicators of risk of dissection. Clinicians should also be alert to reports of transient neurological dysfunction such as visual disturbance and balance deficits, arm paraesthesia and speech deficits, as these may be subtle. If clinicians suspect arterial dissection is in progress patients should be urgently referred for medical evaluation.

**Keywords:** Carotid artery, Internal dissection, Manipulation, Spinal, Risk factors, Neck

## Assessment of C 1

### **3D motion reliability of occipital condylar glide testing: From concept to kinematics evidence**

Benoît Beyer Stéphane Sobczak Walid Salem Véronique Feipel Pierre-Michel Dugailly

#### Highlights

- We analyzed the 3D motion components during unilateral anterior condylar glide test.
- The task induced angular motions involving extension and lateral bending mainly.
- Kinematics reliability showed good to excellent agreements for the same operator.
- Consistency was limited to lateral bending and condyle position between operators.
- Condylar glide test seems to display a nonspecific bilateral motion appraisal.

#### Abstract

##### Background:

To date, segmental data analyzing kinematics of occipital condylar testing or mobilization is lacking.

##### Objectives:

The objective of this study was to assess occipitoatlantal 3D motion components and to analyze inter- and intra-rater reliability during in vitro condylar glide test.

##### Methods:

To conduct this study, four fresh cadavers were included. Dissection was carried out to ensure technical clusters placement to skull, C1 and C2. During condylar glide test, bone motion data was computed using an optoelectronic system. The reliability of motion kinematics was assessed for three skilled practitioners performing two sessions of 3 trials on two days interval.

##### Findings:

During testing, average absolute motion ROM ( $\pm$ SD) were up to  $4.1 \pm 2.1^\circ$ ,  $0.7 \pm 1.3^\circ$  and  $10.3 \pm 2.5^\circ$  for occipitoatlantal lateral bending, axial rotation and flexion-extension, respectively. For position variation, magnitudes were  $2.3 \pm 1.8$  mm,  $1.1 \pm 1.3$  mm and  $2.6 \pm 0.8$  mm for anteroposterior, cephalocaudal and mediolateral displacements. Concerning motion reliability, variation ranged from  $0.6^\circ$  to  $3.4^\circ$  and from 0.3 mm to 1.6 mm for angular displacement and condyle position variation, respectively. In general, good to excellent agreement was observed (ICC ranging from 0.728 to 0.978) for the same operator, while consistency was limited to lateral/side bending and lateral condyle displacement between operators, with respective ICCs of 0.800 and 0.955.

##### Conclusions:

This study shows specific motion patterns involving extension and lateral bending of the occipitoatlantal level for anterior condylar glide test. In addition, condyle position variation demonstrated coupled components in forward and heterolateral directions. However, task seems not to be side specific. In general, reliability of 3D motion components showed good intra-operator agreement and limited inter-operator agreement.

**Keywords:** Kinematics, Upper cervical spine, Reliability, Condylar glide

### 45 C. MANUAL THERAPY THORACIC

#### Importance of the T spine manip

#### Understanding why the thoracic region is the ‘Cinderella’ region of the spine

N.R. Heneghan A. Rushton

#### Abstract

The thoracic spine has for a long time been the ‘Cinderella’ region of the spine. There has been a lesser research focus to the thoracic region compared with the cervical and lumbar spine, and there continues to be a limited understanding of the aetiology and epidemiology of a range of neuromusculoskeletal presentations which have an anatomical connection to the thoracic spine.

This paper firstly, provides a critical evaluation of the available evidence to provide some understanding for this under-exploration of the thoracic spine. Secondly the paper provides an evaluation of an emerging interest in this spinal region, with a body of evidence supporting the use of thoracic spine manipulation in the management of upper quadrant presentations. This has been linked to the theory of regional interdependence with the thoracic spine being viewed as a silent contributor to clinical presentations where a pain source lies elsewhere. Finally, a case for further research is made. Identified gaps in the current evidence base include, aetiology and epidemiology of thoracic spine pain and thoracic spine dysfunction, and to investigate mechanisms of action of currently used interventions.

Keywords: Thoracic spine dysfunction, Professional issue, Regional interdependence

### Manip and pain pressure thresholds

#### **Cervical & Thoracic Manipulations: Acute Effects upon Pain Pressure Threshold and Self-Reported Pain in Experimentally Induced Shoulder Pain**

Craig A. Wassinger, PhD, PT (Assistant Professor) Dustin Rich Nicholas Cameron Shelley Clark  
Scott Davenport Maranda Lingelbach Albert Smith G.David Baxter

#### Highlights

- We examined the effect cervical and thoracic manipulations on experimental shoulder pain.
- An external rotation eccentric exercise protocol caused mild shoulder pain.
- Self-reported shoulder pain was reduced immediately following manipulations.
- Pain pressure threshold over infraspinatus increased bilaterally after manipulations.

#### Abstract

**Background:** Emerging evidence suggests that cervical and thoracic joint manipulations may be advocated in treating patients with shoulder pain.

**Objectives:** To determine the acute effects of cervical, cervicothoracic, and thoracic joint manipulations on outcomes of self-reported pain and pain pressure threshold in experimentally induced shoulder pain.

**Design:** Repeated measures.

**Methods:** Twenty (20) healthy volunteers were tested on two sessions. Session 1 consisted of baseline assessment of pain pressure threshold testing over the infraspinatus bilaterally and self-reported shoulder pain using the shoulder pain and disability index (SPADI) pain scale. An isokinetic exercise protocol was used to induce delayed onset muscle soreness. In session 2 (24-48 hours later), all variables were reassessed before and immediately after a combination of cervical, cervicothoracic and thoracic manipulations.

**Results:** SPADI pain scale scores were significantly different between time points ( $p < 0.001$ ): the exercise protocol significantly increased reported pain [mean increase 14.1,  $p < 0.001$ ] while the manipulation significantly decreased reported pain (mean decrease 5.60,  $p < 0.001$ ) although pain remained higher than baseline levels. Pain pressure threshold differences were also found between time points ( $p = 0.001$ ): manipulation significantly increased pain threshold bilaterally ( $p < 0.001$ ) similar to baseline levels.

**Conclusions:** Cervical, cervicothoracic, and thoracic joint manipulations acutely increased pain pressure threshold and decreased self-reported shoulder pain in participants with experimentally induced shoulder pain. Physiotherapists may consider the combination of such techniques to achieve short-term hypoalgesic effects and facilitate the application of more active interventions.

**Keywords:** Experimental shoulder pain, Cervical and thoracic manipulation, Manual Therapy



**45 D. MANUAL THERAPY EXTREMITIES****MT positive on improving function post fracture of ankle**

## CASE REPORT

**Manual Physical Therapy Following Immobilization for Stable Ankle Fracture: A Case Series**

Authors: Elizabeth E. Painter, PT, DSc1, Gail D. Deyle, PT, DSc1, Christopher Allen, PT, DSc1, Evan J. Petersen, PT, DSc2, Theodore Croy, PT, PhD3, Kenneth P. Rivera, PA-C, DSc4

Published: Journal of Orthopaedic & Sports Physical Therapy, 2015, Volume: 45 Issue: 9 Pages: 665-674 doi:10.2519/jospt.2015.5981

Study Design: Case series.

Background: Ankle fractures commonly result in persistent pain, stiffness, and functional impairments. There is insufficient evidence to favor any particular rehabilitation approach after ankle fracture. The purpose of this case series was to describe an impairment-based manual physical therapy approach to treating patients with conservatively managed ankle fractures.

Case Description: Patients with stable ankle fractures postimmobilization were treated with manual physical therapy and exercise targeted at associated impairments in the lower limb. The primary outcome measure was the Lower Extremity Functional Scale. Secondary outcome measures included the ankle lunge test, numeric pain-rating scale, and global rating of change. Outcome measures were collected at baseline (performed within 7 days of immobilization removal) and at 4 and 12 weeks postbaseline.

Outcomes: Eleven patients (mean age, 39.6 years; range, 18–64 years; 2 male), after ankle fracture–related immobilization (mean duration, 48 days; range, 21–75 days), were treated for an average of 6.6 sessions (range, 3–10 sessions) over a mean of 46.1 days (range, 13–81 days). Compared to baseline, statistically significant and clinically meaningful improvements were observed in Lower Extremity Functional Scale score ( $P = .001$ ; mean change, 21.9 points; 95% confidence interval: 10.4, 33.4) and in the ankle lunge test ( $P = .001$ ; mean change, 7.8 cm; 95% confidence interval: 3.9, 11.7) at 4 weeks. These changes persisted at 12 weeks.

Discussion Statistically significant and clinically meaningful improvements in self-reported function and ankle range of motion were observed at 4 and 12 weeks following treatment with impairment-based manual physical therapy. All patients tolerated treatment well. Results suggest that this approach may have efficacy in this population.

Level of Evidence: Therapy, level 4. J Orthop Sports Phys Ther 2015;45(9):665–674. Epub 10 Jul 2015. doi:10.2519/jospt.2015.5981 Keyword: clinical reasoning, lower extremity, manipulation, mobilization Read

More: <http://www.jospt.org/doi/abs/10.2519/jospt.2015.5981#.VenjNmTBwXA>

**46 B. LOWER LIMB NEUROMOBILIZATION****Sciatic nerve excursion****Excursion of the Sciatic Nerve During Nerve Mobilization Exercises: An In Vivo Cross-Sectional Study Using Dynamic Ultrasound Imaging**

Authors: Michel W. Coppieters, PT, PhD<sup>1,2</sup>, Line S. Andersen, PT, MAppSc<sup>3</sup>, Runar Johansen, PT, MAppSc<sup>4</sup>, Per K. Giskegjerde, PT, MAppSc<sup>5</sup>, Mona Høivik, PT, MAppSc<sup>6</sup>, Siv Vestre, PT, MAppSc<sup>7</sup>, Robert J. Nee, PT, PhD<sup>8</sup>

Published: Journal of Orthopaedic & Sports Physical Therapy, Ahead of Print Pages: 1-23 doi:10.2519/jospt.2015.5743

## Abstract

**Study Design:** Controlled laboratory cross-sectional study, using single-group, within-subject comparisons.

**Objectives:** To determine whether different types of neurodynamic techniques result in differences in longitudinal sciatic nerve excursion.

**Background:** Large differences in nerve biomechanics have been demonstrated for different neurodynamic techniques for the upper limb (median nerve), but recent findings for the sciatic nerve only revealed small differences in nerve excursion that may not be clinically meaningful.

**Methods:** High-resolution ultrasound imaging was used to quantify longitudinal sciatic nerve movement in the thigh in 15 asymptomatic participants during 6 different mobilization techniques for the sciatic nerve involving the hip and knee. Healthy volunteers were selected to reveal normal nerve biomechanics and to eliminate potentially confounding variables associated with dysfunction. Repeated-measures analyses of variance were used to analyze the data.

**Results:** The techniques resulted in markedly different amounts of nerve movement ( $P < .001$ ). The tensioning technique was associated with the smallest excursion (mean  $\pm$  SD):  $3.2 \pm 2.1$  mm;  $P \leq .004$ ). The sliding technique resulted in the largest excursion ( $17.0 \pm 5.2$  mm;  $P < .001$ ), which was approximately 5 times larger than the tensioning technique, and on average twice as large as for individual hip or knee movements.

**Conclusions:** Consistent with current theories and findings for the median nerve, different neurodynamic exercises for the lower limb resulted in markedly different sciatic nerve excursions. Considering the continuity of the nervous system, movement and the position of adjacent joints have a large impact on nerve biomechanics.

J Orthop Sports Phys Ther, Epub 24 Aug 2015. doi:10.2519/jospt.2015.5743

Keyword: nerve biomechanics, neural mobilization, neurodynamics

**48 A. STM****STM for vertical talus (casting)**

J Bone Joint Surg Am. 2015 Aug 19;97(16):1354-65. doi: 10.2106/JBJS.N.01002.

**Treatment of Congenital Vertical Talus: Comparison of Minimally Invasive and Extensive Soft-Tissue Release Procedures at Minimum Five-Year Follow-up.**

Yang JS<sup>1</sup>, Dobbs MB<sup>2</sup>.

Author information

Abstract

**BACKGROUND:**

The most common historical treatment method for congenital vertical talus is extensive soft-tissue release surgery. A minimally invasive treatment approach that relies primarily on serial cast correction was introduced almost ten years ago, with promising early results. The purpose of this study was to assess the long-term outcome of patients with congenital vertical talus managed with the minimally invasive technique and compare them with a cohort treated with extensive soft-tissue release surgery.

**METHODS:**

The records of twenty-seven consecutive patients with vertical talus (forty-two feet) were retrospectively reviewed at a mean of seven years (range, five to 11.3 years) after initial correction was achieved. The minimally invasive method was used to treat sixteen patients (twenty-four feet), and extensive soft-tissue release surgery was used to treat eleven patients (eighteen feet). Patient demographics, ankle range of motion, the PODCI (Pediatric Outcomes Data Collection Instrument) questionnaire, and radiographic measurements were analyzed.

**RESULTS:**

At the latest follow-up, the mean range of motion of patients treated with the minimally invasive method was 42.4° compared with 12.7° for patients treated with extensive surgery ( $p < 0.0001$ ). The PODCI normative pain and global function scores were superior in the minimally invasive treatment group compared with the extensive soft-tissue release group. Greater correction of hindfoot valgus (anteroposterior talar axis-first metatarsal base angle) was achieved in the minimally invasive treatment group compared with the extensive surgery group (40.1° versus 27.9°,  $p = 0.03$ ), although all other radiographic values were similar between the two groups ( $p > 0.1$  for all). Subgroup analysis of patients with isolated vertical talus also showed superior range of motion and PODCI normative global function scores in the minimally invasive group.

**CONCLUSIONS:**

The minimally invasive treatment method for vertical talus resulted in better long-term ankle range of motion and pain scores compared with extensive soft-tissue release surgery. Longer-term studies are necessary to determine whether the improved outcomes are maintained into adulthood and whether the superior outcome is related to reduced scarring.

**LEVEL OF EVIDENCE:** Therapeutic Level III. See Instructions for Authors for a complete description of levels of evidence.

PMID: 26290087

### Massage and knee pain

#### **Knee arthritis pain is reduced and range of motion is increased following moderate pressure massage therapy**

Complementary Therapies in Clinical Practice , 09/01/2015

**F**ield T, et al. – The literature on massage therapy effects on knee pain suggests that pain was reduced based on self-report, but little is known about range of motion (ROM) effects. These data highlight the effectiveness of moderate pressure massage therapy for increasing ROM and lessening ROM-related pain and long-term pain and sleep disturbances.

#### **Methods**

- Medical School staff and faculty who had knee arthritis pain were randomly assigned to a moderate pressure massage therapy or a waitlist control group (24 per group).
- Self-reports included the WOMAC (pain, stiffness and function) and the Pittsburgh Sleep Quality Index.
- ROM and ROM-related pain were assessed before and after the last sessions.

#### **Results**

- The massage group showed an immediate post-massage increase in ROM and a decrease in ROM-associated pain.
- On the last versus the first day of the study, the massage group showed greater increases in ROM and decreases in ROM-related pain as well as less self-reported pain and sleep disturbances than the waitlist control group.

**Connective tissue massage and C spine****Cervical and scapulothoracic stabilization exercises with and without connective tissue massage for chronic mechanical neck pain: A prospective, randomized controlled trial☆**

Seyda Toprak Celenay Derya Ozer Kaya Turkan Akbayrak

**Highlights**

- Mechanical neck pain has become an increasing problem.
- Cervical and scapulothoracic stabilization exercise program can be used to treat.
- The exercise program may help to control pain, anxiety and physical health.
- Connective tissue massage may be add to the exercise program.
- The massage might improve night pain, pressure pain threshold, and mental health.

**Abstract**

This study was planned to assess and compare the effectiveness of cervical and scapulothoracic stabilization exercise treatment with and without connective tissue massage (CTM) on pain, anxiety, and the quality of life in patients with chronic mechanical neck pain (MNP). Sixty patients with chronic MNP (18–65 years) were recruited and randomly allocated into stabilization exercise with (Group 1, n = 30) and without the CTM (Group 2, n = 30). The program was carried out for 12 sessions, 3 days/week in 4 weeks. Pain intensity with Visual Analog Scale, pressure pain threshold with digital algometer (JTech Medical Industries, ZEVEX Company), level of anxiety with Spielberger State Trait Anxiety Inventory, and quality of life with Short Form-36 were evaluated before and after the treatment. After the program, pain intensity and the level of anxiety decrease, physical health increase in Group 1 and 2 were found ( $p < 0.05$ ). Pressure pain threshold and mental health increase were detected in only Group 1 ( $p < 0.05$ ). The intergroup comparison showed that significant difference in pain intensity at night, pressure pain threshold, state anxiety and mental health were seen in favor of Group 1 ( $p < 0.05$ ). The study suggested that stabilization exercises with and without the CTM might be a useful treatment for patients with chronic MNP. However, stabilization exercises with CTM might be superior in improving pain intensity at night, pressure pain threshold, state anxiety and mental health compared to stabilization exercise alone.

Keywords: Neck pain, Stabilization exercise, Connective tissue massage

## Psoas size

**Comparison of psoas major muscle thickness measured by sonography during active straight leg raising in subjects with and without uncontrolled lumbopelvic rotation**

In-cheol Jeon Oh-yun Kwon Jong-hyuck Weon Sung-dae Choung Ui-jae Hwang 

## Highlights

- Thickness of the contralateral psoas major (cPM) was measured during ASLR.
- Thickness (ultrasound) was less in subjects with uncontrolled lumbopelvic rotation.
- Finding suggested the cPM stabilized the lumbar spine during ASLR.

## Abstract

**Background**

The psoas major (PM) is important for stabilizing lumbopelvic region during active straight leg raising (ASLR). Uncontrolled lumbopelvic rotation (ULPR) frequently occurs during ASLR in subjects with poor lumbo-pelvic stability and may contribute to asymmetric symptoms including pain in lumbopelvic region.

**Objects**

This study compared the thickness of contralateral PM (cPM) using ultrasound imaging during ASLR in subjects with and without ULPR.

**Method**

Healthy male subjects (18 without ULPR, 19 with ULPR) were recruited. The thickness of the cPM during rest and ASLR without loading and with a 1-kg load was measured by ultrasound imaging. The relative muscle thickness was calculated as the thickness during ASLR/thickness at rest. Two-way mixed-model analysis of variance was used to identify significant differences in the relative thickness of the cPM between groups and within a loading status. The level of statistical significance was set at  $\alpha = 0.05$ .

**Results**

The resting thickness of the cPM in subjects without ULPR did not differ from that of subjects with ULPR. The relative thickness of the cPM in subjects without ULPR was significantly greater during ASLR than that in subjects with ULPR both without loading and with a load ( $p < 0.01$ ). No significant change in thickness of the cPM was evident in those with ULPR.

**Conclusion**

The thickness of the cPM was significantly greater during ASLR in subjects without ULPR than with ULPR. This result indicates that persons with ULPR have less activation of the cPM to stabilize the lumbar spine during ASLR.

**Keywords:** Muscle thickness, Psoas major, Uncontrolled lumbopelvic rotation

**Dry needling and MET****The effect of the combination of dry needling and MET on latent trigger point upper trapezius in females**

Ameneh Yeganeh Lari Farshad Okhovatian Sedigheh sadat Naimi Alireza Akbarzadeh Baghban

DOI: <http://dx.doi.org/10.1016/j.math.2015.08.004>

## Abstract

**Aim:** The purpose of this clinical trial experiment was to compare the effects of the combination of dry needling (DN) and the muscle energy technique (MET) on the upper trapezius latent myofascial trigger point.

**Method:** Sixty female patients, aged 18–30 with latent myofascial trigger points in the upper trapezius muscle were randomly divided into three groups: group 1 (n = 20) received DN and MET, group 2 (n = 20) received only MET, and group 3 (n = 20) received only DN. The visual analogue scale (VAS), pressure pain threshold (PPT), and range of active contra lateral flexion (CLF) were measured before each treatment. The patients were treated for three sessions in a one-week period with at least a two-day break between each session, and in session four, an assessment of primary outcomes was conducted without any treatment.

**Results:** All three treatment groups showed decreases in pain ( $p = 0.001$ ) and increases in PPT levels ( $p = 0.001$ ) as well as increases in CLF ( $p = 0.001$ ). But the group receiving trigger point DN together with MET showed more significant improvement than the other two groups in VAS, PPT and ROM. No significant differences were found between the MET-only group and the DN-only group.

**Conclusion:** Our results indicate that all three treatments used in this study were effective for treating MTP. According to this study, DN and MET is suggested as a new method for the treatment of MTP.

**Keywords:** Myofascial pain syndromes, Trigger point, MET, Dry needling

### Impact of STM and movement reeducation

#### **The effectiveness of soft-tissue therapy for the management of musculoskeletal disorders and injuries of the upper and lower extremities: A systematic review by the Ontario Protocol for Traffic Injury Management (OPTIMa) Collaboration**

Steven Piper Heather M. Shearer Pierre Côté Jessica J. Wong Hainan Yu Sharanya  
 Varatharajan Danielle Southerst Kristi Randhawa Deborah Sutton Maja Stupar Margareta Nordin  
 Silvano Mior Gabrielle van der Velde Anne Taylor-Vaisey

DOI: <http://dx.doi.org/10.1016/j.math.2015.08.011>

#### **Highlights**

- Movement re-education is effective for treating persistent lateral epicondylitis
- Myofascial release therapy is effective for managing lateral epicondylitis
- Plantar fasciitis can be managed effectively with myofascial release therapy
- Localized relaxation massage combined with multimodal care may be helpful for carpal tunnel syndrome

#### Abstract

**Background:** Soft-tissue therapy is commonly used to manage musculoskeletal injuries.

**Objective :** To determine the effectiveness of soft-tissue therapy for the management of musculoskeletal disorders and injuries of the upper and lower extremities.

**Design:** Systematic Review

**Methods:** We searched six databases from 1990 to 2015 and critically appraised eligible articles using Scottish Intercollegiate Guidelines Network (SIGN) criteria. Evidence from studies with low risk of bias was synthesized using best-evidence synthesis methodology.

**Results:** We screened 9,869 articles and critically appraised seven; six had low risk of bias. Localized relaxation massage provides added benefits to multimodal care immediately post-intervention for carpal tunnel syndrome. Movement re-education (contraction/passive stretching) provides better long-term benefit than one corticosteroid injection for lateral epicondylitis. Myofascial release improves outcomes compared to sham ultrasound for lateral epicondylitis. Diacutaneous fibrolysis (DF) or sham DF leads to similar outcomes in pain intensity for subacromial impingement syndrome. Trigger point therapy may provide limited or no additional benefit when combined with self-stretching for plantar fasciitis; however, myofascial release to the gastrocnemius, soleus and plantar fascia is effective.

**Conclusion:** Our review clarifies the role of soft-tissue therapy for the management of upper and lower extremity musculoskeletal disorders and injuries. Myofascial release therapy was effective for treating lateral epicondylitis and plantar fasciitis. Movement re-education was also effective for managing lateral epicondylitis. Localized relaxation massage combined with multimodal care may provide short-term benefit for treating carpal tunnel syndrome. More high quality research is needed to study the appropriateness and comparative effectiveness of this widely utilized form of treatment.

**Keywords:** musculoskeletal injuries, soft-tissue therapy, massage, systematic review



**50 A. MOTOR CONTROL****LBP and TL motor control****RESEARCH REPORT****Validation of a Clinical Test of Thoracolumbar Dissociation in Chronic Low Back Pain**

Authors: Edith Elgueta-Cancino, PT, MPhil1, Siobhan Schabrun, BPhysio (Hons), PhD2, Lieven Danneels, PT, PhD3, Wolbert van den Hoorn, PT, MSc1, Paul Hodges, BPhy (Hons), PhD1

Published: Journal of Orthopaedic & Sports Physical Therapy,  
2015, Volume: 45 Issue: 9 Pages: 703-712 doi:10.2519/jospt.2015.5590

Study Design Clinical test validation.

Objectives

Preliminary study of concurrent and discriminant validity of a clinical test of thoracolumbar dissociation.

Background Control deficits of back muscles and trunk movement are common in chronic/recurrent low back pain (LBP). A reliable clinical test to rate an individual's ability to dissociate lumbopelvic movement from the thoracolumbar region has been described. This test rates the performance quality of 5 key aspects against criterion standards.

Methods Concurrent validity was examined by comparison of clinical test scores (overall score and each individual criterion) against spine kinematics. Discriminant validity was evaluated by comparison of scores between pain-free controls and participants with LBP. A receiver operating characteristic curve was calculated to determine the optimal cutoff or score to differentiate between good and poor performers.

Results Concurrent validity was supported by the significant correlation between the total score and motion of the T5 vertebra relative to the S1 vertebra ( $P < .05$ ). Scores for some (4 correlations of 14 measures) but not all individual criteria were correlated with the kinematic features that each criterion was expected to reflect. Discriminant validity was supported by higher test scores for pain-free controls than for participants with LBP after 2 minutes of training ( $P = .045$ ). Scores of less than 5.5 were more prevalent in the LBP group (pretraining LBP versus control, 72% versus 35%;  $P = .008$ ; posttraining LBP versus control, 48% versus 16%;  $P = .018$ ).

**Conclusion** This preliminary study of concurrent and discriminant validity of the test provides a foundation to further investigate its utility to characterize thoracolumbar movement patterns in individuals with LBP. J Orthop Sports Phys Ther 2015;45(9):703–712. Epub 9 Jul 2015.

doi:10.2519/jospt.2015.5590 Keyword: lumbar movements, movement control, spinal motion

Read More: <http://www.jospt.org/doi/abs/10.2519/jospt.2015.5590#.VenvRGTBwXA>

**51. CFS/BET****CBT in enhancing movement in LBP****Changing beliefs for changing movement and pain: Classification-based cognitive functional therapy (CB-CFT) for chronic non-specific low back pain**

N. Meziat Filho

DOI: <http://dx.doi.org/10.1016/j.math.2015.04.013>

**Highlights**

- A patient with chronic low back pain was treated with cognitive functional therapy.
- She had the belief that bending over and sitting would cause damage to her disc.
- Management was to change maladaptive functional behaviour and the negative belief.
- Active exercises for graded exposure to restore lumbar flexion were prescribed.
- The fear avoidance beliefs decreased as well as the pain and disability.

**Abstract**

This case report presents the effect of classification-based cognitive functional therapy in a patient with chronic disabling low back pain. The patient was assessed using a multidimensional biopsychosocial classification system and was classified as having flexion pattern of movement impairment disorder. Management of this patient was to change her belief that bending over and sitting would cause damage to her disc, combined with active exercises for graded exposure to lumbar flexion to restore normal movement. Three months after the first appointment, the treatment resulted in reduced pain, the mitigation of fear avoidance beliefs and the remediation of functional disability. The patient returned to work and was walking for one hour a day on a treadmill. The cognitive intervention to change the patient's negative beliefs related to the biomedical model was important to make the graded exercises and the lifestyle changes possible.

Keywords: Low back pain, Cognitive therapy, Movement, Behaviour

**52. EXERCISE****Biomarkers in ex**

Biol Res Nurs. 2015 Aug 14. pii: 1099800415599252.

**Effects of Exercise on Select Biomarkers and Associated Outcomes in Chronic Pain Conditions: Systematic Review.**

Kawi J<sup>1</sup>, Lukkahatai N<sup>2</sup>, Inouye J<sup>2</sup>, Thomason D<sup>2</sup>, Connelly K<sup>2</sup>.

Author information

Abstract

**BACKGROUND:**

Chronic pain is highly prevalent. Current management is challenged by lack of validated objective measures like biological markers. Clinical pain studies employing exercise interventions have evaluated biomarkers; however, it is unclear how exercise impacts biomarkers involved in pain pathways and whether these markers are associated with relevant pain-related outcomes. This systematic review evaluates data from clinical studies employing exercise interventions in chronic musculoskeletal nonmalignant pain conditions in which biomarkers in pain pathways were measured.

**METHOD:**

Published research studies from several databases were examined using the Jadad Scale for assessing the quality of clinical studies.

**RESULTS:**

Twelve research studies were reviewed. Jadad scores ranged from 5 to 11 out of 13 points. Inflammatory markers were most commonly measured followed by neurotransmitter-related genes and metabolite-detecting genes. After exercise interventions, changes in biomarkers involved in neurotransmission and inflammation suggest a hypoalgesic exercise effect. Significant biomarker associations were found with pain intensity, fatigue, depression, anxiety, and quality of life. However, there were varying methodologies in the studies reviewed.

**DISCUSSION:**

It remains a question whether biomarkers can be used as objective measures for risk assessment, diagnosis, or evaluation or as surrogate endpoints in chronic pain. Adequate sample sizes, optimal exercise dose determination, study replications, and longitudinal research studies with consistent methodologies are warranted. Regardless, the potential translational value of biomarkers in chronic pain is evident. Advancing nursing research in biomarkers is vital for moving the nursing discipline and clinical chronic pain practice forward. Developing a biobehavioral perspective in chronic pain is also necessary for comprehensive management.

**KEYWORDS:** biomarkers; chronic pain; exercise; systematic review

PMID: 26276511

**53. CORE****Pregnancy and draw in maneuver****The Immediate Effects on Inter-Rectus Distance of Abdominal Crunch and Drawing in Exercises During Pregnancy and the Postpartum Period**

Authors: Patrícia Mota, PT, PhD1, Augusto Gil Pascoal, PT, PhD1, Ana Isabel Carita, PhD2, Kari Bø, PT, PhD3

Published: Journal of Orthopaedic & Sports Physical Therapy, Ahead of Print Pages: 1-24 doi:10.2519/jospt.2015.5459

**Abstract**

**Study Design:** Longitudinal descriptive exploratory study.

**Objectives:** To evaluate the immediate effect induced by drawing in and abdominal crunch exercises on inter-rectus distance (IRD) of first time pregnant women measured at 4 time points during pregnancy and in the postpartum period.

**Background:** There is scant knowledge on the effect of different abdominal exercises on IRD in pregnant and postpartum women.

**Methods:** The study included 84 primiparous participants. Ultrasound images were recorded with a 12 MHz linear transducer at rest and during abdominal drawing in and abdominal crunch exercises, at 3 locations on the linea alba. IRD was measured at 4 time points: gestational weeks 35-41 and 6th to 8th, 12th to 14th, and 24th to 26th weeks postpartum. Separate 2-way repeated measures ANOVA were performed for each exercise (drawing in and abdominal crunch) and each measurement location to evaluate the immediate effects of exercises on IRD at each of the 4 time points. Similarly, 2-way ANOVAs were used to contrast the effects of the 2 exercises on IRD.

**Results** Performing the DI exercise caused a significant change in width of the IRD at the location 2 cm below the umbilicus, narrowing the IRD by a mean (95% CI) of 3.8 mm (1.2, 6.4) at gestational week 35-41 and widening the IRD by 3.0 mm (1.4, 4.6) at 6th to 8th, by 1.8 mm (0.6, 3.1) at 12th to 14th, and by 2.5 mm (1.4, 3.6) at 24th to 26th weeks postpartum ( $P < .01$ ).

Performing the AC exercise led to a significant narrowing of the IRD ( $P < .01$ ) at all 3 locations at all 4 time points, with the exception of 2 cm below the umbilicus at postpartum week 24-26. The average amount of narrowing varied from 1.6 to 20.9 mm, based on time and location.

**Conclusion** Overall, there was a contrasting effect of the 2 exercises, with the abdominal crunch exercise consistently producing a significant narrowing of the IRD. In contrast, the DI exercise generally led to small widening of the IRD. J Orthop Sports Phys Ther, Epub 24 Aug 2015.

doi:10.2519/jospt.2015.5459

Keyword: abdominals, diastasis recti, ultrasound imaging Read

More: <http://www.jospt.org/doi/abs/10.2519/jospt.2015.5459#.VeMYgrxVhHw>

## Vibration and core

J Sport Rehabil. 2015 Aug 10.

**Effect of Whole Body Vibration Training on Trunk Muscle Strength and Physical Performance in Healthy Adults: Preliminary Results of a Randomized Controlled Trial.**

Maeda N<sup>1</sup>, Urabe Y, Sasadai J, Miyamoto A, Murakami M, Kato J.  
Author information

## Abstract

**CONTEXT:** Whole-body vibration (WBV) stimulus equipment has been used as a new training method for health promotion. Its use of in its clinical has expanded to the field of sports and rehabilitation for disabled patients. WBV training is rapidly gaining popularity in health and fitness centers as an alternative method for improving muscle performance. Acute positive effects of WBV have been shown on lower extremity muscle power and the ability of vertical jump, however there have not been any studies focusing on the long-term effects of WBV for trunk muscle and dynamic balance.

**OBJECTIVE:** To investigate the effects of an 8-week program of WBV in combination with trunk muscle training on muscular performance in healthy, untrained adults.

**DESIGN:** Laboratory-based, repeated-measures study.

**SETTING:** University laboratory.

**PARTICIPANTS:** Twenty healthy university male subjects.

**INTERVENTION:** Participants were randomly assigned to a WBV or non-WBV group. The WBV group performed a trunk muscle training program in combination with WBV; the non-WBV group performed the same muscle training program without WBV for 8 weeks.

**MAIN OUTCOME MEASURES:** In the pre-and post-training period, the participants were evaluated using the Functional Movement Screen™, Y-test (anterior, posterior-medial, and posterior-lateral reach), trunk muscle isometric strength (flexor, extensor and flexor/extensor ratio), squat jump, and counter-movement jump.

**RESULTS:** The WBV group had greater improvement than the non-WBV group in both trunk flexor muscle strength ( $p=0.02$ ) and the Y-test (anterior reach) ( $p=0.004$ ) between pre-and post-training.

**CONCLUSION:** Adding WBV to a trunk muscle strengthening program may improve trunk flexor isometric strength and anterior reach during the Y balance test to a greater extent than training without WBV. The WBV protocol used in this study had no significant impact on FMS scores, squat jumping, counter-movement jumping, trunk extensor isometric strength or trunk flexor/extensor ratio."

PMID: 26262571

## 54. POSTURE

### Exercise and training for posture

#### **The effects of training and detraining after an 8 month resistance and stretching training program on forward head and protracted shoulder postures in adolescents: Randomised controlled study**

R.M. Ruivo A.I. Carita<sup>2</sup> P. Pezarat-Correia<sup>1</sup>

DOI: <http://dx.doi.org/10.1016/j.math.2015.05.001>

#### Highlights

- A targeted exercise program can result in a posture improvement.
- A 4-month detraining period was not sufficient to reduce the postural training effects.
- Subjects with neck pain had a smaller cervical angle.
- Postural training is important to prevent upper quadrant musculoskeletal pain.

#### Abstract

##### **Purpose**

This study aimed to evaluate the effects of a 32-week resistance and stretching training program applied in Physical Education classes on forward head posture and protracted shoulder posture of Portuguese adolescents (15–17 years old). The detraining effects after a 16-week period were also measured.

##### **Methods**

This prospective, randomized and controlled study was conducted in two secondary schools in Portugal. One hundred and thirty adolescents with forward head and protracted shoulder posture were randomly assigned to a control or experimental group. The sagittal head, cervical and shoulder angle were measured before and after a 32-week time intervention period. The control group (n = 46) did only the Physical Education classes whereas the exercise group (n = 42) received a posture corrective exercise programme in addition to Physical Education classes. A 16 week detraining period followed the 32-week.

##### **Results**

Significant increase were observed in the cervical and shoulder angle in the experimental group following the 32 week-intervention period. After the 16-week detraining period no significant differences were observed in the three postural angles in the intervention group.

##### **Conclusions**

The exercise intervention was successful at decreasing forward head and protracted shoulder in adolescents. Detraining period was not sufficient to reduce the overall training effects. This study supports the postural training and rehabilitation performed during Physical Education classes, with the aim of preventing and managing upper quadrant musculoskeletal pain.

Keywords: Detraining, Neck, Posture, Rehabilitation

**Training does not enhance postural responses****Effects of low back pain and of stabilization or movement-system-impairment treatments on induced postural responses: A planned secondary analysis of a randomized controlled trial**

Jesse V. Jacobs Karen V. Lomond Juvena R. Hitt Michael J. DeSarno Janice Y. Bunn,  
Sharon M. Henry

DOI: <http://dx.doi.org/10.1016/j.math.2015.08.006>

**Highlights**

- Subjects with low back pain responded to induced balance perturbations.
- Assessed before and after stabilization or movement-system-impairment treatments.
- Electromyography responses not improved by either treatment.
- Physical treatment may not transfer to benefit impaired postural responses for low back pain.

**Abstract****Background**

Motor retraining for non-specific chronic low back pain (LBP) often focuses on voluntary postural tasks. This training, however, may not transfer to other known postural impairments, such as automatic postural responses to external perturbations.

**Objectives**

To evaluate the extent current treatments of motor retraining ameliorate impaired postural coordination when responding to a perturbation of standing balance.

**Design**

Planned secondary analysis of a prospectively registered (NCT01362049), randomized controlled trial with a blinded assessor.

**Method**

Sixty-eight subjects with chronic, recurrent, non-specific LBP were allocated to perform a postural response task as a secondary assessment one week before and one week after receiving either stabilization or Movement System Impairment (MSI)-directed treatment over 6 weekly 1-h sessions plus home exercises. For assessment, subjects completed the Oswestry disability and numeric pain rating questionnaires and then performed a postural response task of maintaining standing balance in response to 3 trials in each of 4 randomly presented directions of linear surface translations of the platform under the subjects' feet. Integrated amplitudes of surface electromyography (EMG) were recorded bilaterally from the rectus abdominis (RA), internal oblique (IO), and external oblique (EO) muscles during the postural response task.

**Results**

No significant effects of treatment on EMG responses were evident. Oswestry and numeric pain ratings decreased similarly following both treatments.

**Conclusions**

Stabilization and MSI-directed treatments do not affect trunk EMG responses to perturbations of standing balance in people with LBP, suggesting current methods of motor retraining do not sufficiently transfer to tasks of reactive postural control.

**Keywords:** Low back pain, Movement system impairment, Stabilization, Posture, Balance, Treatment

## 56. ATHLETICS

### Athletics and life expectancy

Prev Med. 2015 Aug 22. pii: S0091-7435(15)00266-2. doi: 10.1016/j.ypmed.2015.08.014.

#### **Dose-response association of moderate-to-vigorous physical activity with cardiovascular biomarkers and all-cause mortality: Considerations by individual sports, exercise and recreational physical activities.**

Loprinzi PD<sup>1</sup>.

Author information

Abstract

#### **BACKGROUND:**

Previous research demonstrates that moderate-to-vigorous physical activity (MVPA) is associated with reduced all-cause mortality risk. Our understanding of whether individual physical activities are associated with all-cause mortality is less understood.

#### **METHODS:**

Data from the 1999-2006 NHANES were employed, with follow-up through 2011. 48 different individual physical activities (e.g., swimming, running, bicycling) were assessed, and total MVPA MET-min-month was calculated based on their responses to these 48 individual physical activities.

#### **RESULTS:**

Greater engagement in MVPA was associated with more favorable cardiovascular biomarkers, particularly for men. Even after adjustment for total MVPA, different individual physical activities were associated with cardiovascular biomarkers across gender. When compared to those not meeting guidelines (0-1999 MVPA MET-min-month), a dose-response association between MVPA and mortality was observed, with those engaging in 5 times the guideline level having the lowest risk of all-cause mortality (45% reduced risk). There was no evidence of a harmful effect of very high MVPA (e.g., 20,000+ MVPA MET-min-month).

#### **CONCLUSIONS:**

Engaging in MVPA even below the minimum recommendation was associated with survival benefits, and the greatest survival effects occurred at a dose of approximately 5 times the minimum recommendation. Although very high levels (e.g., 10 times the minimum recommendation) of self-reported MVPA did not demonstrate the greatest survival effects, high levels of physical activity did not appear to have harmful effects.

**KEYWORDS:** Cardiovascular biomarkers; Epidemiology; Mortality; Survival  
PMID: 26307435



**Warm up impact**

Med Sci Sports Exerc. 2015 Aug 27.

**Acute Warm-up Effects in Submaximal Athletes: An EMG Study of Skilled Violinists.**

McCrary JM<sup>1</sup>, Halaki M, Sorkin E, Ackermann BJ.

Author information

Abstract

**BACKGROUND:**

Warm-up is commonly recommended for injury prevention and performance enhancement across all activities, yet this recommendation is not supported by evidence for repetitive submaximal activities such as instrumental music performance.

**PURPOSE:**

Quantify the effects of cardiovascular, core muscle, and musical warm-ups on muscle activity levels, musical performance, and subjective experience in skilled violinists.

**METHODS:**

Fifty-five undergraduate, postgraduate, or professional violinists performed 5 randomly ordered 45-second musical excerpts of varying physical demands both before and after a randomly assigned 15-minute, moderate intensity cardiovascular, core muscle, musical (technical violin exercises), or inactive control warm-up protocol. Surface EMG (sEMG) data were obtained for 16 muscles of the trunk, shoulders, and right arm during each musical performance. Sound recording and perceived exertion (RPE) data were also obtained. Sound recordings were randomly ordered and rated for performance quality by blinded adjudicators. Questionnaire data regarding participant pain sites and fitness levels were used to stratify participants according to pain and fitness levels. Data were analyzed using 2 and 3-factor ANCOVAs (sEMG and sound recording), and Wilcoxon matched pairs tests (RPE).

**RESULTS:**

None of the 3 warm-up protocols had significant effects on muscle activity levels ( $p \geq 0.10$ ). Performance quality did not significantly increase ( $p \geq 0.21$ ). RPE significantly decreased ( $p < 0.05$ ) following warm-up for each of the 3 experimental warm-ups; control condition RPE did not significantly decrease ( $p > 0.23$ ).

**CONCLUSION:**

Acute physiological and musical benefits from cardiovascular, core muscle, and musical warm-ups in skilled violinists are limited to decreases in RPE. This investigation provides data from the performing arts in support of sports medical evidence suggesting warm-up only effectively enhances maximal strength and power performance.

PMID: 26312615

**57. GAIT****Posture and resisted side stepping****RESEARCH REPORT****Resisted Side Stepping: The Effect of Posture on Hip Abductor Muscle Activation**

Authors: Justin W. Berry, PT, DPT1, Theresa S. Lee, BS2, Hanna D. Foley, BS2, Cara L. Lewis, PT, PhD2

Published: Journal of Orthopaedic & Sports Physical Therapy,  
2015, Volume: 45 Issue: 9 Pages: 675-682 doi:10.2519/jospt.2015.5888

**Study Design** Controlled laboratory study, repeated-measures design.

**Objectives** To compare hip abductor muscle activity and hip and knee joint kinematics in the moving limb to the stance limb during resisted side stepping, and to determine whether muscle activity was affected by the posture (upright standing versus squat) used to perform the exercise.

**Background** Hip abductor weakness has been associated with a variety of lower extremity injuries. Resisted side stepping is often used as an exercise to increase strength and endurance of the hip abductors. Exercise prescription would benefit from knowing the relative muscle activity level generated in each limb and for different postures during the side-stepping exercise.

**Methods** Twenty-four healthy adults participated in this study. Kinematics and surface electromyographic data from the gluteus maximus, gluteus medius, and tensor fascia lata were collected as participants performed side stepping with a resistive band around the ankle, while maintaining each of 2 postures: (1) upright standing and (2) squat.

**Results** Mean normalized electromyographic signal amplitude of the gluteus maximus, gluteus medius, and tensor fascia lata was higher in the stance limb than in the moving limb ( $P \leq .001$ ). Gluteal muscle activity was higher, whereas tensor fascia lata muscle activity was lower, in the squat posture compared to the upright standing posture ( $P < .001$ ). Hip abduction excursion was greater in the stance limb than in the moving limb ( $P < .001$ ).

**Conclusion** The 3 hip abductor muscles respond differently to the posture variations of the side-stepping exercise in healthy individuals. When prescribing resisted side-stepping exercises, therapists should consider the differences in hip abductor activation across limbs and variations in trunk posture. J Orthop Sports Phys Ther 2015;45(9):675–682. Epub 10 Jul 2015.

doi:10.2519/jospt.2015.5888 Keyword: electromyography, gluteus maximus, gluteus medius, strengthening, tensor fascia lata Read

More: <http://www.jospt.org/doi/abs/10.2519/jospt.2015.5888#.Venj3WTBwXA>

## Knee OA impact on gait

## RESEARCH REPORT

**Higher Knee Flexion Moment During the Second Half of the Stance Phase of Gait Is Associated With the Progression of Osteoarthritis of the Patellofemoral Joint on Magnetic Resonance Imaging**

Authors: Hsiang-Ling Teng, PT, PhD1, Toran D. MacLeod, PT, PhD2, Thomas M. Link, MD, PhD1, Sharmila Majumdar, PhD1, Richard B. Souza, PT, PhD1,3

Published: Journal of Orthopaedic & Sports Physical Therapy, 2015, Volume: 45 Issue: 9 Pages: 656-664 doi:10.2519/jospt.2015.5859

Study Design: Controlled laboratory study, longitudinal design.

Objective: To examine whether baseline knee flexion moment or impulse during walking is associated with the progression of osteoarthritis (OA) with magnetic resonance imaging of the patellofemoral joint (PFJ) at 1 year.

Background: Patellofemoral joint OA is highly prevalent and a major source of pain and dysfunction. The biomechanical factors associated with the progression of PFJ OA remain unclear.

Methods: Three-dimensional gait analyses were performed at baseline. Magnetic resonance imaging of the knee (high-resolution, 3-D, fast spin-echo sequence) was used to identify PFJ cartilage and bone marrow edema-like lesions at baseline and a 1-year follow-up. The severity of PFJ OA progression was defined using the modified Whole-Organ Magnetic Resonance Imaging Score when new or increased cartilage or bone marrow edema-like lesions were observed at 1 year. Peak external knee flexion moment and flexion moment impulse during the first and second halves of the stance phase of gait were compared between progressors and nonprogressors, and used to predict progression after adjusting for age, sex, body mass index, and presence of baseline PFJ OA.

Results: Sixty-one participants with no knee OA or isolated PFJ OA were included.

Patellofemoral joint OA progressors (n = 10) demonstrated significantly higher peak knee flexion moment (P = .01) and flexion moment impulse (P = .04) during the second half of stance at baseline compared to nonprogressors. Logistic regression showed that higher peak knee flexion moment during the second half of the stance phase was significantly associated with progression at 1 year (adjusted odds ratio = 3.3, P = .01).

**Conclusion** Peak knee flexion moment and flexion moment impulse during the second half of stance are related to the progression of PFJ OA and may need to be considered when treating individuals who are at risk of or who have PFJ OA. J Orthop Sports Phys Ther 2015;45(9):656-664. Epub 10 Jul 2015. doi:10.2519/jospt.2015.5859

Keyword: bone marrow lesions, cartilage, gait, kinetics, WOMBS Read

More: <http://www.jospt.org/doi/abs/10.2519/jospt.2015.5859#.Venih2TBwXA>

**58. RUNNING****Frontal plane kinematics of the hip during running: are they related to hip anatomy and strength?**

Michael Baggaley Brian Noehren Jody L. Clasey Robert Shapiro Michael B. Pohl

## Highlights

- Hip adduction during running was not associated with deviations in the neck shaft angle.
- A fair relationship was found between hip abduction strength and deviations in the neck shaft angle.
- Hip adduction during running was not associated with hip abduction strength.
- Hip adduction during running was not linked with deviations in pelvis width-femur length ratio.

## Abstract

Excessive hip adduction has been associated with a number of lower extremity overuse running injuries. The excessive motion has been suggested to be the result of reduced strength of the hip abductor musculature. Hip anatomical alignment has been postulated to influence both hip abduction (HABD) strength and thus may impact hip adduction during running. The purpose of this study was to investigate the relationship between hip anatomy, HABD strength, and frontal plane kinematics during running. Peak isometric HABD strength, 3D lower extremity kinematics during running, femoral neck-shaft angle (NSA), and pelvis width-femur length (PW-FL) ratio were recorded for 25 female subjects. Pearson correlations ( $P < .05$ ) were performed between variables. A fair relationship was observed between femoral NSA and HABD strength ( $r = -.47$ ,  $p = .02$ ) where an increased NSA was associated with reduced HABD strength.

No relationship was observed between HABD strength and hip adduction during running. None of the anatomical measurements, NSA or PW-FL, were associated with hip adduction during running. Deviations in the femoral NSA have a limited ability to influence peak isometric hip abduction strength or frontal plane hip kinematics during running. Hip abduction strength does also not appear to be linked with changes in hip kinematics. These findings in healthy individuals question whether excessive hip adduction typically seen in female runners with overuse injuries is caused by deviations in hip abduction strength or anatomical structure.

Keywords: Running, Biomechanics, Hip, Strength, Alignment

**Strike patterns variations****Biomechanical Differences of Foot Strike Patterns During Running: A Systematic Review With Meta-Analysis**

Authors: Matheus O. Almeida, PT, PhD1, Irene S. Davis, PT, PhD2, Alexandre D. Lopes, PT, PhD1

Published: Journal of Orthopaedic & Sports Physical Therapy, Ahead of Print Pages: 1-40 doi:10.2519/jospt.2015.6019

**Abstract**

**Study Design** Systematic review with meta-analysis.

**Objective** To determine the biomechanical differences between foot strike patterns using when running.

**Background** Strike patterns during running has received attention in the recent literature due to the mechanical differences and associated injury risks between them.

**Methods** Electronic databases (Medline, Embase, Lilacs, Scielo, and SPORTDiscus) were searched through July 2014. Studies (cross-sectional, case control, prospective, and retrospective) comparing biomechanical characteristics between foot strike patterns during running of distance runners with at least 18 years of age were included in this review. Two independent reviewers evaluated the risk of bias. A meta-analysis with a random-effects model was used to combine the data from the included studies.

**Results** Sixteen studies were included in the final analysis. In the meta-analyses of kinematic variables, significant differences between forefoot and rearfoot strikers were found for foot and knee angle at initial contact and knee flexion range of motion. A forefoot strike pattern resulted in a plantar flexed ankle position and a more flexed knee position, compared to a dorsiflexed ankle position and a more extended knee position for the rearfoot strikers, at initial contact with ground. In the comparison of rearfoot and midfoot strikers, midfoot strikers demonstrated greater ankle dorsiflexion range of motion and decreased knee flexion range of motion compared to rearfoot strikers. For kinetic variables, the meta-analysis revealed that rearfoot strikers had higher vertical loading rates compared to forefoot strikers.

**Conclusion** There are differences in kinematic and kinetic characteristics between foot strike patterns when running. Clinicians should be aware of these characteristics to help in the management of running injuries and advice on training.

J Orthop Sports Phys Ther, Epub 24 Aug 2015. doi:10.2519/jospt.2015.6019

**Keyword:** biomechanics, jogging, landing, runners Read

**59. PAIN****Hippocampal's involvement in chronic pain**

Pain. 2015 Aug 17.

**Role of adult hippocampal neurogenesis in persistent pain.**

Apkarian AV<sup>1</sup>, Mutso AA, Centeno MV, Kan L, Wu M, Levinstein M, Banisadr G, Gobeske KT, Miller RJ, Radulovic J, Hen R, Kessler JA.

Author information

**Abstract**

The full role of adult hippocampal neurogenesis (AHN) remains to be determined, yet it is implicated in learning, emotional functions, and is disrupted in negative mood disorders. Recent evidence indicates that AHN is decreased in persistent pain consistent with the idea that chronic pain is a major stressor, associated with negative moods and abnormal memories. Yet the role of AHN in development of persistent pain has remained unexplored. Here we test the influence of AHN in post-injury inflammatory and neuropathic persistent pain-like behaviors by manipulating neurogenesis: pharmacologically through intracerebroventricular infusion of the antimitotic AraC; ablation of AHN by x-irradiation; and using transgenic mice with increased or decreased AHN. Downregulating neurogenesis reversibly diminished or blocked persistent pain; oppositely, upregulating neurogenesis led to prolonged persistent pain. Moreover, we could dissociate negative mood from persistent pain. These results suggest that AHN mediated hippocampal learning mechanisms are involved in emergence of persistent pain.

PMID:26313405

**Chronic pain and suicide**

Aust N Z J Psychiatry. 2015 Sep;49(9):803-11. doi: 10.1177/0004867415569795. Epub 2015 Feb 19.

**The prevalence and correlates of chronic pain and suicidality in a nationally representative sample.**

Campbell G<sup>1</sup>, Darke S<sup>2</sup>, Bruno R<sup>3</sup>, Degenhardt L<sup>2</sup>.  
Author information

Abstract

**BACKGROUND:**

Research suggests that people suffering from chronic pain have elevated rates of suicidality. With an ageing population, more research is essential to gain a better understanding of this association.

**AIMS:**

To document the prevalence and correlates of chronic pain and suicide, and estimate the contribution of chronic pain to suicidality.

**METHOD:**

Data from the 2007 Australian National Survey of Mental Health and Wellbeing, a nationally representative household survey on 8841 people, aged 16-85 years, was analysed.

**RESULTS:**

The odds of lifetime and past 12-month suicidality were two to three times greater in people with chronic pain. Sixty-five percent of people who attempted suicide in the past 12 months had a history of chronic pain. Chronic pain was independently associated with lifetime suicidality after controlling for demographic, mental health and substance use disorders.

**CONCLUSIONS:**

Health care professionals need to be aware of the risk of suicidality in patients with chronic pain, even in the absence of mental health problems.

**KEYWORDS:** Chronic non-cancer pain; prevalence; suicide  
PMID:25698809

### Chronic pain and Marijuana

#### Anesthetic Techniques In Pain Management (D Wang, Section Editor)

Current Pain and Headache Reports  
October 2015, 19:50

#### Medical Marijuana and Chronic Pain: a Review of Basic Science and Clinical Evidence

##### Abstract

Cannabinoid compounds include phytocannabinoids, endocannabinoids, and synthetics. The two primary phytocannabinoids are delta-9-tetrahydrocannabinol (THC) and cannabidiol (CBD), with CB1 receptors in the brain and peripheral tissue and CB2 receptors in the immune and hematopoietic systems. The route of delivery of cannabis is important as the bioavailability and metabolism are very different for smoking versus oral/sublingual routes. Gold standard clinical trials are limited; however, some studies have thus far shown evidence to support the use of cannabinoids for some cancer, neuropathic, spasticity, acute pain, and chronic pain conditions.

Keywords: Medical marijuana Chronic

pain Cannabis Phytocannabinoids Endocannabinoids Neuropathic pain



## Social empathy

### **Brief Report**

Cognitive Therapy and Research

First online: 28 August 2015

### **Social Anxiety and Empathy for Social Pain**

#### **Abstract**

We examined whether dispositional social anxiety influenced empathy for individuals who experience aversive social events. Participants ( $N = 121$ ) were randomly assigned to an experimental condition designed to increase state anxiety via social threat or to a control condition. They then observed videos of target individuals discussing high school events in which they were either socially included or excluded. Both participants and targets rated the emotions the targets felt when discussing those situations. Hierarchical linear modeling revealed that social anxiety was associated with greater accuracy for targets' negative social emotions but only under conditions of social threat. These results suggest that individual differences in social anxiety may influence empathic accuracy for others' social pain.

#### **Keywords**

Social anxiety Empathy Empathy gap Social pain Emotion perception

**Cortical readings**

Eur J Neurosci. 2015 Aug 14. doi: 10.1111/ejn.13043.

**Differential effects of cathodal-tDCS of prefrontal, motor, and somatosensory cortices on cortical excitability and pain perception: a double-blind randomised sham-controlled study.**

Vaseghi B<sup>1</sup>, Zoghi M<sup>2</sup>, Jaberzadeh S<sup>1</sup>.

Author information

**Abstract**

The primary aim was to assess the effects of c-tDCS over cortical regions of the pain neuromatrix, including the primary motor (M1), sensory (S1), and dorsolateral prefrontal (DLPFC) cortices on M1/S1 excitability, sensory (STh), and pain thresholds (PTh) in healthy adults. The secondary aim was to evaluate the placebo effects of c-tDCS on induced cortical and behavioural changes. Before, immediately after, and 30 min after c-tDCS the amplitude of N20-P25 components of somatosensory evoked potentials (SEPs) and peak-to-peak amplitudes of motor evoked potentials (MEPs) were measured under four different experimental conditions. STh and PTh for peripheral electrical and mechanical stimulation were also evaluated. C-tDCS of 0.3 mA was applied for 20 minutes. A blinded assessor evaluated all outcome measures. C-tDCS of M1, S1, and DLPFC significantly decreased the corticospinal excitability of M1 ( $p < 0.05$ ) for at least 30 min. Following the application of c-tDCS over the S1, M1, and DLPFC, the amplitude of the N20-P25 component of SEPs decreased for at least 30 minutes ( $p < 0.05$ ). Compared to baseline values, significant STh and PTh increases were observed after c-tDCS of these three sites. Decreasing the level of S1 and M1 excitability, following S1, M1, and DLPFC stimulation, approved the functional connectivities between these cortical sites involved in pain processing. Furthermore, increasing the level of STh/PTh after c-tDCS of these sites indicated that stimulation of not only M1 but also S1 and DLPFC could be considered as a technique to decrease the level pain in patients in future studies. This article is protected by copyright. All rights reserved.

**KEYWORDS:** Cathodal transcranial direct current stimulation; Motor evoked potential; Pain threshold; Sensory evoked potential; Sensory threshold  
PMID: 26275236

## 61. FIBROMYALGIA

### FM and fitness

Arch Phys Med Rehabil. 2015 Aug 25. pii: S0003-9993(15)01099-0. doi: 10.1016/j.apmr.2015.08.416.

#### **The International Fitness Scale (IFIS): construct validity and reliability in women with fibromyalgia. The al-Ándalus project.**

Álvarez-Gallardo IC<sup>1</sup>, Soriano-Maldonado A<sup>2</sup>, Segura-Jiménez V<sup>2</sup>, Carbonell-Baeza A<sup>3</sup>, Estévez-López F<sup>4</sup>, McVeigh JG<sup>5</sup>, Delgado-Fernández M<sup>2</sup>, Ortega FB<sup>6</sup>.

Author information

Abstract

#### **OBJECTIVE:**

To examine the construct validity of the International Fitness Scale (IFIS, i.e. self-reported fitness) against objectively measured physical fitness in women with fibromyalgia and in healthy women; and study the test-retest reliability of the IFIS in women with fibromyalgia.

#### **DESIGN:**

Cross-sectional study.

#### **SETTING:**

Fibromyalgia patient support groups in Andalusia, southern Spain.

#### **PARTICIPANTS:**

413 women with fibromyalgia and 195 healthy women (controls) for validity purposes and 101 women with fibromyalgia for the reliability study.

#### **INTERVENTION:**

Not applicable.

#### **MAIN OUTCOME MEASURES:**

Fitness level was both self-reported (IFIS) and measured using performance-based fitness tests. For the reliability study the IFIS was completed on two occasions, one week apart.

#### **RESULTS:**

Women with fibromyalgia who reported average fitness had better measured fitness compared with those reporting very poor fitness (all  $p < 0.001$ , except 6-min walk test where  $p < 0.05$ ); with similar trends observed in healthy control women. The test-retest reliability of the IFIS, as measured by the average weighted Kappa, was 0.45.

#### **CONCLUSIONS:**

The IFIS was able to identify women with fibromyalgia who had very low fitness and distinguish them from those with higher fitness levels. Furthermore, the IFIS was moderately reliable in women with fibromyalgia.

**KEYWORDS:** Cardiorespiratory fitness; Chronic pain; Fibromyalgia; Muscle strength; Physical fitness; Self-reported measures

PMID:26319424

**62 A. NUTRITION/VITAMINS****Caffeine and performance**

Med Sci Sports Exerc. 2015 Aug 28.

**Muscle Pain as a Regulator of Cycling Intensity: Effect of Caffeine Ingestion.**

Gonglach AR<sup>1</sup>, Ade CJ, Bembem MG, Larson RD, Black CD.

Author information

**Abstract**

Caffeine ingestion improves endurance time-trial performance. However, the ergogenic mechanism of action remains unresolved. One potential explanation for caffeine's performance enhancing effect is an improvement in work for a given amount of muscle pain.

**PURPOSE:**

To test this hypothesis, participants performed two studies in which they regulated exercise intensity based upon feelings of muscle pain.

**METHODS:**

Thirteen young men were asked to regulate exercise intensity based on feelings of "moderate" muscle pain (a "3" on a 0-10 pain scale). After 3 familiarization trials, either caffeine (~5mg·kg body weight) or placebo were administered prior to a moderate pain trial. Nine caffeine "responders" were re-tested and asked to regulate their exercise intensity at a "strong" pain level (a "5" on a 0-10 pain scale). A caffeine (~5mg·kg body weight) or placebo was again ingested prior to exercise.

**RESULTS:**

Participants performed more work ( $p=0.008$ ) and covered more distance ( $p=0.008$ ) at a higher average power output ( $p=0.009$ ) and  $\dot{V}O_2$  ( $p=0.019$ ), for an identical amount of "moderate" muscle pain in the caffeine condition. When exercising at a rating of a "5" caffeine did not increase total work, distance covered or  $\dot{V}O_2$  for an identical amount of "strong" pain in the 9 caffeine "responders".

**CONCLUSION:**

Our findings indicate caffeine increases work performed during exercise eliciting a moderate amount of a pain. However, a threshold level of muscle pain may exist above which antagonism of adenosine receptors alone does not induce a hypoalgesic effect.

PMID:26322555

**Vit D decreased knee pain and improves quad contraction**

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**Restorative Effect of Vitamin D Deficiency on Knee Pain and Quadriceps Muscle Strength in Knee Osteoarthritis**

Behzad Heidari, Yahya Javadian, Mansour Babaei, Behnaz Yousef Ghahari

## ABSTRACT

Both vitamin D deficiency and quadriceps muscle weakness are associated with knee osteoarthritis (KOA) and pain. The aim of this study was to determine the restorative effect of vitamin D deficiency on pain and quadriceps muscle strength in knee osteoarthritis. Patients with KOA aged  $\geq 30$  years, the presence of knee pain for at least one month or longer and serum 25-hydroxyvitamin (25-OHD) deficiencies were recruited in the study. Participants with KOA compatible with Kellgren-Lawrence grade 4, joint instability, and effusion, history of surgery or inflammatory arthropathies were excluded. Serum 25-OHD was assessed by ELISA method and concentrations  $< 20$  ng/ml was considered deficiency. Quadriceps muscle strength was measured by dynamometry method and intensity of knee pain by Western Ontario and McMaster University Osteoarthritis index scored by Likert scale and visual analog scale. All participants received 50,000 IU oral cholecalciferol weekly for at least two months. The influence of raising serum 25-OHD on quadriceps muscle strength and pain was assessed by calculation of mean changes from baseline at the end of the treatment period using paired t-test. A total of 67 patients with mean age of  $50 \pm 6.6$  years of age were treated for 2 months. Serum 25-OHD reached to sufficient levels in all except one patient. At the end of the study period, serum 25-OHD and quadriceps muscle strength increased significantly as compared with baseline ( $P=0.007$  and  $P=0.002$ , respectively), whereas knee pain decreased significantly based on Western Ontario and McMaster University Osteoarthritis index ( $P=0.001$ ) as well as visual analogue scale scores ( $P=0.001$ ). These findings indicated that correction of vitamin D deficiency in patients with KOA exerts a significant favorable effect on quadriceps muscle strength and knee pain.

**Nutrition and aging**

J Hum Nutr Diet. 2015 Aug 18. doi: 10.1111/jhn.12335.

**Role of fatty acids and micronutrients in healthy ageing: a systematic review of randomised controlled trials set in the context of European dietary surveys of older adults.**

Ruxton CH<sup>1</sup>, Derbyshire E<sup>2</sup>, Toribio-Mateas M<sup>3</sup>.

Author information

Abstract

**BACKGROUND:**

Ageing is a multifaceted and inevitable process involving a decline in health and well-being that could be ameliorated by dietary modification. We review and discuss the evidence for nutritional interventions that may support healthy ageing.

**METHODS:**

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were used to identify randomised controlled trials investigating the role(s) of fatty acids and micronutrients in relation to markers of healthy ageing.

**RESULTS:**

European dietary surveys suggest that diets in elderly people are generally high in saturated fat, whereas intakes of vitamin D, magnesium, potassium, zinc and copper are below recommended levels. Thirty-four studies meeting the criteria were found, with 12 of these investigating the role of fatty acids and 22 considering intakes of micronutrients in relation to healthy ageing. Overall, these studies suggested that certain nutrients were consistent with healthy ageing; for example, omega-3 fatty acids were helpful for cognitive health, whereas combinations of calcium, vitamin D and K were linked with better bone health.

**CONCLUSIONS:**

Vitamin, mineral and fatty acid intakes are in need of improvement to help elderly populations achieve optimal diet quality and support healthy ageing. This could involve the judicious use of supplements alongside dietary advice. Additional research is needed to determine optimal nutrient doses, combinations and forms in relation to desired health outcomes.

**KEYWORDS:** minerals and trace elements; public health; systematic review; vitamins  
PMID: 26286890