

## ABSTRACTS

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## 1. LUMBAR SPINE

### Intraforaminal lig

Spine J. 2016 Apr 6. pii: S1529-9430(16)30018-3. doi: 10.1016/j.spinee.2016.03.048. [Epub ahead of print]

#### **The morphology and clinical significance of the intraforaminal ligaments at the l5-s1 level.**

Zhao Q1, Zhong E1, Shi B2, Li Y2, Sun C3, Ding Z4.

#### **Abstract**

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

The extraforaminal ligaments between the L5-S1 lumbar spinal nerves and the tissues surrounding the intervertebral foramina have been well studied. However, little research has been undertaken to describe the local anatomy of the intraforaminal portion of the L5-S1 spine; detailed anatomic studies of the intraforaminal ligaments of the L5-S1 have not been performed.

##### **PURPOSE:**

The objective of this study was to identify and describe the intraforaminal ligaments in relation to the L5-S1 intervertebral foramen and to determine their clinical significance.

##### **STUDY DESIGN:**

A dissection-based study of 5 embalmed and 5 fresh-frozen human cadavers.

##### **METHODS:**

Twenty L5-S1 intervertebral foramina from 5 embalmed cadavers and 5 fresh cadavers were studied, and the intraforaminal ligaments were identified. The quantity, morphology, origin, insertion and spatial orientation of the intraforaminal ligaments in the L5-S1 region were observed. The length, width, diameter and thickness of the ligaments were measured with a vernier caliper. This study has been supported by grants from the National Natural Science Foundation of China (Grant No.31271286) without potential conflict of interest-associated biases in the text of the manuscript.

##### **RESULTS:**

The intraforaminal ligaments could be found from the entrance zone (inside) to the exit zone (outside) of the L5-S1 intervertebral foramen. These ligaments were found to be of 2 types: a radiating ligament, which connected the nerve root sleeves that radiated to the transverse processes and wall of the intervertebral foramen, and a transforaminal ligament, which connected the structures around the intervertebral foramen. In our study, the radiating ligaments were found more often than the transforaminal ligaments were.

##### **CONCLUSIONS:**

The results demonstrate that intraforaminal ligaments are common structures in the intervertebral foramen, and that there are 2 types of intraforaminal ligaments: the transforaminal ligaments and the radiating ligaments. Transforaminal ligaments may be the potential cause of back pain. The radiating ligaments may contribute to dura laceration and epidural hemorrhage during endoscopic spinal adhesiolysis through the sacral hiatus, and an appreciation of this relationship might help reduce the risk of such complications.

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##### **KEYWORDS:**

Cerebrospinal fluid leakage; Dural tears; Endoscopic spinal adhesiolysis; Intraforaminal ligament; L5-S1 intervertebral foramen; Sacral hiatus

PMID: 27060710

**2. LBP****Exercise intervention****Efficacy of classification-specific treatment and adherence on outcomes in people with chronic low back pain. A one-year follow-up, prospective, randomized, controlled clinical trial**

Linda R. Van Dillen, PT, PhD, FAPT Barbara J. Norton, PT, PhD, FAPTA Shirley A. Sahrman, PT, PhD, FAPTA Bradley A. Evanoff, MD, MPH Marcie Harris-Hayes, PT, MSCI, OCS, DPT Gregory W. Holtzman, PT, DPT Jeanne Earley, PT, MHS Irene Chou, PT, MSPT, OCS Michael J. Strube, PhD

DOI: <http://dx.doi.org/10.1016/j.math.2016.04.003>

**Highlights**

- •Outcomes were similar for the two treatment groups.
- •Both treatments included exercise and performance training to modify functional activities.
- •Both groups adhered more to performance training than to exercise.
- •Adherence to performance training had a unique and independent effect on outcomes above and beyond adherence to exercise.

**Background** It is unknown if low back pain (LBP) outcomes are enhanced by classification-specific treatment based on the Movement System Impairment classification system. The moderating effect of adherence to treatment also is unknown.

**Objectives** Compare the efficacy of a classification-specific treatment (CS) and a non-classification specific (NCs) treatment and examine the moderating effect of adherence on outcomes.

**Design** 2 center, 2 parallel group, prospective, randomized, clinical trial.

**Method** Participants with chronic LBP were classified and randomized. Self-report data was obtained at baseline, post-treatment, and 6 and 12 months post-treatment. The primary outcome was the modified Oswestry Disability Index (mODI; 0-100%). Treatment effect modifiers were exercise adherence and performance training adherence. An intention to treat approach and hierarchical linear modeling were used.

**Results** 47 people received CS treatment, 54 people received NCs treatment. Treatment groups did not differ in mODI scores ( $p > .05$ ). For both groups, scores improved with treatment ( $p < .05$ ), plateaued at 6 months ( $p > .05$ ), and minimally regressed at 12 months ( $p < .05$ ). Performance training adherence had a unique, independent effect on mODI scores above and beyond the effect of exercise adherence ( $p < .05$ ). There were no treatment group effects on the relationship between mODI scores and the two types of adherence ( $p < .05$ ).

**Conclusions** There were no differences in function between the two treatment groups (CS and NCs). In both treatment groups, people with chronic LBP displayed clinically important long-term improvements in function. When both forms of adherence were considered, the improvements were uniquely related to adherence to performance training.

**Keywords:** Classification, Low Back Pain, Adherence

**3. DISC****Diffusion rates**

Spine J. 2016 Apr 6. pii: S1529-9430(16)30016-X. doi: 10.1016/j.spinee.2016.03.046.

**Diffusion characteristics of human annulus fibrosus. - a study documenting the dependence of annulus fibrosus on endplate for diffusion.**

Naresh-Babu J1, Neelima G2, Reshma Begum S3, Siva-Leela V4.

STUDY DESIGN:; In-vivo Human serial post-contrast MRI (Magnetic Resonance image) study.

**OBJECTIVE:**

To document the 24-hour diffusion characteristics of Human Annulus fibrosus.

**SUMMARY OF BACKGROUND DATA:**

Intervertebral disc being avascular, depends on nutrition either from endplate or annulus fibrosus (AF). Role of endplate on disc diffusion had been extensively studied. However diffusion of human AF remains poorly understood due to lack of reliable techniques to study AF in-vivo & non-invasively. Present study for the first time evaluates the 24-hr diffusion characteristics of AF in radial, axial & circumferential directions.

**METHODS:**

25 discs from 5 healthy volunteers (age < 20 yrs) were studied. Diffusion over 24-hours following i.v gadodiamide injection (0.3mmol/kg) was studied at 10min, 2, 4, 6, 12 and 24 hrs. Axial images at cranial, middle and caudal zones of the disc were obtained. Vertebral body and endplate signal intensities were measured in sagittal sections. 39 ROIs (24 in AF, 15 in Nucleus-pulposus) at each disc were analyzed. Peak enhancement percentage (EPmax) and time to attain EPmax (Tmax) were calculated. Radial (outer Vs inner AF), axial (cranial Vs caudal Vs middle zone) and circumferential diffusion were analyzed. (Study received research grant from AOSPINE INDIA 6000USD).

**RESULTS:**

AF showed a biphasic pattern of diffusion with a characteristic "double peak". Early peak was seen at 10mins (coinciding with Tmax of VB) and delayed peak at 6 hrs (coinciding with Tmax of nucleus pulposus) and characteristically noted after Tmax of endplate (2hrs). Inner AF showed significant regional differences both at the early and delayed peaks but outer AF had no regional differences in the early peak. In axial direction, both outer and inner AF showed maximum EP at middle zone followed by caudal and least at cranial zone.

**CONCLUSION:**

Annulus fibrosus characteristically showed a "double peak" pattern of diffusion. Both the peaks had different characteristics confirming two different sources of nutrition. An initial peak was contributed by peri-annular vascularity and delayed one via endplate from vertebral body. The fact that even AF depends on endplate for nutrition, help us to better understand the complex nutritional pathways of inter-vertebral discs.

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**KEYWORDS:**

Annulus fibrosus, diffusion; MRI(magnetic resonance images); nutrition

PMID: 27060711

## 6. PELVIC GIRDLE

### SI fusion

Eur Spine J. 2016 Mar 8.

#### **Sacroiliac joint fusion for low back pain: a systematic review and meta-analysis.**

Lingutla KK<sup>1</sup>, Pollock R<sup>2</sup>, Ahuja S<sup>3</sup>.

Author information

Abstract

#### **BACKGROUND CONTEXT:**

Although pain is generally regarded as originating in the lumbar spine, it has been estimated that in 15-30 % of patients, LBP originates from the sacroiliac joint (SIJ).

#### **PURPOSE:**

To determine whether sacroiliac joint fusion (SIJF) for LBP is effective in reducing pain when the SIJ is known to be the pain generator.

#### **STUDY DESIGN/SETTING:**

Systematic review and meta-analysis.

#### **METHODS:**

A systematic literature review and meta-analysis was performed of observational studies describing outcome of SIJF in patients with LBP. Outcome measures were VAS pain, ODI, SF-36 PCS/MCS and Majeed score. The following databases were searched: PubMed, Web of Science, Embase, Medline and Google scholar. The methodological quality of selected studies was assessed using the National Heart Lung and Blood Institute case series quality assessment tool. Meta-analysis was used to combine the studies for each outcome and forest plots were prepared. Outcomes were expressed as mean difference (MD).

#### **RESULTS:**

Six studies were included in the meta-analysis with a mean follow-up of 17.6 months. All outcomes showed statistical and clinical improvement (VAS pain MD: 54.8; 95 % CI 48.6, 61.0; n = 380; p < 0.001, ODI MD: 14.5; 95 % CI 8.4, 20.6; n = 102; p < 0.001, SF-36 PCS MD: -19.5; 95 % CI -24.7, -14.2; n = 140; p < 0.001, SF-36 MCS MD: -8.5; 95 % CI -12.9, -4.1; n = 198; p < 0.001 and Majeed score MD: -35.4; 95 % CI -48.5, -22.2; n = 140; p < 0.001).

#### **CONCLUSIONS:**

SIJF appears to be a satisfactory procedure for alleviating pelvic girdle pain.

#### **KEYWORDS:**

Fusion; Low back pain; Meta-analysis; Outcome; Pelvic girdle pain; Sacroiliac joint

PMID: 26957096

## 7. PELVIC ORGANS/WOMAN'S HEALTH

### Vit D and fetal health

Am J Clin Nutr. 2016 Apr 20. pii: ajcn123752.

#### **Maternal vitamin D concentrations during pregnancy, fetal growth patterns, and risks of adverse birth outcomes.**

Miliku K<sup>1</sup>, Vinkhuyzen A<sup>2</sup>, Blanken LM<sup>3</sup>, McGrath JJ<sup>2</sup>, Eyles DW<sup>2</sup>, Burne TH<sup>2</sup>, Hofman A<sup>4</sup>, Tiemeier H<sup>5</sup>, Steegers EA<sup>6</sup>, Gaillard R<sup>1</sup>, Jaddoe VW<sup>7</sup>.

#### **BACKGROUND:**

Maternal vitamin D deficiency during pregnancy may affect fetal outcomes.

#### **OBJECTIVE:**

The objective of this study was to examine whether maternal 25-hydroxyvitamin D [25(OH)D] concentrations in pregnancy affect fetal growth patterns and birth outcomes.

#### **DESIGN:**

This was a population-based prospective cohort in Rotterdam, Netherlands in 7098 mothers and their offspring. We measured 25(OH)D concentrations at a median gestational age of 20.3 wk (range: 18.5-23.3 wk). Vitamin D concentrations were analyzed continuously and in quartiles. Fetal head circumference and body length and weight were estimated by repeated ultrasounds, and preterm birth (gestational age <37 wk) and small size for gestational age (less than the fifth percentile) were determined.

#### **RESULTS:**

Adjusted multivariate regression analyses showed that, compared with mothers with second-trimester 25(OH)D concentrations in the highest quartile, those with 25(OH)D concentrations in the lower quartiles had offspring with third-trimester fetal growth restriction, leading to a smaller head circumference, shorter body length, and lower body weight at birth (all  $P < 0.05$ ). Mothers who had 25(OH)D concentrations in the lowest quartile had an increased risk of preterm delivery (OR: 1.72; 95% CI: 1.14, 2.60) and children who were small for gestational age (OR: 2.07; 95% CI: 1.33, 3.22). The estimated population attributable risk of 25(OH)D concentrations <50 nmol/L for preterm birth or small size for gestational age were 17.3% and 22.6%, respectively. The observed associations were not based on extreme 25(OH)D deficiency, but presented within the common ranges.

#### **CONCLUSIONS:**

Low maternal 25(OH)D concentrations are associated with proportional fetal growth restriction and with an increased risk of preterm birth and small size for gestational age at birth. Further studies are needed to investigate the causality of these associations and the potential for public health interventions.

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#### **KEYWORDS:**

25(OH)D; birth weight; fetal growth; pediatrics; pregnancy; preterm birth; small-size for gestational age; vitamin D

PMID: 27099250

### Value of breast milk

#### Research reveals a new secret to the miracle of breast milk

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The Walter and Eliza Hall Institute of Medical Research News, 04/26/2016

**m**ilk production in lactation has been uncovered by researchers at the Walter and Eliza Hall Institute. Their studies have revealed that breast cells develop two nuclei as the breast switches on lactation to nurture the newborn. This change begins to occur in late pregnancy with the generation of vast numbers of cells with two nuclei. The research was led by Professor Jane Visvader, Professor Geoff Lindeman, Dr Anne Rios and Dr Nai Yang Fu, from the institute's ACRF Stem Cells and Cancer Division, and shows that these cells with two nuclei disappear at the cessation of lactation, when breast cells return to a single nucleus state.

It was published in the journal Nature Communications. Using unique 3-D imaging technology Dr Rios and Dr Fu found huge numbers of cells became binucleated – developed a second nucleus – a process that is critical to milk production. Professor Visvader said the process – which lasts only for the duration of lactation – was important for the newborn to thrive when breast milk was the sole nutrient.

## Breast-feeding in premi's

**Impact of optimized breastfeeding on the costs of necrotizing enterocolitis in extremely low birthweight infants**

The Journal of Pediatrics, 04/29/2016 Colaizy TT, et al.

The authors estimate risk of necrotizing enterocolitis (NEC) for extremely low birth weight (ELBW) infants as a function of preterm formula (PF) and maternal milk intake and calculate the impact of suboptimal feeding on the incidence and costs of NEC. Among ELBW infants, not being fed predominantly human milk is associated with an increased risk of NEC. Efforts to support milk production by mothers of ELBW infants may prevent infant deaths and reduce costs.

**Methods**

- The authors used aORs derived from the Glutamine Trial to perform Monte Carlo simulation of a cohort of ELBW infants under current suboptimal feeding practices, compared with a theoretical cohort in which 90% of infants received at least 98% human milk.

**Results**

- NEC incidence among infants receiving  $\geq 98\%$  human milk was 1.3%; 11.1% among infants fed only PF; and 8.2% among infants fed a mixed diet ( $P = .002$ ).
- In adjusted models, compared with infants fed predominantly human milk, they found an increased risk of NEC associated with exclusive PF (aOR = 12.1, 95% CI 1.5, 94.2), or a mixed diet (aOR 8.7, 95% CI 1.2–65.2).
- In Monte Carlo simulation, current feeding of ELBW infants was associated with 928 excess NEC cases and 121 excess deaths annually, compared with a model in which 90% of infants received  $\geq 98\%$  human milk.
- These models estimated an annual cost of suboptimal feeding of ELBW infants of \$27.1 million (CI \$24 million, \$30.4 million) in direct medical costs, \$563 655 (CI \$476 191, \$599 069) in indirect nonmedical costs, and \$1.5 billion (CI \$1.3 billion, \$1.6 billion) in cost attributable to premature death.

## 8. VISCERA

### COX 2 and proton pump

Aliment Pharmacol Ther. 2016 Apr 28. doi: 10.1111/apt.13642.

#### **Systematic review with network meta-analysis: comparative effectiveness and safety of strategies for preventing NSAID-associated gastrointestinal toxicity.**

Yuan JQ<sup>1,2</sup>, Tsoi KK<sup>1,3</sup>, Yang M<sup>4</sup>, Wang JY<sup>5</sup>, Threapleton DE<sup>1,2</sup>, Yang ZY<sup>1,2</sup>, Zou B<sup>4</sup>, Mao C<sup>1,2</sup>, Tang JL<sup>1,2</sup>, Chan FK<sup>3</sup>.

#### **BACKGROUND:**

Many strategies are used to prevent nonsteroidal anti-inflammatory drug (NSAID)-associated gastrointestinal toxicity, but the comparative effectiveness remains unclear.

#### **AIM:**

To evaluate the comparative effectiveness of clinical strategies for preventing gastrointestinal toxicity induced by NSAIDs.

#### **METHODS:**

MEDLINE, EMBASE and the Cochrane Library (from their inception to May 2015) were searched for randomised controlled trials comparing the risk of gastrointestinal adverse events in patients taking nonselective NSAIDs, selective cyclooxygenase(COX)-2 inhibitors or nonselective NSAIDs/COX-2 inhibitors plus gastroprotective agents [proton pump inhibitors (PPIs), histamine-2 receptor antagonists, misoprostol]. Both pairwise meta-analysis and Bayesian network meta-analysis were performed.

#### **RESULTS:**

Analyses were based on 82 trials including 125 053 participants. Network meta-analysis demonstrated that selective COX-2 inhibitors + PPIs [Risk ratio (RR), 95% Credible Interval (CrI): ulcer complications 0.07, 0.02-0.18], selective COX-2 inhibitors (RR, 95% CrI: ulcer complications 0.25, 0.15- 0.38; symptomatic ulcer 0.12, 0.04-0.30), nonselective NSAIDs + PPIs (RR, 95% CrI: ulcer complications 0.28, 0.18-0.41; symptomatic ulcer 0.11, 0.04-0.23), nonselective NSAIDs + misoprostol (RR, 95% CrI: ulcer complications 0.47, 0.24-0.81; symptomatic ulcer 0.41, 0.13-1.00) were associated with significantly lower risk of clinical gastrointestinal events compared with nonselective NSAIDs. For all effectiveness endpoints, selective COX-2 inhibitors + PPIs was associated with the lowest absolute event probability and the highest rank, followed by selective COX-2 inhibitors and thirdly by nonselective NSAIDs + PPIs.

#### **CONCLUSION:**

The combination of selective COX-2 inhibitors plus PPIs provides the best gastrointestinal protection, followed by selective COX-2 inhibitors, and thirdly by nonselective NSAIDs plus PPIs.

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PMID: 27121479

## 10 A. CERVICAL SPINE

### Neck and shoulder pain

Pain. 2016 May;157(5):1114-21. doi: 10.1097/j.pain.0000000000000488.

#### **Long-term patterns of chronic complaints of the arms, neck, and shoulders and their determinants-the Doetinchem Cohort Study.**

van Hulst R1, van Oostrom SH, Ostelo RW, Verschuren WM, Picavet HS.

#### **Author information**

#### **Abstract**

Complaints of the arms, neck, and shoulders (CANS) represent a major public health problem but the long-term course is largely unknown.

Our objective was to explore the 15-year course of chronic CANS and its determinants in a population-based cohort. During 1993 to 2012, 3050 men and women aged 26 to 65 years at baseline were measured every 5 years, up to 4 times. Complaints of the arms, neck, and shoulders and sociodemographic, lifestyle, mental health, and physical load determinants were obtained by self-reported questionnaires and physical examinations. Information on chronic CANS was used to create patterns of the 15-year course: persistence, recovery, variable, no CANS, and the development of CANS. Only 47% were free of chronic CANS throughout the total 15-year period. The prevalence of other patterns was development (18.3%), persistence (8.5%), recovery (7.5%), and variable (18.7%). In multivariable logistic regression analyses, female gender, age 46 to 55 years, being not employed, former smoking, physical inactivity, an episode of CANS during the past 12 months, and high physical load in daily life (eg, often adopting awkward postures, frequent lifting, carrying, pushing, or pulling) were associated with the development of chronic CANS. Female gender, age 36 to 45 years, being not employed, and awkward postures in daily life were associated with persistent CANS. We conclude that chronic CANS represent a dynamic condition and affect the majority of the general population at least once in 15 years.

Determinants associated with chronic CANS, especially physical load in daily life, can be used to develop preventive interventions and give guidance to treatment.

PMID: 26808143

**Exercises for C spine pain****Exercises for mechanical neck disorders: A Cochrane Review Update**

A.R. Gross J.P. Paquin G. Dupont S. Blanchette P. Lalonde T. Cristie N. Graham T.M. Kay S.J. Burnie G. Gelley C.H. Goldsmith M. Forget P.L. Santaguida A.J. Yee G.G. Radisic J.L. Hoving G. Bronfort

DOI: <http://dx.doi.org/10.1016/j.math.2016.04.005>

**Abstract****Background**

Neck pain (NP) is disabling and costly.

**Objectives**

To assess the effectiveness of exercise on pain, disability, function, patient satisfaction, quality of life (QoL) and global perceived effect (GPE) in adults with NP.

**Methods**

We searched computerised databases up to May 2014 for randomised controlled trials (RCTs) comparing exercise to a control in adults with NP with/without cervicogenic headache (CGH) or radiculopathy. Two reviewers independently conducted selection, data abstraction and assessed risk of bias. Meta-analyses were performed to establish pooled standardised mean differences (SMDp). The Grade of Recommendation, Assessment, Development and Evaluation (GRADE) was used to summarise the body of evidence.

**Main Results**

The following exercises (27 trials) were supported by 'Moderate GRADE' evidence:

For chronic NP, 1) cervico-scapulothoracic and upper extremity (UE) strengthening for moderate to large pain reduction immediately post treatment (IP) and at short-term (ST) follow-up; 2) scapulothoracic and UE endurance training for a small pain reduction (IP/ST); 3) cervical, shoulder and scapulothoracic strengthening and stretching exercise for a small to large pain reduction in the long-term (LT) (SMDp -0.45 [95%CI: -0.72 to -0.18]) and function improvement; 4) cervico-scapulothoracic strengthening/stabilisation exercises for pain and function at intermediate-term (IT) (SMDp -14.90 [95%CI: -22.40 to -7.39]). 5) mindfulness exercises (Qigong) for minor improved function but not GPE (ST).

For chronic CGH, cervico-scapulothoracic strengthening and endurance exercises including pressure biofeedback for small/moderate improvement of pain, function and GPE (IP/LT).

**Authors' conclusions**

Specific strengthening exercises of the neck, scapulothoracic and shoulder for chronic NP and chronic CGH are beneficial. Future research should explore optimal dosage.

**Keywords:**

Cochrane Review, meta-analysis, neck pain, exercise

## Classification of NP

Pain. 2016 May;157(5):1028-36. doi: 10.1097/j.pain.0000000000000477.

**Classification of neck/shoulder pain in epidemiological research: a comparison of personal and occupational characteristics, disability, and prognosis among 12,195 workers from 18 countries.**

Sarquis LM<sup>1</sup>, Coggon D, Ntani G, Walker-Bone K, Palmer KT, Felli VE, Harari R, Barrero LH, Felknor SA, Gimeno D, Cattrell A, Vargas-Prada S, Bonzini M, Solidaki E, Merisalu E, Habib RR, Sadeghian F, Kadir MM, Warnakulasuriya SS, Matsudaira K, Nyantumbu B, Sim MR, Harcombe H, Cox K, Marziale MH, Harari F, Freire R, Harari N, Monroy MV, Quintana LA, Rojas M, Harris EC, Serra C, Martinez JM, Delclos G, Benavides FG, Carugno M, Ferrario MM, Pesatori AC, Chatzi L, Bitsios P, Kogevinas M, Oha K, Freimann T, Sadeghian A, Peiris-John RJ, Sathiakumar N, Wickremasinghe AR, Yoshimura N, Kelsall HL, Hoe VC, Urquhart DM, Derrett S, McBride D, Herbison P, Gray A, Salazar Vega EJ.

## Author information

## Abstract

To inform case definition for neck/shoulder pain in epidemiological research, we compared levels of disability, patterns of association, and prognosis for pain that was limited to the neck or shoulders (LNSP) and more generalised musculoskeletal pain that involved the neck or shoulder(s) (GPNS).

Baseline data on musculoskeletal pain, disability, and potential correlates were collected by questionnaire from 12,195 workers in 47 occupational groups (mostly office workers, nurses, and manual workers) in 18 countries (response rate = 70%). Continuing pain after a mean interval of 14 months was ascertained through a follow-up questionnaire in 9150 workers from 45 occupational groups. Associations with personal and occupational factors were assessed by Poisson regression and summarised by prevalence rate ratios (PRRs). The 1-month prevalence of GPNS at baseline was much greater than that of LNSP (35.1% vs 5.6%), and it tended to be more troublesome and disabling. Unlike LNSP, the prevalence of GPNS increased with age. Moreover, it showed significantly stronger associations with somatising tendency (PRR 1.6 vs 1.3) and poor mental health (PRR 1.3 vs 1.1); greater variation between the occupational groups studied (prevalence ranging from 0% to 67.6%) that correlated poorly with the variation in LNSP; and was more persistent at follow-up (72.1% vs 61.7%).

Our findings highlight important epidemiological distinctions between subcategories of neck/shoulder pain. In future epidemiological research that bases case definitions on symptoms, it would be useful to distinguish pain that is localised to the neck or shoulder from more generalised pain that happens to involve the neck/shoulder region.

PMID: 26761390

**12 A. WHIPLASH****Trigeminal involvement**

Headache. 2016 Apr 19. doi: 10.1111/head.12805.

**The Role of the Trigemino Cervical Complex in Chronic Whiplash Associated Headache: A Cross Sectional Study.**

Watson DH<sup>1</sup>, Drummond PD<sup>1</sup>.

**OBJECTIVE:**

To investigate signs of central sensitization in a cohort of patients with chronic whiplash associated headache (CWAH).

**BACKGROUND:**

Central sensitization is one of the mechanisms leading to chronicity of primary headache, and thus might contribute to CWAH. However, the pathophysiological mechanism of CWAH is poorly understood and whether it is simply an expression of the primary headache or has a distinct pathogenesis remains unclear. Thus, the factors involved in the genesis of CWAH require further investigation.

**METHODS:**

Twenty-two patients with CWAH (20 females, 2 males; age 25-50 years, mean age 36.3 years) and 25 asymptomatic participants (13 females, 12 males; age 18-50 years, mean age 35.6 years) rated glare and light-induced discomfort in response to light from an ophthalmoscope. Hyperalgesia evoked by a pressure algometer was assessed bilaterally on the forehead, temples, occipital base, and the middle phalanx of the third finger. The number, latency, area under the curve, and recovery cycle of nociceptive blink reflexes elicited by a supraorbital electrical stimulus were also recorded.

**RESULTS:**

Eight and 6 CWAH patients had migrainous and tension-type headache (TTH) profiles, respectively; the remainder had features attributable to both migraine and TTH. Patients in the whiplash group reported significantly greater light-induced pain than controls ( $8.48 \pm .35$  vs  $6.66 \pm .43$  on a 0-10 scale;  $P = .001$ ). The CWAH patients reported significantly lower pressure pain thresholds at all sites. For stimuli delivered at 20 second intervals, whiplash patients were more responsive than controls ( $4.8 \pm .6$  blinks vs  $3.0 \pm .6$  blinks in a block of 10 stimuli;  $P = .036$ ). While R2 latencies and the area under the curve for the 20 second interval trials were comparable in both groups, there was a significant reduction of the area under the curve from the first to the second of the 2-second interval trials only in controls ( $99 \pm 8\%$  of baseline in whiplash patients vs  $68 \pm 7\%$  in controls;  $P = .009$ ). The recovery cycle was comparable for both groups.

**CONCLUSIONS:**

Our results corroborate previous findings of mechanical hypersensitivity and photophobia in CWAH patients. The neurophysiological data provide further evidence for hyperexcitability in central nociceptive pathways, and endorse the hypothesis that CWAH may be driven by central sensitization.

**KEYWORDS:**

central sensitization; chronic whiplash associated headache; migraine; nociceptive blink reflex; photophobia; recovery cycle; sensory hyperalgesia; tension-type headache; whiplash

PMID: 27091393

**Measurement of**

*Eur Spine J.* 2016 Apr 4.

**Confirmatory factor analysis of the neck disability index, comparing patients with whiplash associated disorders to a control group with non-specific neck pain.**

Gabel CP<sup>1</sup>, Cuesta-Vargas A<sup>2</sup>, Barr S<sup>3</sup>, Black SW<sup>3</sup>, Osborne JW<sup>4</sup>, Melloh M<sup>5,6</sup>.

**Purpose** The neck disability index (NDI) as a 10-item patient reported outcome (PRO) measure is the most commonly used whiplash associated disorders (WAD) assessment tool. However, statistical rigor and factor structure are not definitive. To date, confirmatory factor analysis (CFA) has not examined whether the factor structure generalizes across different groups (e.g., WAD versus non-WAD). This study aimed to determine the psychometric properties of the NDI in these population groups.

***METHODS:***

This study used CFA to analyze NDI baseline-data for WAD (n = 804; 69 % females) and non-WAD (n = 963; 67 % females), each for the full sample and separate genders. Invariance analyses examined the NDI structure across the four groups.

***RESULTS:***

Across both populations and gender subgroups the one-factor solutions consistently showed better model fit over two-factor solutions. The NDI was best characterized as one-dimensional and invariant across multiple sub-groups.

***CONCLUSION:***

The NDI remains a valid PRO in WAD populations that provides acceptable measurement of neck status that is appropriate for basic functional assessment across genders. However, it is recommended that both clinicians and researchers initiate the transition toward more rigorous and less ambiguous PRO measurement tools for WAD patients and research. This future graduated movement toward other PROs should consider both regional PROs and computerized decision support systems, initially measured concurrently with the NDI to establish ways to convert existing scored data prior to their singular use.

***KEYWORDS:***

Clinimetrics; Factor Analysis; Neck Pain; Neck disability index; Whiplash

PMID: 27040281

### 13. CRANIUM/TMJ

#### Dentures and postural sway

*J Oral Rehabil.* 2016 Apr 15. doi: 10.1111/joor.12400.

**The effect of denture installation at mandibular rest position on unsteady motion of the centre of pressure in postural sway.**

Yoshino N<sup>1</sup>, Nozaki K<sup>2</sup>, Maeda Y<sup>1</sup>.

Wearing dentures has been believed to decrease the instability of the postural sway using the total length of centre of pressure (CoP) trajectory or the magnitude of its variability.

However, the physical aspects of the postural sway have not been taken into account while evaluating the CoP in patients who wear dentures. The CoP fluctuations are found to show a random walk process. Therefore, changes in the random movement of CoP caused by wearing dentures should be examined by nonlinear dynamics that enables analysis of the characteristics found in the random movement. We evaluated the effect of complete denture installation on CoP sway for twenty-six edentulous patients by performing the following steps. First, we excluded subjects who did not show crossover in spectral analyses. Then, we evaluated the spectral characteristics and phase shifts of the velocities of CoP sway for the subjects who showed crossover. We found that wearing complete dentures decreased the fluctuations in the high-frequency part of the power spectral density (PSD) and the phase shift in the mediolateral direction.

On the other hand, we also found that the use of complete dentures decreased the fluctuations of PSD amplitude in the anteroposterior direction. From the point of view of the kinetic energy of the musculoskeletal system, we suggested that the use of complete dentures could reduce the energy consumption for the standing posture.

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**KEYWORDS:**

accidental falls; behaviour and behaviour mechanisms; body sway; nonlinear biomechanics; posture; prosthodontics

PMID: 27084494

**Second hand smoke and oral health**

Nicotine Tob Res. 2016 Apr 15. pii: ntw105.

**Systematic Review and Meta-analysis of the Association Between Exposure to Environmental Tobacco Smoke and Periodontitis Endpoints Among Nonsmokers.**

Akingugbe AA<sup>1</sup>, Slade GD<sup>2</sup>, Divaris K<sup>3</sup>, Poole C<sup>4</sup>.

**OBJECTIVE:**

A systematic review was conducted to summarize the epidemiological evidence on environmental tobacco smoke (ETS) exposure and prevalent periodontitis endpoints among nonsmokers.

**METHODS:**

We searched PubMed, EMBASE, Web of Science, Pro-Quest dissertations, and conference proceedings of a dental research association. We included studies from which prevalence odds ratios (POR) could be extracted for periodontitis determined by examiner measurements of clinical attachment level (CAL) and/or probing pocket depth (PD) or self-report of missing teeth. Studies determined ETS exposure by self-report or biomarker (cotinine) levels.

**RESULTS:**

For studies reporting CAL and/or PD (n = 6), associations were stronger with cotinine-measured exposure (n = 3; random effects POR [95% prediction interval] = 1.63 (0.90, 2.96)) than self-reported exposure (n = 3; random effects POR = 1.15 (0.68, 1.96)). There was no meaningful difference in summary estimate for studies reporting CAL and/or PD endpoint (n = 6; random effects POR = 1.34 (0.93, 1.94)) as opposed to tooth loss (n = 2; random effects POR = 1.33 (0.52, 3.40)).

**CONCLUSIONS:**

There appears to be a positive association between exposure to ETS and prevalent periodontitis endpoints among nonsmokers, the magnitude of which depended mostly on the method of ETS assessment.

**IMPLICATIONS:**

The notoriety of ETS is often discussed in terms of its associations with cancer, chronic conditions like cardiovascular diseases, and respiratory illnesses in children. However, very little attention is paid to its association with oral diseases, especially periodontitis. Periodontitis affects a large proportion of the population and is a major cause of tooth loss. This study summarized the epidemiologic association between exposure to ETS and periodontitis among nonsmokers. Although the findings are consistent with a positive association, methodological weaknesses relating to study design, assessment of ETS, periodontitis, and adjustment covariates were highlighted and recommendations for improvement in future studies provided.

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PMID: 27083214

## Oral health and CV disease

Endod. 2016 Apr 16. pii: S0099-2399(16)30100-5. doi: 10.1016/j.joen.2016.03.011

**Association of Radiographically Diagnosed Apical Periodontitis and Cardiovascular Disease: A Hospital Records-based Study.**

An GK<sup>1</sup>, Morse DE<sup>2</sup>, Kunin M<sup>3</sup>, Goldberger RS<sup>3</sup>, Psoter WJ<sup>2</sup>.

**INTRODUCTION:**

Numerous studies have demonstrated an association between oral health status and systemic diseases. However, reports examining apical periodontitis (AP) and cardiovascular disease (CVD) are few. This study investigates whether an association exists between AP and CVD.

**METHODS:**

The present study was a pair-matched, cross-sectional design that used medical and dental chart review. The AP group (n = 182) was defined as subjects with radiographic AP, and the non-AP group (n = 182) was defined as subjects without any radiographic AP. Samples for both groups were pair-matched by age and gender. Diagnosis for CVD, hypercholesterolemia, hypertension, and diabetes were identified by using International Classification of Diseases, Ninth Revision, Clinical Modification and collected from electronic medical records. Documentation of alcohol use, smoking, race, and body mass index within the electronic medical records was also collected. Presence or absence of AP, missing teeth, teeth with root canal treatment, caries experience, and history of periodontal disease were collected from the electronic dental records. Analysis was performed by using Pearson  $\chi^2$ , the paired t test, and conditional multivariate logistic regression.

**RESULTS:**

AP was significantly associated with CVD, hypercholesterolemia, race, missing teeth, caries experience, and number of root canal treatments in our bivariate analysis. Our final adjusted conditional logistic regression model showed statistically significant positive associations between AP and CVD (odds ratio, 5.3; 95% confidence interval, 1.5-18.4).

**CONCLUSIONS:**

Subjects with AP were more likely to have CVD than subjects without AP by 5.3-fold. However, further research is needed to elucidate temporality and reinforce association between CVD and AP.

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**KEYWORDS:**

Apical periodontitis; cardiovascular disease; endodontics; root canal treatment; systemic disease

PMID: 27091354

**Burning mouth syndrome**

*Cephalalgia*. 2016 Apr 27. pii: 0333102416646769.

**Role of psychological factors in burning mouth syndrome: A systematic review and meta-analysis.**

Galli F<sup>1</sup>, Lodi G<sup>2</sup>, Sardella A<sup>2</sup>, Vegni E<sup>3</sup>.

***BACKGROUND:***

Burning mouth syndrome (BMS) is a chronic medical condition characterised by hot, painful sensations in the lips, oral mucosa, and/or tongue mucosa. On examination, these appear healthy, and organic causes for the pain cannot be found. Several studies have yielded scant evidence of the involvement of psychological and/or psychopathological factors, and several have outlined a model for the classification of BMS.

***AIM:***

This review aims to provide a systematic review of research examining the psychological, psychiatric, and/or personality factors linked to BMS.

***FINDINGS:***

Fourteen controlled studies conducted between 2000 and the present were selected based on stringent inclusion/exclusion criteria. All studies but one reported at least some evidence for the involvement of psychological factors in BMS. Anxiety and depression were the most common and the most frequently studied psychopathological disorders among BMS patients.

***DISCUSSION AND CONCLUSION:***

Anxiety and depression play critical roles in this condition. Evidence on the role of personality characteristics of BMS patients has also been produced by a few studies. Further studies on the role of specific psychological factors in BMS are warranted, but the importance of a multidisciplinary approach (medical and psychological) to BMS is no matter of discussion.

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***KEYWORDS:***

Burning mouth syndrome; anxiety; depression; personality; psychological disorder; systematic review

PMID: 27121358

## 14. HEADACHES

### Brain connectivity and HA

*J Headache Pain.* 2016 Dec;17(1):38. doi: 10.1186/s10194-016-0636-7. Epub 2016 Apr 18.

#### **Multi-frequency analysis of brain connectivity networks in migraineurs: a magnetoencephalography study.**

Zhou Y<sup>1</sup>, Xiang J<sup>2</sup>, Tang L<sup>1</sup>, Liu H<sup>1</sup>, Huang S<sup>1</sup>, Wu T<sup>3</sup>, Chen Q<sup>3</sup>, Wang X<sup>4</sup>.

#### **BACKGROUND:**

Although alterations in resting-state neural network have been previously reported in migraine using functional MRI, whether this atypical neural network is frequency dependent remains unknown. The aim of this study was to investigate the alterations of the functional connectivity of neural network and their frequency specificity in migraineurs as compared with healthy controls by using magnetoencephalography (MEG) and concepts from graph theory.

#### **METHODS:**

Twenty-three episodic migraine patients with and without aura, during the interictal period, and 23 age- and gender-matched healthy controls at resting state with eye-closed were studied with MEG. Functional connectivity of neural network from low (0.1-1 Hz) to high (80-250 Hz) frequency ranges was analyzed with topographic patterns and quantified with graph theory.

#### **RESULTS:**

The topographic patterns of neural network showed that the migraineurs had significantly increased functional connectivity in the slow wave (0.1-1 Hz) band in the frontal area as compared with controls. Compared with the migraineurs without aura (MwoA), the migraineurs with aura (MwA) had significantly increased functional connectivity in the theta (4-8 Hz) band in the occipital area. Graph theory analysis revealed that the migraineurs had significantly increased connection strength in the slow wave (0.1-1 Hz) band, increased path length in the theta (4-8 Hz) and ripple (80-250 Hz) bands, and increased clustering coefficient in the slow wave (0.1-1 Hz) and theta (4-8 Hz) bands. The clinical characteristics had no significant correlation with interictal MEG parameters.

#### **CONCLUSIONS:**

Results indicate that functional connectivity of neural network in migraine is significantly impaired in both low- and high-frequency ranges. The alteration of neural network may imply that migraine is associated with functional brain reorganization.

#### **KEYWORDS:**

Functional connectivity; Graph theory; Magnetoencephalography (MEG); Migraine; Multi-frequency; Neural network

PMID: 27090418

## Cluster onset

*J Headache Pain*. 2016 Dec;17(1):44. doi: 10.1186/s10194-016-0626-9. Epub 2016 Apr 22.

**Age of onset of episodic and chronic cluster headache - a review of a large case series from a single headache centre.**

Manzoni GC<sup>1</sup>, Taga A<sup>2</sup>, Russo M<sup>3</sup>, Torelli P<sup>2</sup>.

**BACKGROUND:**

In the largest case series of cluster headache (CH) published in the literature, age of onset varies between 29.6 and 31.6 years. Differences in onset age based on gender and subtype diagnosis are reported, while there are only few data on patients with childhood and elderly onset. We therefore deemed it useful to review our own large case series of CH patients.

**METHODS:**

The age of onset of cluster headache was investigated in a consecutive case series of 808 patients (585 men and 223 women), including 686 (503 men and 183 women) with episodic cluster headache (ECH), 103 (66 men and 37 women) with chronic cluster headache (CCH), and 19 with an indeterminate form of CH (16 men and three women).

**RESULTS:**

The mean age of onset was  $30.2 \pm 13.8$  years ( $30.1 \pm 13.0$  in men and  $30.4 \pm 15.7$  in women). The women with primary CCH had a mean onset age of  $42.8 \pm 21.7$  years, while the women with secondary CCH did not differ much from those with ECH. Distribution of the study subjects by decades of onset age showed a peak in the third decade both in men and in women, but when only CCH patients were considered it displayed a more marked bimodal pattern in women (with peaks in the second and the sixth decade) than men (with peaks in the third and the fifth decade). The clear male predominance in cases with onset in the central age groups became attenuated in the extreme age groups. In patients with onset between  $\leq 15$  years and  $\geq 50$  years, the traditional male-to-female ratio was actually inverted in CCH.

**CONCLUSIONS:**

Based on these epidemiological findings, it would be important to investigate the possible role, causative or protective, played by hormonal factors in CH pathogenesis.

PMID: 27102121

## 15. VESTIBULAR

### Balance disorders

*Man Ther.* 2016 Apr;22:122-30. doi: 10.1016/j.math.2015.10.017. Epub 2015 Nov 26.

#### **Balance, dizziness and proprioception in patients with chronic whiplash associated disorders complaining of dizziness: A prospective randomized study comparing three exercise programs.**

Treleaven J<sup>1</sup>, Peterson G<sup>2</sup>, Ludvigsson ML<sup>3</sup>, Kammerlind AS<sup>4</sup>, Peolsson A<sup>5</sup>.

#### **BACKGROUND:**

Dizziness and unsteadiness are common symptoms following a whiplash injury.

#### **OBJECTIVE:**

To compare the effect of 3 exercise programs on balance, dizziness, proprioception and pain in patients with chronic whiplash complaining of dizziness.

#### **DESIGN:**

A sub-analysis of a randomized study.

#### **METHODS:**

One hundred and forty subjects were randomized to either a physiotherapist-guided neck-specific exercise (NSE), physiotherapist-guided neck-specific exercise, with a behavioural approach (NSEB) or prescription of general physical activity (PPA) group. Pre intervention, 3, 6 and 12 months post baseline they completed the University of California Los Angeles Dizziness Questionnaire (UCLA-DQ), Visual Analogue Scales (VAS) for, dizziness at rest and during activity and physical measures (static and dynamic clinical balance tests and head repositioning accuracy (HRA)).

#### **RESULTS:**

There were significant time by group differences with respect to dizziness during activity and UCLA-Q favouring the physiotherapy led neck specific exercise group with a behavioural approach. Within group analysis of changes over time also revealed significant changes in most variables apart from static balance.

#### **CONCLUSION:**

Between and within group comparisons suggest that physiotherapist led neck exercise groups including a behavioural approach had advantages in improving measures of dizziness compared with the general physical activity group, although many still complained of dizziness and balance impairment. Future studies should consider exercises specifically designed to address balance, dizziness and cervical proprioception in those with persistent whiplash.

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#### **KEYWORDS:**

Balance; Dizziness; Proprioception; Whiplash

PMID: 26678652

## 16. CONCUSSIONS

### Assessment tools

*Sports Health*. 2016 Mar 28. pii: 1941738116641394.

#### **A Practical Concussion Physical Examination Toolbox: Evidence-Based Physical Examination for Concussion.**

Matuszak JM<sup>1</sup>, McVige J<sup>2</sup>, McPherson J<sup>3</sup>, Willer B<sup>4</sup>, Leddy J<sup>4</sup>.

#### **CONTEXT:**

With heightened awareness of concussion, there is a need to assess and manage the concussed patient in a consistent manner. Unfortunately, concussion physical examination has not been standardized or supported by evidence. Important questions remain about the physical examination.

#### **EVIDENCE ACQUISITION:**

Review of ClinicalKey, Cochrane, MEDLINE, and PubMed prior to July 2015 was performed using search terms, including concussion, mTBI, physical examination, mental status, cranial nerves, reflexes, cervical, vestibular, and oculomotor. The references of the pertinent articles were reviewed for other relevant sources.

#### **STUDY DESIGN:**

Clinical review.

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

Level 3.

#### **RESULTS:**

The pertinent physical examination elements for concussion include evaluation of cranial nerves, manual muscle testing, and deep tendon reflexes; inspecting the head and neck for trauma or tenderness and cervical range of motion; Spurling maneuver; a static or dynamic balance assessment; screening ocular examination; and a mental status examination that includes orientation, immediate and delayed recall, concentration, mood, affect, insight, and judgment. Other examination elements to consider, based on signs, symptoms, or clinical suspicion, include testing of upper motor neurons, cervical strength and proprioception, coordination, pupillary reactivity, and visual acuity; examination of the jaw, temporomandibular joint, and thoracic spine; fundoscopic evaluation; orthostatic vital signs; assessment of dynamic visual acuity; and screening for depression, anxiety, substance abuse disorders, and preinjury psychiatric difficulties.

#### **CONCLUSION:**

Various elements of the physical examination, such as screening ocular examination, cervical musculoskeletal examination, static and/or dynamic balance assessment, and mental status examination, appear to have utility for evaluating concussion; however, data on validity are lacking.

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#### **KEYWORDS:**

concussion; mTBI; physical examination

PMID: 27022058

**In the military**

*Curr Pain Headache Rep.* 2016 Jun;20(6):37. doi: 10.1007/s11916-016-0572-x.

**Concussion in the Military: an Evidence-Base Review of mTBI in US Military Personnel Focused on Posttraumatic Headache.**

Holtkamp MD<sup>1,2</sup>, Grimes J<sup>3,4</sup>, Ling G<sup>3,4,5</sup>.

Traumatic brain injury (TBI) is defined as an alteration in brain function caused by an external force. Mild TBI or concussion is now well recognized to be a risk of military service as well as participation in athletic sports such as football.

Posttraumatic headache (PTH) is the most common symptom after mTBI in US service members. PTH most commonly presents with migraine-like headache features. The following is an overview of the epidemiology, pathophysiology, clinical course, prognosis, complications, and treatment of mTBI and associated comorbidities with a focus on PTH. There is a particular emphasis on emerging evidence-based clinical practice. One important medical consequence of the recognition that mTBI is a highly prevalent among military service members is that the Department of Defense (DoD) is dedicating significant financial and intellectual resources to better understanding and developing treatments for TBI. The identification of the importance of TBI among the US military population has had the added benefit of increasing awareness of this condition among civilian populations, particularly those engaged in both professional and youth sports. The NIH and NSF are also supporting important TBI research. President Obama's Brain Initiative is also providing additional impetus for these efforts. Unfortunately, the understanding of the acute and chronic effects of mTBI on the brain remains limited.

Gratefully, there is hope that through innovative research, there will be advances in elucidating the underlying pathophysiology, which will lead to clinical and prognostic indicators, ultimately resulting in new treatment options for this very complicated set of disorders.

**KEYWORDS:**

Assessment; Concussion; Headache; Headache disorder; Management; Migraine; Military personnel; Posttraumatic headache; Traumatic brain injury; Treatment; mTBI

PMID: 27084376

**Neuropsychological assessment**

*Curr Pain Headache Rep.* 2016 Jun;20(6):38. doi: 10.1007/s11916-016-0571-y.

**Neuropsychological Assessment Following Concussion: an Evidence-Based Review of the Role of Neuropsychological Assessment Pre- and Post-Concussion.**

Kontos AP<sup>1</sup>, Sufrinko A<sup>2</sup>, Womble M<sup>2</sup>, Kegel N<sup>2</sup>.

Neuropsychological evaluation is one component of a comprehensive and multifaceted assessment following concussion. Although some neuropsychologists use a "hybrid" assessment approach integrating computerized neurocognitive testing batteries with traditional paper and pencil tests, computerized neurocognitive test batteries are the predominant testing modality for assessment of athletes from the youth to professional level.

This review summarizes the most recent research supporting the utility of neuropsychological evaluation and highlights the strengths and weaknesses of both computerized and traditional neuropsychological testing approaches. The most up to date research and guidelines on baseline neurocognitive testing is also discussed.

This paper addresses concerns regarding reliability of neuropsychological testing while providing an overview of factors that influence test performance, both transient situational factors (e.g., pain level, anxiety) and characteristics of particular subgroups (e.g., age, preexisting learning disabilities), warranting the expertise of an experienced neuropsychologist for interpretation. Currently, research is moving forward by integrating neuropsychological evaluation with emerging assessment approaches for other domains of brain function (e.g., vestibular function) vulnerable to concussion.

**KEYWORDS:**

Baseline; Computerized assessment battery; Concussion; Neurocognitive tests; Neuropsychological evaluation; Sport

PMID: 27099226

**20 A. ROTATOR CUFF****Assessment of****Rotator cuff related shoulder pain: Assessment, management and uncertainties**

Jeremy Lewis

DOI: <http://dx.doi.org/10.1016/j.math.2016.03.009>**Abstract****Introduction**

Rotator cuff related shoulder pain (RCRSP) is an over-arching term that encompasses a spectrum of shoulder conditions including; subacromial pain (impingement) syndrome, rotator cuff tendinopathy, and symptomatic partial and full thickness rotator cuff tears. For those diagnosed with RCRSP one aim of treatment is to achieve symptom free shoulder movement and function. Findings from published high quality research investigations suggest that a graduated and well-constructed exercise approach confers at least equivalent benefit as that derived from surgery for; subacromial pain (impingement) syndrome, rotator cuff tendinopathy, partial thickness rotator cuff (RC) tears and atraumatic full thickness rotator cuff tears. However considerable deficits in our understanding of RCRSP persist. These include; (i) cause and source of symptoms, (ii) establishing a definitive diagnosis, (iii) establishing the epidemiology of symptomatic RCRSP, (iv) knowing which tissues or systems to target intervention, and (v) which interventions are most effective.

**Purpose**

The aim of this masterclass is to address a number of these areas of uncertainty and it will focus on; (i) RC function, (ii) symptoms, (iii) aetiology, (iv) assessment and management, (v) imaging, and (vi) uncertainties associated with surgery.

**Implications**

Although people experiencing RCRSP should derive considerable confidence that exercise therapy is associated with successful outcomes that are comparable to surgery, outcomes may be incomplete and associated with persisting and recurring symptoms. This underpins the need for ongoing research to; better understand the aetiology, improve methods of assessment and management, and eventually prevent these conditions.

*Keywords:*[Rotator cuff](#), [Shoulder pain](#), [Assessment](#), [Management](#)

**25. WRIST AND HAND****Compartment syndrome**

*J Hand Surg Am.* 2016 Apr 23. pii: S0363-5023(16)30004-1. doi: 10.1016/j.jhsa.2016.03.010.

**Spontaneous Extensor Carpi Ulnaris Compartment Syndrome.**

Stewart SK<sup>1</sup>, Singleton JA<sup>2</sup>.

We report a case of isolated compartment syndrome within the extensor carpi ulnaris (ECU) compartment in the forearm of a 40-year-old diabetic man.

Magnetic resonance imaging of his forearm showed isolated changes in the ECU muscle belly; compartment syndrome was confirmed on manometry. In view of the short history of symptoms and his diabetic status, the patient was managed conservatively. Twenty-four hours after onset of the symptoms, the pain and swelling resolved and he was able to be discharged. To date, 3 cases of ECU compartment syndrome secondary to trauma have been reported.

This report illustrates a case of confirmed compartment syndrome without antecedent trauma, highly unusual in terms of both its etiology and its anatomical location.

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**KEYWORDS:**

Compartment pressure; compartment syndrome; extensor carpi ulnaris; forearm; spontaneous compartment syndrome

PMID: 27118391

**26. CARPAL TUNNEL SYNDROME****Carpel Tunnel CPR**

*J Orthop Sports Phys Ther.* 2016 Mar 23:1-28.

**Prediction of Outcome in Women With Carpal Tunnel Syndrome Who Receive Manual Physical Therapy Interventions: A Validation Study.**

Fernández-de-Las-Peñas C<sup>1,2</sup>, Cleland JA<sup>3,4</sup>, Salom-Moreno J<sup>1,2</sup>, Palacios-Ceña M<sup>1</sup>, Martínez-Perez A<sup>5</sup>, Pareja JA<sup>5</sup>, Ortega-Santiago R<sup>1,2</sup>.

Study Design Prospective cohort study.

Background A clinical prediction rule to identify patients with carpal tunnel syndrome (CTS) most likely to respond to manual physical therapy has been published but requires further testing to determine its validity.

Objective To assess the validity of a clinical prediction rule proposed for the management of patients with CTS in a different group of patients with a variety of treating clinicians.

Methods A preplanned secondary analysis of a randomized controlled trial investigating the efficacy of manual physical therapies including desensitization manoeuvres of the central nervous system in 120 women suffering from CTS was performed. Patients were randomized to receive 3 sessions of manual physical therapy (n=60) or surgical release/decompression of the carpal tunnel (n=60). Self-perceived improvement with a Global Rating of Change (GROC) was recorded at 6 and 12 months follow-up. Pain intensity (mean pain and the worst pain, NPRS 0-10), and Boston Carpal Tunnel Questionnaire (functional status and symptoms severity scales), were assessed at baseline, and 1, 3, 6, and 12 months. Status on the clinical prediction rule (responders were those who met at least 2 of the following criteria: PPT over the affected C5-C6 joint <137kPa; HPT over the affected carpal tunnel <39.6°C, and general health > 66 points) was measured at baseline. Different linear mixed model with repeated measures were used to examine the validity of the rule.

Results Women with a positive status on the rule who received manual physical therapy did not experience greater improvements compared to those with a negative status on the rule for: mean pain (P=0.65), worst pain (P=0.86), function (P=0.99) or symptoms severity (P=0.85). Further, the clinical prediction rule performed no better than chance in identifying individual with CTS most likely to respond to manual physical therapy or surgery (mean pain, P=0.87; worst pain, P=0.91; function, P=0.60; severity P=0.66). No differences in self-perceived improvement was observed at either 6 (P=0.67) or 12 (P=0.37) months according to the rule.

Conclusions The results of this study did not support the validity of the previously developed clinical prediction rule for manual physical therapy in women with CTS. Level of Evidence Prognosis, Level 1b. *J Orthop Sports Phys Ther*, Epub 23 Mar 2016.  
doi:10.2519/jospt.2016.6348.

**KEYWORDS:**

carpal tunnel syndrome; clinical prediction rule validation; prospective cohort

### Obesity and increased symptoms

#### **Associations between body anthropometric measures and severity of carpal tunnel syndrome**

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Archives of Physical Medicine and Rehabilitation, 04/28/2016 Mondelli M, et al.

**T**he aim of this study is to assess the associations between carpal tunnel syndrome (CTS) severity and selected anthropometric and obesity indexes.

Different configurations of the body and, in particular, the hand and wrist system may influence the occurrence and severity of CTS. Multiple obesity indexes, possibly including waist–stature ratio, should be considered when investigating the association between body composition and CTS.

Future studies should determine whether in obese subjects with CTS the weight and waist circumference loss may produce an improvement in CTS symptoms and recovery of distal conduction velocity of the median nerve.

**32 A. KNEE/ACL****Hamstring changes**

*Arthroscopy*. 2016 Apr 8. pii: S0749-8063(16)00071-2. doi: 10.1016/j.arthro.2016.01.041.

**Hamstring Activity in the ACL Injured Patient: Injury Implications and Comparison With Quadriceps Activity.**

Frank RM<sup>1</sup>, Lundberg H<sup>2</sup>, Wimmer MA<sup>2</sup>, Forsythe B<sup>2</sup>, Bach BR Jr<sup>2</sup>, Verma NN<sup>2</sup>, Cole BJ<sup>2</sup>.

**PURPOSE:**

To investigate the potential causes of diminished knee extension after acute anterior cruciate ligament (ACL) injury using both surface electromyography (sEMG) analysis of the quadriceps and hamstrings, and gait analysis to assess muscle action and tone.

**METHODS:**

Consecutive patients with an acute ACL tear underwent sEMG and gait analysis within 2 weeks of injury, before ACL reconstruction. Standard motion analysis techniques were used and sEMG data were collected simultaneously with gait data. T-tests were used to determine differences between the ACL-deficient and control subjects in knee flexion angles, peak external knee joint moments, and total time that a muscle was activated ("on") during gait. External knee moments were expressed as a percentage of body weight times height.

**RESULTS:**

Ten patients (mean age  $24 \pm 4$  years) were included at a mean 10.2 days between injury and analysis; 10 uninjured, matched control subjects were included for comparison. There were significant increases in minimum flexion angle at heel strike ( $5.92 \pm 3.39$  v  $-3.49 \pm 4.55$ ,  $P < .001$ ) and midstance ( $14.1 \pm 6.23$  v  $1.20 \pm 4.21$ ,  $P < .001$ ) in the injured limb compared with controls. There were significantly lower maximum external extension moments at heel strike ( $-0.99 \pm 0.46$  v  $-2.94 \pm 0.60$ ,  $P < .001$ ) and during the second half of stance in the injured limb compared with controls ( $-0.56 \pm 1.14$  v  $-3.54 \pm 1.31$ ,  $P < .001$ ). The rectus femoris was "on" significantly less during gait in the injured leg compared with controls ( $49.1 \pm 7.76\%$  v  $61.0 \pm 14.8\%$ ,  $P = .044$ ). There were no significant differences in hamstring activity "on" time during gait ( $P > .05$ ).

**CONCLUSIONS:**

In patients with acute ACL injury, the ACL-deficient limb does not reach as much extension as controls. Although the rectus femoris is "on" for shorter periods during the gait cycle, there is no difference in hamstring time on during gait. This information may help clinicians better understand muscle function and gait patterns in the acute time period after ACL injury.

**LEVEL OF EVIDENCE:**

Level III, case control study.

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PMID: 27067475

## 36. KNEE/EXERCISE

### Loads and laxity

April 2016 Volume 22, Pages 1–8

#### The effect of open kinetic chain knee extensor resistance training at different training loads on anterior knee laxity in the uninjured

Massimo G. Barcellona Matthew C. Morrissey

DOI: <http://dx.doi.org/10.1016/j.math.2015.12.011>

#### Highlights

- Evaluated extensor open kinetic chain resistance training on anterior laxity in knee.
- Laxity increased in the high load (2 repetition maximum (RM)) isotonic group.
- Laxity unchanged in the other 2 groups (isotonic 20RM and isokinetic).

#### Abstract

##### Background

The commonly used open kinetic chain knee extensor (OKCKE) exercise loads the sagittal restraints to knee anterior tibial translation.

##### Objective

To investigate the effect of different loads of OKCKE resistance training on anterior knee laxity (AKL) in the uninjured knee.

##### Study design

non-clinical trial.

##### Methods

Randomization into one of three supervised training groups occurred with training 3 times per week for 12 weeks. Subjects in the LOW and HIGH groups performed OKCKE resistance training at loads of 2 sets of 20 repetition maximum (RM) and 20 sets of 2RM, respectively. Subjects in the isokinetic training group (ISOK) performed isokinetic OKCKE resistance training using 2 sets of 20 maximal efforts. AKL was measured using the KT2000 arthrometer with concurrent measurement of lateral hamstrings muscle activity at baseline, 6 weeks and 12 weeks.

##### Results

Twenty six subjects participated (LOW n = 9, HIGH n = 10, ISOK n = 7). The main finding from this study is that a 12-week OKCKE resistance training programme at loads of 20 sets of 2RM, leads to an increase in manual maximal AKL.

##### Conclusions

OKCKE resistance training at high loads (20 sets of 2RM) increases AKL while low load OKCKE resistance training (2 sets of 20RM) and isokinetic OKCKE resistance training at 2 sets of 20RM does not.

##### Keywords:

Therapeutic exercise, Joint stability, Hypermobility, Resistance training

**37. OSTEOARTHRITIS/KNEE****Limitations from**

Clin Rheumatol. 2016 Apr 4.

**Knee pain during activities of daily living and its relationship with physical activity in patients with early and severe knee osteoarthritis.**

Fukutani N<sup>1</sup>, Iijima H<sup>2,3</sup>, Aoyama T<sup>2</sup>, Yamamoto Y<sup>4</sup>, Hiraoka M<sup>4</sup>, Miyanobu K<sup>4</sup>, Jinnouchi M<sup>5</sup>, Kaneda E<sup>4,5</sup>, Tsuboyama T<sup>2</sup>, Matsuda S<sup>6</sup>.

This study aimed to investigate whether knee pain during various activities of daily living (ADLs) is associated with physical activity in patients with early and severe knee osteoarthritis (OA).

We hypothesized that the painful ADLs associated with decreased physical activity differ according to disease severity. This cross-sectional study enrolled 270 patients with medial knee OA, assigned to either the early (Kellgren Lawrence [K/L] grade 1-2) or the severe group (K/L grade 3-4). Physical activity was assessed using a pedometer. Knee pain during six ADLs (waking up in the morning, walking on a flat surface, ascending stairs, etc.) was evaluated using a questionnaire. We performed multiple regression and quantile regression analysis to investigate whether knee pain during each ADL was associated with physical activity.

In the early group, the more knee pain they experienced while ascending stairs, the lower their physical activity was (75th regression coefficient = -1033.70, P = 0.018). In the severe group, the more knee pain they experienced while walking on a flat surface or bending to the floor or standing up, the lower their physical activity was (unstandardized coefficients = -1850.87, P = 0.026; unstandardized coefficients = -2640.35, P = 0.010). Knee pain while ascending stairs and while walking on a flat surface or bending to the floor or standing up was a probable limiting factor for physical activity in early and severe knee OA, respectively.

These findings suggested that a reduction in task-specific knee pain according to disease severity could improve physical activity levels.

**KEYWORDS:**

Activities of daily living (ADLs); Early; Knee osteoarthritis; Knee pain; Physical activity; Severe

PMID: 27041381

**PRP more effective than HA**

Knee Surg Sports Traumatol Arthrosc. 2016 Apr 7.

**Choice of intra-articular injection in treatment of knee osteoarthritis: platelet-rich plasma, hyaluronic acid or ozone options.**

Duymus TM<sup>1</sup>, Mutlu S<sup>2</sup>, Dernek B<sup>3</sup>, Komur B<sup>2</sup>, Aydogmus S<sup>4</sup>, Kesiktaş FN<sup>5</sup>.

**PURPOSE:**

This study was performed to compare the efficacy of treatment in three groups of patients with knee osteoarthritis (OA) given an intra-articular injection of platelet-rich plasma (PRP), hyaluronic acid (HA) or ozone gas.

**METHODS:**

A total of 102 patients with mild-moderate and moderate knee OA who presented at the polyclinic with at least a 1-year history of knee pain and VAS score  $\geq 4$  were randomly separated into three groups. Group 1 (PRP group) received intra-articular injection of PRP  $\times$  2 doses, Group 2 (HA group) received a single dose of HA, and Group 3 (Ozone group) received ozone  $\times$  four doses. Weight-bearing anteroposterior-lateral and Merchant's radiographs of both knees were evaluated. WOMAC and VAS scores were applied to all patients on first presentation and at 1, 3, 6 and 12 months.

**RESULTS:**

At the end of the 1st month after injection, significant improvements were seen in all groups. In the 3rd month, the improvements in WOMAC and VAS scores were similar in Groups 1 and 2, while those in Group 3 were lower ( $p < 0.001$ ). At the 6th month, while the clinical efficacies of PRP and HA were similar and continued, the clinical effect of ozone had disappeared ( $p < 0.001$ ). At the end of the 12th month, PRP was determined to be both statistically and clinically superior to HA ( $p < 0.001$ ).

**CONCLUSION:**

In the treatment of mild-moderate knee OA, PRP was more successful than HA and ozone injections, as the application alone was sufficient to provide at least 12 months of pain-free daily living activities.

**LEVEL OF EVIDENCE:**

Therapeutic study, Level I.

**KEYWORDS:**

Hyaluronic acid; Intra-articular injection options; Knee osteoarthritis; Ozone; Platelet-rich plasma

PMID: 27056686

**38 A. FOOT AND ANKLE****Heel pain**

Foot Ankle Int. 2016 Apr 4. pii: 1071100716642038.

**Pain Threshold Tests in Patients With Heel Pain Syndrome.**

Saban B<sup>1</sup>, Masharawi Y<sup>2</sup>.

**BACKGROUND:**

Pressure pain threshold (PPT) is a useful tool for evaluating mechanical sensitivity in patients suffering from various musculoskeletal disorders. However, no previous study has investigated PPT in the heel of patients experiencing plantar heel pain syndrome (PHPS). The aim of this study was to compare PPT levels and topographic presentation of sensitivity in the heel of patients with PHPS and in healthy controls.

**METHODS:**

The reliability of PPT testing in patients with PHPS was assessed for intra- and interrater recordings. The PPT levels of 40 feet in each group were then assessed on 5 predetermined sites in the heel using a standardized measurement protocol. Patient functional status (FS) as measured by the Foot & Ankle Computerized Adaptive Test was employed as an external reference.

**RESULTS:**

Multivariate analysis of covariance revealed no group differences for PPTs at all sites ( $P = .406$ ). Age ( $P = .099$ ) or BMI ( $P = .510$ ) did not affect PPT values, although there was an effect on gender ( $P = .006$ ). The analysis revealed significant differences between sites ( $P < .001$ ) demonstrating a diverse topographic distribution. In the PHPS group, PPT levels at the anterior/medial, posterior/medial and central sites were significantly lower than at the posterior/lateral and anterior/lateral sites ( $P < .05$ ). For the control group, PPT levels at the anterior/medial site were significantly lower than all other sites ( $P < .001$ ).

**CONCLUSION:**

No significant differences were found between PPT of the PHPS patients and controls, therefore, PPT cannot be recommended as an assessment tool for these patients. The topographic distribution indicated low PPT levels at the anterior/medial area of the heel in patients with PHPS and controls.

**LEVEL OF EVIDENCE:**

Level II, comparative study.

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**KEYWORDS:**

heel pain; plantar fasciitis; pressure pain threshold; topographic distribution

PMID: 27044541

**Talus motions**

*J Bone Joint Surg Am.* 2016 Apr 6;98(7):568-75. doi: 10.2106/JBJS.15.00470.

**Rotational Dynamics of the Talus in a Normal Tibiotalar Joint as Shown by Weight-Bearing Computed Tomography.**

Lepojärvi S<sup>1</sup>, Niinimäki J<sup>2</sup>, Pakarinen H<sup>3</sup>, Koskela L<sup>4</sup>, Leskelä HV<sup>5</sup>.

**BACKGROUND:**

The aim of this study was to investigate the normal anatomy and rotational dynamics of the talus in the tibiotalar joint using weight-bearing cone-beam computed tomography (WBCT).

**METHODS:**

In a cross-sectional study of thirty-two healthy subjects divided into two age groups (twenty-six to thirty-six years of age and sixty to sixty-four years of age), low-dose WBCT scans of both uninjured ankles were obtained. The rotation of the talus, medial clear space, anterior and posterior widths of the tibiotalar joint, translation of the talus, and talar tilt were measured. The primary outcome measures were intersubject and intrasubject (bilateral) variation of the talar movements between maximal internal and external rotation. The secondary outcome measures were the effect of sex and age on the movements of the talus.

**RESULTS:**

When the ankle is rotated, the talus rotates a mean of 10° with no substantial widening of the medial clear space. All of the measured values changed subtly but statistically significantly between maximal internal and maximal external rotation, with mean changes of 10° (standard deviation [SD] = 5.8°) in talar rotation ( $p = 0.006$ ), 2.0° (SD = 1.5°) in talar tilt ( $p = 0.0015$ ), -0.2 mm (SD = 0.5 mm) in the medial clear space ( $p = 0.01$ ), 0.9 mm (SD = 0.8 mm) in the anterior width of the tibiotalar joint ( $p = 0.003$ ), -0.4 mm (SD = 0.9 mm) in the posterior width of the tibiotalar joint ( $p = 0.011$ ), and 2.9 mm (SD = 2.2 mm) in translation of the talus ( $p = 0.002$ ). Intersubject variation was large, but there was very little intrasubject variation in the total rotational range of motion. There were no differences between men and women with regard to any of the measurements.

**CONCLUSIONS:**

This study provides reference values with which to evaluate the dynamics of the normal tibiotalar joint in order to clarify rotational stability of the ankle mortise. The internal control of the contralateral ankle seems to be a better reference than population-based normal values.

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PMID: 27053585

**Hindfoot assessment for total knee**

Knee Surg Sports Traumatol Arthrosc. 2016 Apr 7.

**Clinical usefulness of hindfoot assessment for total knee arthroplasty: persistent post-operative hindfoot pain and alignment in pre-existing severe knee deformity.**

Okamoto Y<sup>1</sup>, Otsuki S<sup>2</sup>, Jotoku T<sup>2</sup>, Nakajima M<sup>2</sup>, Neo M<sup>2</sup>.

**PURPOSE:**

The purpose of this study was to compare the hindfoot alignment and symptoms in patients with pre-existing moderate and severe knee deformities after total knee arthroplasty (TKA).

**METHODS:**

Eighty knees of 75 patients who underwent TKA for varus osteoarthritis were enrolled retrospectively and evaluated the following pre-operatively and at 2 years post-operatively: the American Orthopaedic Foot and Ankle Society ankle-hindfoot scale (pain and function scores), calcaneal pitch, and naviculocuboid overlap as an indicator of hindfoot alignment. The knees were divided into two groups according to the pre-operative hip-knee-ankle angle defined as the angle between the mechanical axis of the femur and the tibia: group M with genu varus of  $\leq 6^\circ$ , and group S with varus  $> 6^\circ$ .

**RESULTS:**

The pain ( $p = 0.03$ ) and function ( $p = 0.02$ ) scores improved in group M; however, in group S, these measures did not change. The differences between the groups were not significant concerning the pre-operative calcaneal pitch and naviculocuboid overlap. The post-operative pitch ( $p = 0.03$ ) and the overlap ( $p = 0.04$ ) in group M was significantly greater and less than those in group S, respectively. Although the pitch ( $p < 0.01$ ) and the overlap ( $p = 0.03$ ) increased in group M, these did not change in group S. Post-operative hindfoot pain and valgus remained in patients in group S.

**CONCLUSIONS:**

For pre-existing moderate knee deformities, a relationship was observed between post-operative knee alignment and compensatory hindfoot alignment, whereas patients with severe deformities experienced persistent post-operative hindfoot pain and valgus alignment. It was concluded that evaluations and managements of residual symptoms after TKA including the hindfoot are important. These findings are clinically relevant that perioperative evaluation of the hindfoot should be required in knee surgery. To help improve the outcomes of TKA, clinicians may consider perioperative intervention in the insole and/or physical therapy of the foot and ankle.

**LEVEL OF EVIDENCE:**

Therapeutic study, Level III.

**KEYWORDS:**

Hindfoot alignment; Knee osteoarthritis; Pre-operative severity; Total knee arthroplasty

PMID: 27056693

**40. ANKLE SPRAINS AND INSTABILITY****Balance**

*Knee Surg Sports Traumatol Arthrosc.* 2016 Apr;24(4):1086-95. doi: 10.1007/s00167-015-3744-z. Epub 2015 Aug 8.

**Dynamic balance deficits in individuals with chronic ankle instability compared to ankle sprain copers 1 year after a first-time lateral ankle sprain injury.**

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

Author information

**Abstract****PURPOSE:**

To quantify the dynamic balance deficits that characterise a group with chronic ankle instability compared to lateral ankle sprain copers and non-injured controls using kinematic and kinetic outcomes.

**METHODS:**

Forty-two participants with chronic ankle instability and twenty-eight lateral ankle sprain copers were initially recruited within 2 weeks of sustaining a first-time, acute lateral ankle sprain and required to attend our laboratory 1 year later to complete the current study protocol. An additional group of non-injured individuals were also recruited to act as a control group. All participants completed the anterior, posterior-lateral and posterior-medial reach directions of the star excursion balance test. Sagittal plane kinematics of the lower extremity and associated fractal dimension of the centre of pressure path were also acquired.

**RESULTS:**

Participants with chronic ankle instability displayed poorer performance in the anterior, posterior-medial and posterior-lateral reach directions compared with controls bilaterally, and in the posterior-lateral direction compared with lateral ankle sprain copers on their 'involved' limb only. These performance deficits in the posterior-lateral and posterior-medial directions were associated with reduced flexion and dorsiflexion displacements at the hip, knee and ankle at the point of maximum reach, and coincided with reduced complexity of the centre of pressure path.

**CONCLUSION:**

In comparison with lateral ankle sprain copers and controls, participants with chronic ankle instability were characterised by dynamic balance deficits as measured using the SEBT. This was attested to reduced sagittal plane motions at the hip, knee and ankle joints, and reduced capacity of the stance limb to avail of its supporting base.

**LEVEL OF EVIDENCE:**

III.

**KEYWORDS:**

Ankle joint [MeSH]; Biomechanical phenomena [MeSH]; Kinematics [MeSH]; Kinetics [MeSH]; Postural balance [MeSH]

PMID: 26254090

**43. HALLUX VALGUS****Hindfoot influence**

Foot Ankle Int. 2016 Apr 20. pii: 1071100716645403.

**Influence of Hindfoot Malalignment on Hallux Valgus Operative Outcomes.**

Ginés-Cespedosa A<sup>1</sup>, Pérez-Prieto D<sup>2</sup>, Muñetón D<sup>3</sup>, González-Lucena G<sup>4</sup>, Millán A<sup>4</sup>, de Zabala S<sup>1</sup>, Busquets R<sup>3</sup>.

**BACKGROUND:**

Hindfoot deformity has been described as a risk factor for poor hallux valgus (HV) surgery outcomes. However, there has been no study that demonstrates it. The purpose of this investigation was to evaluate the influence of hindfoot misalignment in HV surgery results.

**METHODS:**

All patients operated on for HV during 2010 and 2011 at 3 university hospitals were included. The preoperative and 2-year postoperative radiologic data included the HV and the intermetatarsal (IM) angles, the naviculocuboid overlap (NC), the talonavicular coverage (TN) angle, the talus-first metatarsal (T-1MT) angle, as well as the calcaneal pitch (CP) angle. Additionally, the Short Form-36 questionnaire version 2.0 (SF-36) and the American Orthopaedic Foot & Ankle Society (AOFAS) score, satisfaction and recurrence were also analyzed. A total of 207 met the inclusion criteria. There were 26 patients (12.6%) who could not be assessed at the 2-year follow-up. Patients were allocated to a varus, normal, or a valgus hindfoot tertile using the values for the CP, NC, TN, and T-1MT angles.

**RESULTS:**

No significant differences (*ITALIC!*  $P > .05$ ) were found between the groups when the HV or IM angles, AOFAS, SF-36 Mental Composite Scale, SF-36 Physical Composite Scale, or satisfaction were compared. Similarly, no significant and strong correlations were observed (*ITALIC!*  $P > .05$ ,  $\rho < 0.3$ ) between any of the mentioned hindfoot measures and the outcomes scales.

**CONCLUSION:**

No influence of hindfoot misalignment on HV surgery outcomes was found in the present study in terms of correction, pain, function, satisfaction, or quality of life. Patients with hindfoot misalignment did not obtain worse outcomes in HV surgery.

**LEVEL OF EVIDENCE:**

Level II, prognostic, comparative study.

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**KEYWORDS:**

forefoot disorders; hallux disorders; misalingment; outcome studies

PMID: 27103656

**45 A. MANUAL THERAPY LUMBAR & GENERAL****Ex and MT**

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

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

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

**BACKGROUND:**

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

**METHODS:**

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

**RESULTS:**

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

**CONCLUSION:**

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

**TRIAL REGISTRATION:**

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

PMID: 27005470

## Use of MT

*BMC Musculoskelet Disord.* 2016 Apr 23;17(1):176. doi: 10.1186/s12891-016-1030-y.

**Three combinations of manual therapy techniques within naprapathy in the treatment of neck and/or back pain: a randomized controlled trial.**

Paanalahti K<sup>1,2</sup>, Holm LW<sup>1,3</sup>, Nordin M<sup>1,4</sup>, Höjjer J<sup>5</sup>, Lyander J<sup>2</sup>, Asker M<sup>1,2</sup>, Skillgate E<sup>6,7</sup>.

**BACKGROUND:**

Manual therapy as spinal manipulation, spinal mobilization, stretching and massage are common treatment methods for neck and back pain. The objective was to compare the treatment effect on pain intensity, pain related disability and perceived recovery from a) naprapathic manual therapy (spinal manipulation, spinal mobilization, stretching and massage) to b) naprapathic manual therapy without spinal manipulation and to c) naprapathic manual therapy without stretching for male and female patients seeking care for back and/or neck pain.

**METHOD:**

Participants were recruited among patients, ages 18-65, seeking care at the educational clinic of Naprapathögskolan - the Scandinavian College of Naprapathic Manual Medicine in Stockholm. The patients (n = 1057) were randomized to one of three treatment arms a) manual therapy (i.e. spinal manipulation, spinal mobilization, stretching and massage), b) manual therapy excluding spinal manipulation and c) manual therapy excluding stretching. The primary outcomes were minimal clinically important improvement in pain intensity and pain related disability. Treatments were provided by naprapath students in the seventh semester of eight total semesters. Generalized estimating equations and logistic regression were used to examine the association between the treatments and the outcomes.

**RESULTS:**

At 12 weeks follow-up, 64 % had a minimal clinically important improvement in pain intensity and 42 % in pain related disability. The corresponding chances to be improved at the 52 weeks follow-up were 58 % and 40 % respectively. No systematic differences in effect when excluding spinal manipulation and stretching respectively from the treatment were found over 1 year follow-up, concerning minimal clinically important improvement in pain intensity (p = 0.41) and pain related disability (p = 0.85) and perceived recovery (p = 0.98). Neither were there disparities in effect when male and female patients were analyzed separately.

**CONCLUSION:**

The effect of manual therapy for male and female patients seeking care for neck and/or back pain at an educational clinic is similar regardless if spinal manipulation or if stretching is excluded from the treatment option.

**TRIAL REGISTRATION:**

Current Controlled Trials ISRCTN92249294.

**KEYWORDS:**

Back pain; Muskuloskeletal manipulations; Naprapathy; Neck pain

PMID: 27107960

**Sympathec response from different frequency of oscillations****An investigation into the effects of applying a lumbar Maitland mobilisation at different frequencies on sympathetic nervous system activity levels in the lower limb**

Victoria Piekarz Jo Perry

DOI: <http://dx.doi.org/10.1016/j.math.2016.01.001>**Highlights**

- Maitland lumbar PA mobilisation at 2 Hz creates sympathoexcitatory responses of 12%.
- An atypical frequency mobilisation at 3 Hz results in responses in the order of 20%.
- Effects at 3 Hz are at least comparable to effects of a standard 2 Hz intervention.
- Further research into high frequency manual therapy interventions is recommended.

**Abstract****Background**

Oscillatory Maitland mobilisations are commonly used in the management of lower back pain with research suggesting that mobilisations at 2 Hz may excite the sympathetic nervous system (SNS) more than sustained pressure glides or 0.5 Hz oscillatory mobilisations.

**Objectives**

Investigate the effects of increasing the oscillation frequency greater than 2 Hz.

**Design**

A double-blind, placebo-controlled, independent group experimental design.

**Method**

Sixty healthy male volunteers were randomly allocated to one of four groups; a control group (no contact), placebo group (sustained static pressure to L4 vertebra), and two intervention groups receiving a centrally applied postero-anterior mobilisation applied at either 2 Hz or 3 Hz for three 1-min periods. SNS activity was recorded by a blinded data collector by continuous skin conductance (SC) activity levels in the feet using a Biopac MP35 electrodermal amplifier. Participants were blinded to their group allocation which was further validated by a post-experiment questionnaire ( $p > 0.05$ ).

**Results**

The magnitude of sympathoexcitatory response was greatest for the 3 Hz mobilisation (20%) compared with the 2 Hz mobilisation (12%), placebo (-1%) and control conditions (3%). Only the 3 Hz group demonstrated statistical significance when compared to placebo intervention ( $p = 0.002$ ), and the control group ( $p = 0.02$ ).

**Conclusion**

SC changes reflect those of previous studies using lumbar mobilisations at 2 Hz, however the 3 Hz group was found to have a greater magnitude of effect worthy of consideration within research and clinical settings. These findings provide preliminary evidence to support the use of 3 Hz oscillatory mobilisations to affect a greater magnitude of SNS activity than those previously reported (0.5, 1.5 and 2 Hz).

**Lumbar manips and patella pain**

April 2016 Volume 22, Pages 16–21

**The immediate effect of lumbopelvic manipulation on EMG of vasti and gluteus medius in athletes with patellofemoral pain syndrome: A randomized controlled trial**

Alireza Motealleh Elham Gheysari Esmaeil Shokri Sobhan Sobhani

DOI: <http://dx.doi.org/10.1016/j.math.2016.02.002>

**Highlights**

- •Lubmopelvic manipulation improved the EMG activity of vastus medialis and gluteus medius.
- •Improvement was observed in step-down test and pain intensity after manipulation.
- •Lumbopelvic manipulation might be considered in the management of PFPS.

**Abstract****Objective**

To evaluate the immediate effect of lubmopelvic manipulation on EMG activity of vastus medialis, vastus lateralis and gluteus medius as well as pain and functional performance of athletes with patellofemoral pain syndrome.

**Design**

Randomized placebo-controlled trial.

**Methods**

Twenty eight athletes with patellofemoral pain syndrome were randomly assigned to two groups. One group received a lubmopelvic manipulation at the side of the involved knee while the other group received a sham manipulation. EMG activity of the vasti and gluteus medius were recorded before and after manipulation while performing a rocking on heel task. The functional abilities were evaluated using two tests: step-down and single-leg hop. Additionally, the pain intensity during the functional tests was assessed using a visual analog scale.

**Results**

The onset and amplitude of EMG activity from vastus medialis and gluteus medius were, respectively, earlier and higher in the manipulation group compared to the sham group. There were no significant differences, however, between two groups in EMG onset of vastus lateralis. While the scores of one-leg hop test were similar for both groups, significant improvement was observed in step-down test and pain intensity in the manipulation group compared to the sham group.

**Conclusions**

Lubmopelvic manipulation might improve patellofemoral pain and functional level in athletes with patellofemoral pain syndrome. These effects could be due to the changes observed in EMG activity of gluteus medius and vasti muscles. Therefore, the lubmopelvic manipulation might be considered in the rehabilitation protocol of the athletes with patellofemoral pain syndrome.

**Keywords:**

Anterior knee pain, Chondromalacia, Electromyography, Manual therapy

**45 B. MANUAL THERAPY CERVICAL****Rational for CG Tinnitus****Cervicogenic somatosensory tinnitus: An indication for manual therapy? Part 1: Theoretical concept**

Rob A.B. Oostendorp Iem Bakker Hans Elvers Emilia Mikołajewska Sarah Michiels  
Willem De Hertogh Han Samwel

DOI: <http://dx.doi.org/10.1016/j.math.2015.11.008>

**Highlights**

- •Understanding of neural mechanisms underlying somatosensory tinnitus is the basics for application of manual therapy.
- •Chronic subjective tinnitus combined with secondary central tinnitus is comparable with chronic pain with central sensitization.
- •Manual therapy is a potential treatment in patients with cervicogenic somatosensory tinnitus.

**Abstract**

Tinnitus can be evoked or modulated by input from the somatosensory and somatomotor systems. This means that the loudness or intensity of tinnitus can be changed by sensory or motor stimuli such as muscle contractions, mechanical pressure on myofascial trigger points, transcutaneous electrical stimulation or joint movements. The neural connections and integration of the auditory and somatosensory systems of the upper cervical region and head have been confirmed by many studies. These connections can give rise to a form of tinnitus known as somatosensory tinnitus.

To date only a handful of publications have focussed on (cervicogenic) somatosensory tinnitus and manual therapy. Broadening the current understanding of somatosensory tinnitus would represent a first step towards providing therapeutic approaches relevant to manual therapists. Treatment modalities involving the somatosensory systems, and particularly manual therapy, should now be re-assessed in the subgroup of patients with cervicogenic somatosensory tinnitus.

The conceptual phase of this study aims to uncover underlying mechanisms linking the auditory and somatosensory systems in relation to subjective tinnitus through (i) review of the literature (part 1) and (ii) through design of a pilot study that will explore characteristics of the study population and identify relevant components and outcomes of manual therapy in patients with cervicogenic somatosensory tinnitus (part 2). This manuscript focusses the theoretical concept of (cervicogenic) somatosensory tinnitus, either with or without secondary central tinnitus or tinnitus sensitization.

**Keywords:**

Auditory–somatosensory interactions, Somatosensory tinnitus, Tinnitus sensitization, Cervical spine, Somatosensory stimulation, Manual therapy

**Manual therapy for CG tinnitus****Cervicogenic somatosensory tinnitus: An indication for manual therapy plus education?  
Part 2: A pilot study**

Rob A.B. Oostendorp Iem Bakker Hans Elvers Emilia Mikolajewska Sarah Michiels Willem De Hertogh Han Samwel [www.paininmotion.be](http://www.paininmotion.be).

DOI: <http://dx.doi.org/10.1016/j.math.2016.02.006>

**Highlights**

- Evaluation of somatosensory tinnitus should be a regular feature in tinnitus patients.
- Manual therapists have a role in the management of patients with somatosensory tinnitus.
- Additional evidence is needed to verify the effectiveness of manual therapy.
- Verification of manual therapy with tinnitus education is needed.

**Abstract****Objectives**

The aim of this study was to evaluate the efficacy of Manual Therapy Utrecht (MTU) plus education in patients with cervicogenic somatosensory tinnitus (CeT).

**Study design**

Pretest–posttest design.

**Method**

Five hundred and six patients were referred or referred themselves. A subgroup of patients was identified with CeT, and within this a subgroup with tinnitus sensitization (TS). Two CeT groups were created based on the presence or absence of TS. Both groups underwent manual therapy combined with tinnitus education. Tinnitus intensity (VAS-tin 0–100 mm) was the primary outcome measure. Number of treatments and adverse effects were the secondary outcome measures.

**Results**

A total of 122 patients with CeT (24.1%) were included (average age 53.3 years [ $\pm 9.8$ ], female 38.5% and duration of tinnitus 7.3 years [ $\pm 8.9$ ]). Patients were divided into two groups: 55 patients (45.1%) with TS (CeT + TS group) and 67 patients (54.9%) without TS (CeT – TS group). Pretest to posttest differences on the VAS-tin were statistically significant within both groups (CeT – TS group: difference VAS-tin 5.9 [ $p = 0.01$ ]; CeT + TS group: difference VAS-tin 18.2 [ $p = 0.00$ ]), and between the groups in favor of the CeT + TS group (difference VAS-tin 12.3 [ $p = 0.01$ ]). Pretest to posttest differences were clinically significant for the CeT + TS group (difference VAS-tin 18.2 [MCIC =  $\geq 10$  mm VAS-tin]) and between the groups (difference VAS-tin 12.3 in favor of the CeT + TS group). The average number of treatment sessions was 9.6 ( $\pm 2.6$ ) for the CeT – TS group and 10.3 ( $\pm 2.5$ ) for the CeT + TS group, a non-significant difference. There were no adverse effects in either group.

**Conclusions**

Despite its limitations, this study provides valuable information on both the characteristics of patients with CeT and TS in a Dutch primary care manual therapy practice and on the potential effectiveness of MTU combined with tinnitus education for the subgroup of CeT + TS patients.

**Manip and massage for HA's**

Eur J Phys Rehabil Med. 2016 Mar 18.

**The effect of manipulation plus massage therapy versus massage therapy alone in people with tension-type headache. a randomized controlled clinical trial.**

Espi-Lopez GV<sup>1</sup>, Zurriaga-Llorens R, Monzani L, Falla D.

**BACKGROUND:**

Manipulative techniques have shown promising results for relief of tension-type headache (TTH), however prior studies either lacked a control group, or suffered from poor methodological quality.

**AIM:**

To compare the effect of spinal manipulation combined with massage versus massage alone on range of motion of the cervical spine, headache frequency, intensity and disability in patients with TTH.

**DESIGN:**

Randomized, single-blinded, controlled clinical trial SETTING: University clinic.

**POPULATION:**

105 subjects with TTH.

**METHODS:**

Participants were divided into two groups: 1) manipulation and massage 2) massage only (control). Four treatment sessions were applied over four weeks. The Headache Disability Inventory (HDI) and range of upper cervical and cervical motion were evaluated at baseline, immediately after the intervention and at a follow up, 8 weeks after completing the intervention.

**RESULTS:**

Both groups demonstrated a large ( $f=1.22$ ) improvement on their HDI scores. Those that received manipulation reported a medium-sized reduction ( $f=.33$ ) in headache frequency across all data points ( $p<.05$ ) compared to the control group. Both groups showed a large within-subject effect for upper cervical extension ( $f=.62$ ), a medium-sized effect for cervical extension ( $f=.39$ ), and large effects for upper cervical ( $f=1.00$ ) and cervical ( $f=.27$ ) flexion. The addition of manipulation resulted in larger gains of upper cervical flexion range of motion, and this difference remained stable at the follow-up.

**CONCLUSION:**

These findings support the benefit of treating TTH with either massage or massage combined with a manipulative technique. However, the addition of manipulative technique was more effective for increasing range of motion of the upper cervical spine and for reducing the impact of headache.

**CLINICAL REHABILITATION IMPACT:**

Although massage provided relief of headache in TTH sufferers, when combined with cervical manipulation, there was a stronger effect on range of upper cervical spine motion.

PMID: 26989818

**45 D. MANUAL THERAPY EXTREMITIES****Carpel Tunnel CPR**

*J Orthop Sports Phys Ther.* 2016 Mar 23:1-28.

**Prediction of Outcome in Women With Carpal Tunnel Syndrome Who Receive Manual Physical Therapy Interventions: A Validation Study.**

Fernández-de-Las-Peñas C<sup>1,2</sup>, Cleland JA<sup>3,4</sup>, Salom-Moreno J<sup>1,2</sup>, Palacios-Ceña M<sup>1</sup>, Martínez-Perez A<sup>5</sup>, Pareja JA<sup>5</sup>, Ortega-Santiago R<sup>1,2</sup>.

Study Design Prospective cohort study.

Background A clinical prediction rule to identify patients with carpal tunnel syndrome (CTS) most likely to respond to manual physical therapy has been published but requires further testing to determine its validity.

Objective To assess the validity of a clinical prediction rule proposed for the management of patients with CTS in a different group of patients with a variety of treating clinicians.

Methods A preplanned secondary analysis of a randomized controlled trial investigating the efficacy of manual physical therapies including desensitization manoeuvres of the central nervous system in 120 women suffering from CTS was performed. Patients were randomized to receive 3 sessions of manual physical therapy (n=60) or surgical release/decompression of the carpal tunnel (n=60). Self-perceived improvement with a Global Rating of Change (GROC) was recorded at 6 and 12 months follow-up. Pain intensity (mean pain and the worst pain, NPRS 0-10), and Boston Carpal Tunnel Questionnaire (functional status and symptoms severity scales), were assessed at baseline, and 1, 3, 6, and 12 months. Status on the clinical prediction rule (responders were those who met at least 2 of the following criteria: PPT over the affected C5-C6 joint <137kPa; HPT over the affected carpal tunnel <39.6°C, and general health > 66 points) was measured at baseline. Different linear mixed model with repeated measures were used to examine the validity of the rule.

Results Women with a positive status on the rule who received manual physical therapy did not experience greater improvements compared to those with a negative status on the rule for: mean pain (P=0.65), worst pain (P=0.86), function (P=0.99) or symptoms severity (P=0.85). Further, the clinical prediction rule performed no better than chance in identifying individual with CTS most likely to respond to manual physical therapy or surgery (mean pain, P=0.87; worst pain, P=0.91; function, P=0.60; severity P=0.66). No differences in self-perceived improvement was observed at either 6 (P=0.67) or 12 (P=0.37) months according to the rule.

Conclusions The results of this study did not support the validity of the previously developed clinical prediction rule for manual physical therapy in women with CTS. Level of Evidence Prognosis, Level 1b. *J Orthop Sports Phys Ther*, Epub 23 Mar 2016.  
doi:10.2519/jospt.2016.6348.

**KEYWORDS:**

carpal tunnel syndrome; clinical prediction rule validation; prospective cohort

PMID: 27011304

**Hip and mobilization with movement**

April 2016 Volume 22, Pages 9–15

**The effects of caudal mobilisation with movement (MWM) and caudal self-mobilisation with movement (SMWM) in relation to restricted internal rotation in the hip: A randomised control pilot study**

Riche Walsh Sharon Kinsella

DOI: <http://dx.doi.org/10.1016/j.math.2016.01.007>

**Highlights**

- •Pilot study comparing self-MWMs to MWMs for internal rotation of the hip.
- •MWMs improved functional ROM of the hip by 10.1%.
- •Caudle MWMs with adduction improves hip internal rotational ROM.
- •Self-MWMs no worse than MWMs of the hip.
- •Self-MWMs may augment MWM treatments.

**Abstract**

**Background**

A loss of internal rotation (IR) of the hip is associated with hip pathology. Improving IR may improve hip range of motion (ROM) or prevent hip pathology.

**Objectives**

The purpose of this study was to compare the immediate effects of caudal mobilisation with movement (MWM) and caudal self-mobilisation with movement (SMWM) on young healthy male subjects with reduced IR of the hip.

**Design**

A randomised controlled trial was performed. Twenty-Two subjects were randomised into a MWM group (n = 6), SMWM group (n = 8) or a control group (n = 8).

**Method**

The primary outcome measures included the functional internal rotation test (FIRT) for the hip and the passive seated internal rotation test (SIRT) for the hip. Outcomes were captured at baseline and immediately after one treatment of MWMs, SMWMs or control.

**Results**

A two-way analysis of variance (ANOVA), group × time interaction was conducted. The ANOVA revealed the only significant improvement was in the MWM group for the FIRT (p = 0.01), over the control group. Subjects with reduced IR of the hip who receive a single session of MWMs exhibited significantly improved functional IR of their hip than the control group.

**Conclusions**

From the data presented, it can be suggested that caudal MWMs of the hip appear to have a positive effect on functional IR of healthy young hips. This may be due to addressing the positional fault theory or the arthroscopic muscular inhibition theory. SMWMs may be effective in augmenting treatments for patients waiting for hip operations.

**47. STRETCHING/MUSCLES****Muscle imbalance and hamstring tears**

Am J Sports Med. 2016 Mar 21. pii: 0363546516632526.

**Hamstring and Quadriceps Isokinetic Strength Deficits Are Weak Risk Factors for Hamstring Strain Injuries: A 4-Year Cohort Study.**

van Dyk N<sup>1</sup>, Bahr R<sup>2</sup>, Whiteley R<sup>3</sup>, Tol JL<sup>4</sup>, Kumar BD<sup>5</sup>, Hamilton B<sup>6</sup>, Farooq A<sup>3</sup>, Witvrouw E<sup>7</sup>.

**BACKGROUND:**

A hamstring strain injury (HSI) has become the most common noncontact injury in soccer. Isokinetic muscle strength deficits are considered a risk factor for HSIs. However, underpowered studies with small sample sizes unable to determine small associations have led to inconclusive results regarding the role of isokinetic strength and strength testing in HSIs.

**PURPOSE:**

To examine whether differences in isokinetic strength measures of knee flexion and extension represent risk factors for hamstring injuries in a large cohort of professional soccer players in an adequately powered study design.

**STUDY DESIGN:**

Cohort study; Level of evidence, 2.

**METHODS:**

A total of 614 professional soccer players from 14 teams underwent isokinetic strength testing during preseason screening. Testing consisted of concentric knee flexion and extension at 60 deg/s and 300 deg/s and eccentric knee extension at 60 deg/s. A clustered multiple logistic regression analysis was used to identify variables associated with the risk of HSIs. Receiver operating characteristic (ROC) curves were calculated to determine sensitivity and specificity.

**RESULTS:**

Of the 614 players, 190 suffered an HSI during the 4 seasons. Quadriceps concentric strength at 60 deg/s (odds ratio [OR], 1.41; 95% CI, 1.03-1.92; P = .03) and hamstring eccentric strength at 60 deg/s (OR, 1.37; 95% CI, 1.01-1.85; P = .04) adjusted for bodyweight were independently associated with the risk of injuries. The absolute differences between the injured and uninjured players were 6.9 N·m and 9.1 N·m, with small effect sizes ( $d < 0.2$ ). The ROC analyses showed an area under the curve of 0.54 and 0.56 for quadriceps concentric strength and hamstring eccentric strength, respectively, indicating a failed combined sensitivity and specificity of the 2 strength variables identified in the logistic regression models.

**CONCLUSION:**

This study identified small absolute strength differences and a wide overlap of the absolute strength measurements at the group level. The small associations between lower hamstring eccentric strength and lower quadriceps concentric strength with HSIs can only be considered as weak risk factors. The identification of these risk factors still does not allow the identification of individual players at risk. The use of isokinetic testing to determine the association between strength differences and HSIs is not supported.

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**KEYWORDS:**

football (soccer); hamstring muscle injury; injury prevention; isokinetic strength testing

PMID: 27002102

**Exam of Hamstring injury**

Br J Sports Med. 2016 Apr;50(7):431-9. doi: 10.1136/bjsports-2015-095073. Epub 2016 Feb 3.

**A combination of initial and follow-up physiotherapist examination predicts physician-determined time to return to play after hamstring injury, with no added value of MRI.**

Jacobsen P<sup>1</sup>, Witvrouw E<sup>2</sup>, Muxart P<sup>1</sup>, Tol JL<sup>3</sup>, Whiteley R<sup>1</sup>.

**BACKGROUND:**

Previous studies investigating prediction of return to play after acute hamstring injury were limited by examining a single postinjury clinical and MRI evaluation. We evaluated the added value of including follow-up clinical evaluation when predicting return to play.

**METHODS:**

A range of clinical and MRI parameters were prospectively investigated for an association with the time to return to play in 90 athletes with MRI positive hamstring injuries undergoing a criteria-based rehabilitation programme. Clinical evaluation was performed within 5 days of injury and 7 days after this initial assessment (follow-up clinical evaluation). The association between possible prognostic parameters and the time to return to play was assessed with a multiple linear regression model.

**RESULTS:**

Data of 90 athletes were available for analysis. At the first physiotherapy appointment, a combination of three demographic and six clinical variables explained 50% of the variance ( $\pm 19$  days) in the time to return to play. At follow-up assessment (7 days), a combination of 10 clinical and demographic variables explained 97.0% of the variance ( $\pm 5$  days) in time to return to play. In order of importance, the variables were: change in strength during the first week for the 'mid-range' test, peak isokinetic knee flexion torque of the uninjured leg, maximum pain at the time of injury, number of days to walk pain free, playing the sport of football, strength performing the 'inner range' hamstring test at day 1, presence of pain on a single leg bridge at day 7 or its absence during a single leg bridge, delay in starting treatment and percentage of strength in the 'outer range' test compared to the healthy leg. No MRI variables were retained in any of these analyses. MRI variables alone explained 8.6% of the variance-which is unhelpful to players and coaches.

**SUMMARY:**

The combination of initial and 7-day follow-up clinical evaluation is clinically helpful in predicting time to return to play ( $\pm 5$  days) following acute hamstring injury. MRI offered no useful clinical information regarding return to play duration in this cohort.

**TRIAL REGISTRATION NUMBER:**

NCT01812564.

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**KEYWORDS:**

Football; Muscle

PMID: 2684353

**Hamstring tension**

August 2016 Volume 24, Pages 1–6

**The difference in passive tension applied to the muscles composing the hamstrings – Comparison among muscles using ultrasound shear wave elastography**

Masatoshi Nakamura Satoshi Hasegawa Hiroki Umegaki Satoru Nishishita Takuya Kobayashi Kosuke Fujita Hiroki Tanaka Satoko Ibuki Noriaki Ichihashi

DOI: <http://dx.doi.org/10.1016/j.math.2016.03.012>

**Highlights**

- The passive tension applied to hamstrings during passive elongation was examined.
- The passive tension applied to semimembranosus is the highest in hamstring muscle.
- The passive tension applied to hamstring increases with anterior tilt of pelvis.

**Abstract****Background**

Hamstring muscle strain is one of the most common injuries in sports. Therefore, to investigate the factors influencing hamstring strain, the differences in passive tension applied to the hamstring muscles at the same knee and hip positions as during terminal swing phase would be useful information. In addition, passive tension applied to the hamstrings could change with anterior or posterior tilt of the pelvis.

**Purpose**

The aims of this study were to investigate the difference in passive tension applied to the individual muscles composing the hamstrings during passive elongation, and to investigate the effect of pelvic position on passive tension.

**Methods**

Fifteen healthy men volunteered for this study. The subject lay supine with the angle of the trunk axis to the femur of their dominant leg at 70° and the knee angle of the dominant leg fixed at 30° flexion. In three pelvic positions (“Non-Tilt”, “Anterior-Tilt” and “Posterior-Tilt”), the shear elastic modulus of each muscle composing the hamstrings (semitendinosus, semimembranosus, and biceps femoris) was measured using an ultrasound shear wave elastography.

**Results**

The shear elastic modulus of semimembranosus was significantly higher than the others. Shear elastic modulus of the hamstrings in Anterior-Tilt was significantly higher than in Posterior-Tilt.

**Conclusion**

Passive tension applied to semimembranosus is higher than the other muscles when the hamstring muscle is passively elongated, and passive tension applied to the hamstrings increases with anterior tilt of the pelvis.

**Keywords:**

Hamstrings, Pelvis, Shear wave elastography

**48 A. STM****TA sliding****Increased sliding of transverse abdominis during contraction after myofascial release in patients with chronic low back pain**

Yen-Hua Chen Huei-Ming Chai Yio-Wha Shau Chung-Li Wang Shwu-Fen Wang

DOI: <http://dx.doi.org/10.1016/j.math.2015.10.004>**Highlights**

- Increased change of thickness of TrA is noted after release in patients and control.
- Increased sliding is noted in the both ends of musculofascial junctions of the TrA.
- The musculofascial corset was shifted anteriorly in patients after release.

**Abstract****Purpose**

Recent evidence suggested the significance of integrity of the tension balance of the muscle-fascia corset system in spinal stability, particularly the posterior musculofascial junction which is adjacent to dorsal located paraspinal muscles joining each other at lateral raphe (LR). The purpose of this study was to compare the contraction of the transversus abdominis (TrA) at both anterior and posterior musculofascial muscle-fascia junctions in patients with low back pain (LBP) and asymptomatic participants before and immediately after a sustained manual pressure to LR.

**Methods**

The present observational cohort study used a single-instance, test-retest design. The outcome variables included the resting thickness (Tr), the thickness during contraction (Tc), change in thickness ( $\Delta T$ ), sliding of musculofascial junction ( $\Delta X$ ), muscle length at rest (L) and displacement pattern ( $\Delta D$ ) of the TrA using ultrasonography. Vertical tolerable pressure at the LR was applied manual for 1 min. Tr, Tc,  $\Delta T$ , and  $\Delta X$  were analyzed by three-way ANOVA (musculofascial junction sites\*group\* pre-post manual release).  $\Delta L$  and  $\Delta D$  were analyzed by two-way ANOVA (group\* pre-post manual release).

**Results**

Participants with LBP revealed less Tc,  $\Delta T$  and  $\Delta X$  at both sites ( $p < 0.005$ ). After myofascial release, LBP group demonstrated a positive  $\Delta D$  of the musculofascial junctions at both end ( $p < 0.001$ ). Nevertheless, both groups increased the  $\Delta T$  and  $\Delta X$  at both sites ( $p < 0.001$  and 0.001, respectively).

**Conclusion**

The result indicated immediately effect of sustained manual pressure on musculofascial junction of TrA and supported the concept that the possible imbalanced tension of the myofascia corset of TrA in patients with LBP.

*Keywords:*

Abdominal drawing-in maneuver, Transversus abdominis, Musculofascial junction, Tensegrity, Lateral raphe

**Massage helps after exercise**

*J Physiother.* 2016 Apr;62(2):83-7. doi: 10.1016/j.jphys.2016.02.009. Epub 2016 Mar 23.

**Massage therapy decreases pain and perceived fatigue after long-distance Ironman triathlon: a randomised trial.**

Nunes GS<sup>1</sup>, Bender PU<sup>1</sup>, de Menezes FS<sup>2</sup>, Yamashitafuji I<sup>1</sup>, Vargas VZ<sup>3</sup>, Wageck B<sup>1</sup>.

**QUESTION:**

Can massage therapy reduce pain and perceived fatigue in the quadriceps of athletes after a long-distance triathlon race (Ironman)?

**DESIGN:**

Randomised, controlled trial with concealed allocation, intention-to-treat analysis and blinded outcome assessors.

**PARTICIPANTS:**

Seventy-four triathlon athletes who completed an entire Ironman triathlon race and whose main complaint was pain in the anterior portion of the thigh.

**INTERVENTION:**

The experimental group received massage to the quadriceps, which was aimed at recovery after competition, and the control group rested in sitting.

**OUTCOME MEASURES:**

The outcomes were pain and perceived fatigue, which were reported using a visual analogue scale, and pressure pain threshold at three points over the quadriceps muscle, which was assessed using digital pressure algometry.

**RESULTS:**

The experimental group had significantly lower scores than the control group on the visual analogue scale for pain (MD -7mm, 95% CI -13 to -1) and for perceived fatigue (MD -15mm, 95% CI -21 to -9). There were no significant between-group differences for the pressure pain threshold at any of the assessment points.

**CONCLUSION:**

Massage therapy was more effective than no intervention on the post-race recovery from pain and perceived fatigue in long-distance triathlon athletes.

**TRIAL REGISTRATION:**

Brazilian Registry of Clinical Trials, RBR-4n2srx. [Nunes GS, Bender PU, de Menezes FS, Yamashitafuji I, Vargas VZ, Wageck B (2016) Massage therapy decreases pain and perceived fatigue after long-distance Ironman triathlon: a randomised trial. *Journal of Physiotherapy* 62: 83-87].

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**KEYWORDS:**

Athletes; Fatigue; Musculoskeletal manipulations; Musculoskeletal pain; Quadriceps muscle

PMID: 27025688

**48 B. TRIGGER POINTS NEEDLING/ACUPUNCTURE****Latent trigger points in LE**

PM R. 2016 Mar 16. pii: S1934-1482(16)00174-X. doi: 10.1016/j.pmrj.2016.03.005.

**The Prevalence of Latent Trigger Points in Lower Limb Muscles in Asymptomatic Subjects.**

Zuil-Escobar JC<sup>1</sup>, Martínez-Cepa CB<sup>2</sup>, Martín-Urrialde JA<sup>2</sup>, Gómez-Conesa A<sup>3</sup>.

**BACKGROUND:**

Latent trigger points (LTrPs) are prevalent in persons with musculoskeletal pain. Because they could be present in healthy persons, it is necessary to evaluate the prevalence of LTrPs in asymptomatic subjects.

**OBJECTIVES:**

To assess the prevalence of LTrPs in lower limb muscles, to evaluate the relationship between LTrP prevalence, gender, and leg dominance, and to determine intra-rater reliability for the diagnosis of LTrPs.

**DESIGN:**

Cross-sectional study.

**SETTING: University community.****PATIENTS:**

A total of 206 asymptomatic subjects (113 women and 93 men, aged  $23.2 \pm 5.2$  years).

**INTERVENTION:**

Not applicable.

**MAIN OUTCOMES MEASURES:**

The prevalence of the LTrPs located in the gastrocnemius, soleus, peroneus longus, peroneus brevis, tibialis anterior, extensor digitorum longus, flexor digitorum longus, rectus femoris, vastus medialis, and vastus lateralis was studied, using the diagnosis criteria recommended by Simons, Travell, and Simons. The pressure pain threshold was also evaluated.

**RESULTS:**

Of the 206 subjects evaluated, 166 (77.7%; 95% confidence interval [CI], 72-83.4) were found to have at least one LTrP in the lower limb muscles. The average number of LTrPs found per individual was  $7.5 \pm 7.7$ . The prevalence in each muscle group ranged from 19.9% (95% CI, 14.4-25.4) to 37.4% (95% CI, 30.8-44), with gastrocnemius LTrPs being the most prevalent. Women had more LTrPs ( $9.6 \pm 7.8$ ) than did men ( $4.9 \pm 6.6$ ) ( $P < .01$ ). No relationship was found between the LTrPs and leg dominance ( $P > .05$ ). The most prevalent diagnosis criteria were the presence of a taut band and a tender spot (98%-100%); the local twitch response was the least prevalent diagnosis criteria (0%-3.5%). Intra-rater reliability was excellent for all the diagnosis criteria in all the muscles evaluated ( $\kappa = 0.762-1$ ), except for the jump sign and the referred pain in several LTrPs.

**CONCLUSION:**

LTrPs were prevalent in the lower limb muscles of asymptomatic subjects. Women have more LTrPs than do men. No differences in LTrP prevalence were found between sides. The presence of the taut band and the tender spot were the most prevalent and reliable diagnosis criteria. It is necessary to determine if the evaluation of LTrPs in the lower limb muscles of asymptomatic subjects has clinical relevance.

**51. CFS/BET****Sit to stand an LBP**

*J Manipulative Physiol Ther.* 2016 Mar-Apr;39(3):169-75. doi: 10.1016/j.jmpt.2016.02.014. Epub 2016 Mar 31.

**The Effect of Chronic Pain Intensity on Sit-to-Stand Strategy in Patients With Herniated Lumbar Disks.**

Sipko T<sup>1</sup>, Glibowski E<sup>2</sup>, Barczyk-Pawelec K<sup>3</sup>, Kuczyński M<sup>4</sup>.

**OBJECTIVE:**

Recurrent symptoms of low back pain and its transition to a chronic state are associated with specific motor strategies used by people to avoid pain. The aim of the study was to determine the impact of chronic pain intensity on sit-to-stand (STS) strategy in chronic low back pain (CLBP) patients with herniated disks.

**METHOD:**

Vertical ground reaction forces (counter, peak, and postpeak rebound) and their respective times of occurrence were measured on 2 Kistler force plates. Thirty-two healthy persons served as a control group. People with CLBP (n = 40) were divided into 2 subgroups according to the reported pain intensity at rest as measured by the numeric pain rating scale (NRS): low pain (NRS ≤ 3) and high pain (HP; NRS > 3).

**RESULTS:**

Both CLBP subgroups achieved shorter time to counter force but longer time to postpeak rebound force (P < .01). The time to peak force was extended in HP on the right side (P < .01). HP presented lower peak force on the right and lower postpeak rebound force on the left side (P < .001) compared with controls.

**CONCLUSION:**

Patients with CLBP were characterized by an individual, compensatory STS movement strategy with shorter preparation and longer stabilization times. Avoidance behavior in STS execution was presented in HP individuals only, indicating that intensity of chronic pain was a significant factor in decreasing ground reaction peak force and increasing time to peak force.

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**KEYWORDS:**

Chronic Pain; Movement; Posture

PMID: 27040035

**52. EXERCISE****Balance training**

*Sports Med.* 2016 Mar 18.

**Specificity of Balance Training in Healthy Individuals: A Systematic Review and Meta-Analysis.**

Kümmel J<sup>1</sup>, Kramer A<sup>2</sup>, Giboin LS<sup>2</sup>, Gruber M<sup>2</sup>.

**BACKGROUND:** It has become common practice to incorporate balance tasks into the training program for athletes who want to improve performance and prevent injuries, in rehabilitation programs, and in fall prevention programs for the elderly. However, it is still unclear whether incorporating balance tasks into a training program increases performance only in these specific tasks or if it affects balance in a more general way.

**OBJECTIVES:** The objective of this systematic literature review and meta-analysis was to determine to what extent the training of balance tasks can improve performance in non-trained balance tasks.

**DATA SOURCES:** A systematic literature search was performed in the online databases EMBASE, PubMed, SPORTDiscus and Web of Science. Articles related to balance training and testing in healthy populations published between January 1985 and March 2015 were considered.

**STUDY ELIGIBILITY CRITERIA:** A total of 3093 articles were systematically evaluated.

Randomized controlled trials were included that (i) used only balance tasks during the training, (ii) used at least two balance tests before and after training, and (iii) tested performance in the trained balance tasks and at least one non-trained balance task. Six studies with a total of 102 subjects met these criteria and were included into the meta-analysis.

**STUDY APPRAISAL AND SYNTHESIS METHODS:** The quality of the studies was evaluated by means of the Physiotherapy Evidence Database (PEDro) scale. A random effect model was used to calculate the between-subject standardized mean differences ( $SMD_{bs}$ ) in order to quantify the effect of balance training on various kinds of balance measures relative to controls. The tested balance tasks in each study were classified into tasks that had been trained and tasks that had not been trained. For further analyses, the non-trained balance tasks were subdivided into tasks with similar or non-similar body position and similar or non-similar balance perturbation direction compared to the trained task.

**RESULTS:** The effect of balance training on the performance of the trained balance tasks reached an  $SMD_{bs}$  of 0.79 [95 % confidence interval (CI) 0.48-1.10], indicating a high effect in favor for the trained task, with no notable heterogeneity ( $I^2 = 0\%$ ). The  $SMD_{bs}$  in non-trained categories reached values between -0.07 (95 % CI -0.53 to 0.38) and 0.18 (95 % CI -0.27 to 0.64), with non-notable to moderate heterogeneity ( $I^2 = 0-32\%$ ), indicating no effect of the balance training on the respective non-trained balance tasks.

**LIMITATIONS:**

With six studies, the number of studies included in this meta-analysis is rather low. It remains unclear how the limited number of studies with considerable methodological diversity affects the outcome of the SMD calculations and thus the general outcome of the meta-analysis.

**CONCLUSION:** In healthy populations, balance training can improve the performance in trained tasks, but may have only minor or no effects on non-trained tasks. Consequently, therapists and coaches should identify exactly those tasks that need improvement, and use these tasks in the training program and as a part of the test battery that evaluates the efficacy of the training program. Generic balance tasks-such as one-leg stance-may have little value as overall balance measures or when assessing the efficacy of specific training interventions.

## 54. POSTURE

### Neck posture

April 2016 Volume 22, Pages 62–67

#### **Neck muscle endurance and head posture: A comparison between adolescents with and without neck pain**

Ana Carolina Oliveira Anabela G. Silva

DOI: <http://dx.doi.org/10.1016/j.math.2015.10.002>

#### **Highlights**

- Neck pain in adolescents is of considerable duration and frequency.
- Neck pain in adolescents interferes with daily activities.
- Adolescents with neck pain have decreased neck flexor endurance capacity.
- Adolescents with neck pain have decreased neck extensor endurance capacity.
- There is a need for early interventions targeting adolescents with neck pain.

#### **Abstract**

##### **Objective**

The main aims of this study were to compare the neck flexor and extensor endurance and forward head posture between adolescents with and without neck pain. The secondary aims were to explore potential associations between muscles endurance, head posture and neck pain characteristics and to assess intra-rater reliability of the measurements used.

##### **Methods**

Adolescents with neck pain (n = 35) and age-matched asymptomatic adolescents (n = 35) had their forward head posture, neck flexor endurance and neck extensor endurance measured using clinical tests. Intra-rater reliability was also assessed.

##### **Results**

Forward head posture and neck flexor and extensor endurance tests showed moderate to almost perfect intra-rater reliability (ICC between 0.58 and 0.88). Adolescents with neck pain showed significantly less forward head posture (neck pain =  $46.62 \pm 4.92$ ; asymptomatic =  $44.18^\circ \pm 3.64^\circ$ ,  $p > 0.05$ ) and less neck flexor (neck pain =  $24.50 \pm 23.03$ s; asymptomatic =  $35.89 \pm 21.53$ s,  $p > 0.05$ ) and extensor endurance (neck pain =  $12.664 \pm 77.94$ s; asymptomatic =  $168.66 \pm 74.77$ s,  $p > 0.05$ ) than asymptomatic adolescents.

##### **Conclusions**

Results suggest that changes in posture and neck muscle endurance are a feature of adolescents with neck pain.

##### *Keywords:*

Neck pain, Endurance, Forward head posture, Adolescents

**Sitting and standing posture**

Spine J. 2016 Apr 7. pii: S1529-9430(16)30028-6. doi: 10.1016/j.spinee.2016.03.056.

**How the spine differs in standing and in sitting-important considerations for correction of spinal deformity.**

Hey HW<sup>1</sup>, Teo AQ<sup>2</sup>, Tan KA<sup>2</sup>, Ng LW<sup>2</sup>, Lau LL<sup>2</sup>, Liu KG<sup>2</sup>, Wong HK<sup>2</sup>.

**BACKGROUND CONTEXT:**

The current prevailing school of thought in spinal deformity surgery is to restore sagittal balance with reference to the alignment of the spine when the patient is standing. This strategy, however, likely accounts for increased rates of proximal junctional failure.

**PURPOSE:** *The purpose of this study was to investigate the differences between the spine in standing and sitting positions as these may elucidate reasons for deformity correction failure.*

**STUDY DESIGN/SETTING:**

A prospective, comparative study of 58 healthy patients presenting to a tertiary hospital over a 6-month period was carried out.

**PATIENT SAMPLE:**

All patients presenting with a less than 3-month history of first episode lower back pain were included. Patients who had radicular symptoms, red flag symptoms, previous spine surgery, or visible spinal deformity during forward bending test were excluded. Pregnant patients were also excluded.

**OUTCOME MEASURES:**

Radiographic measurements including sagittal vertical axis (SVA), lumbar lordosis (LL), thoracolumbar angle (TL), thoracic kyphosis (TK), cervical lordosis (CL), pelvic incidence (PI), and pelvic tilt (PT) were collected. The sagittal apex and end vertebrae of all radiographs were also recorded.

**METHODS:**

Basic demographic data (age, gender, and ethnicity) was recorded. Lateral standing and sitting radiographs were obtained using EOS technology. Statistical analysis was performed to compare standing and sitting parameters using chi-square tests for categorical variables and paired t tests for continuous variables.

**RESULTS:**

Taking the standing position as the reference point, forward displacement of the SVA occurred during sitting by a mean of  $6.39 \pm 3.87$  cm ( $p < .001$ ). This was accompanied by a reduction of LL and TK by a mean of  $24.63 \pm 12.70^\circ$  ( $p < .001$ ) and  $8.56 \pm 7.21^\circ$  ( $p < .001$ ), respectively. The TL became more lordotic by a mean of  $3.25 \pm 7.30^\circ$  ( $p < .001$ ). The CL only reached borderline significance ( $p = .047$ ) for increased lordosis by a mean of  $3.45 \pm 12.92^\circ$ . The PT also increased by 50% ( $p < .001$ ). Despite relatively constant end vertebrae, the apex vertebra moved inferiorly for the thoracic curve ( $p < .006$ ) and superiorly for the lumbar curve ( $p < .001$ ) by approximately one vertebral level each.

**CONCLUSIONS:**

Sagittal spinal alignment changes significantly between standing and sitting positions. Understanding these differences is crucial to avoid overcorrection of LL, which may occur if deformity correction is based solely on the spine's standing sagittal profile.

**KEYWORDS:** *Lumbar lordosis; Proximal junctional failure; Sagittal balance; Sitting; Spinal deformity surgery; Standing*

**Postural assessment**

Eur Spine J. 2016 Apr 7.

**A new quasi-invariant parameter characterizing the postural alignment of young asymptomatic adults.**

Amabile C<sup>1,2</sup>, Pillet H<sup>3</sup>, Lafage V<sup>4</sup>, Barrey C<sup>3,5</sup>, Vital JM<sup>6</sup>, Skalli W<sup>3</sup>.

**PURPOSE:**

Our study aims to describe the postural alignment of young asymptomatic subjects from head to feet from bi-planar standing full-body X-rays, providing database to compare to aging adults. Novelty resides in the inclusion of the head and lower limbs in the erected posture's analysis.

**METHODS:**

For 69 young asymptomatic subjects (18-40 years old) 3D reconstructions of the head, spine, pelvis and lower limbs segments were performed from bi-planar full-body X-rays. Usual studied spinal, pelvic and lower limbs' parameters were computed in 3D, sagittal and frontal planes of the patient. Relationships between these parameters were investigated. Inclinations of different lines were studied to characterize the erected posture.

**RESULTS:**

Values found for spinal curvatures, pelvic parameters and lower limbs geometrical parameters agreed with the literature: thoracic kyphosis, lumbar lordosis, pelvic incidence, pelvic tilt and sagittal vertical axis were respectively in average of 26.9° (SD 7.2°), 30.5° (SD 7.5°), 51.0° (SD 9.4°), 11.1° (SD 5.6°) and -8.9 mm (SD 21.6 mm). The angle between the vertical and the line joining the most superior point of dentiform apophyse of C2 (OD) and the center of the bi-coxofemoral axis (HA) was the less variable one (SD 1.6°).

**CONCLUSIONS:**

This study on 3D postural alignment reports the geometry of the spine, pelvis and lower limbs, of the young asymptomatic adult. The less variable angle is the one of the line OD-HA with the vertical, highlighting the vertical alignment of the head above the pelvis. This study provides a basis for future comparisons when investigating aging populations.

**KEYWORDS:**

3D; Asymptomatic young adults; Head to feet; Skeleton's postural alignment; Spinal alignment  
PMID: 27055441

**58. RUNNING****Post ex dystonia rx**

Parkinsonism Relat Disord. 2016 Mar 18. pii: S1353-8020(16)30067-0. doi: 10.1016/j.parkreldis.2016.03.013.

**Repetitive exercise dystonia: A difficult to treat hazard of runner and non-runner athletes.**

Cutsforth-Gregory JK<sup>1</sup>, Ahlskog JE<sup>2</sup>, McKeon A<sup>3</sup>, Burnett MS<sup>4</sup>, Matsumoto JY<sup>5</sup>, Hassan A<sup>6</sup>, Bower JH<sup>7</sup>.

**INTRODUCTION:**

Runner's dystonia has previously been described in small series or case reports as a lower limb, task-specific dystonia. We have occasionally encountered this disorder and recognized the same phenomenon in non-runners regularly engaging in lower limb exercise. We wished to characterize the syndrome further, including outcomes, treatment, and the diagnostic usefulness of electrophysiology.

**METHODS:**

We conducted a retrospective review and follow-up survey of adults seen at Mayo Clinic (1996-2015) with task-specific dystonia arising after prolonged repetitive lower limb exercise. The findings were compared to all 21 previously reported cases of runner's dystonia.

**RESULTS:**

We identified 20 patients with this condition, 13 runners and seven non-runner athletes. Median age at dystonia onset was in mid-adulthood. Correct diagnosis was delayed by a median of 3.5 years in runners and 1.6 years in non-runners, by which time more than one-third of patients had undergone unsuccessful invasive procedures. Most patients had dystonia onset in the distal lower limb. Dystonia was task-specific with exercise at onset but progressed to affect walking in most. Sensory tricks were reported in some. Surface EMG was consistent with task-specific dystonia in nine patients. Botulinum toxin, levodopa, clonazepam, trihexyphenidyl, and physical therapy provided modest benefit to some, but all patients remained substantially symptomatic at last follow up.

**CONCLUSIONS:**

Repetitive exercise dystonia is task-specific, confined to the lower limb and occasionally trunk musculature. It tends to be treatment-refractory and limits ability to exercise. Diagnosis is typically delayed, and unnecessary surgical procedures are common. Surface EMG may aid the diagnosis.

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**KEYWORDS:**

Dystonia; Exercise; Focal dystonia; Movement disorders; Task-specific dystonia

PMID: 27017145

**Un and shod running injuries**

Br J Sports Med. 2016 Apr;50(8):476-80. doi: 10.1136/bjsports-2014-094482. Epub 2015 Jun 30.

**Prospective comparison of running injuries between shod and barefoot runners.**

Altman AR<sup>1</sup>, Davis IS<sup>2</sup>.

**BACKGROUND:**

Advocates of barefoot running suggest that it is more natural and may be a way to minimise injury risk. In contrast, opponents believe shoes are needed to adequately cushion and support the foot. However, to date, there have been no prospective studies of injury patterns in barefoot and shod runners. The purpose of this study was to compare the incidence and rate of injuries between shod and barefoot runners.

**METHODS:**

A prospective survey was conducted over the course of a year among 201 (107 barefoot and 94 shod) adult runners. Information regarding injuries and mileage was logged monthly using a custom, web-based database program. The number of injured runners, number of injuries per runner and injury rates were compared between habitual barefoot and habitual shod runners. Both musculoskeletal and plantar surface injuries were assessed.

**RESULTS:**

Statistically fewer overall, diagnosed, musculoskeletal injuries/runner were noted in the barefoot group. However, injury rates were not statistically different between groups due to significantly less mileage run in the barefoot group. As expected, barefoot runners sustained a statistically greater number of injuries to the plantar surface of the foot. The descriptive analysis suggests a greater number of calf injuries, but lower number of knee and hip injuries in the barefoot group. Additionally barefoot runners reported less plantar fasciitis than the shod group.

**CONCLUSIONS:**

Barefoot running is associated with fewer overall musculoskeletal injuries/runner, but similar injury rates. A larger scale cohort is needed to more accurately assess differences in individual injuries between these two groups.

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**KEYWORDS:**

Injuries; Running

PMID: 26130697

**59. PAIN****Pain knowledge reduces fear avoidance**

Physiother Theory Pract. 2016 Apr 6:1-6.

**The relationship between knowledge of pain neurophysiology and fear avoidance in people with chronic pain: A point in time, observational study.**

Fletcher C<sup>1,2</sup>, Bradnam L<sup>3,4</sup>, Barr C<sup>2</sup>.

Chronic pain is prevalent in the western world; however fear of pain often has a greater impact than the degree of initial injury.

The aim of this study was to explore the relationship between knowledge of the neurophysiology of pain and fear avoidance in individuals diagnosed with chronic pain. Twenty-nine people with chronic musculoskeletal pain were recruited and completed questionnaires to determine their understanding of pain neurophysiology and the degree of their fear avoidance beliefs. There was an inverse relationship between knowledge of pain neurophysiology and the level of fear avoidance. Patients with higher pain knowledge reported less fear avoidance and lower perceived disability due to pain. There was no relationship with the educational level or compensable status for either variable.

The findings suggest that fear avoidance is positively influenced by neurophysiology of pain education, so that a higher level of pain knowledge is associated with less activity-related fear. The clinical implication is that reducing fear avoidance/kinesiophobia using neurophysiology of pain education in people with chronic pain may provide an effective strategy to help manage fear avoidance and related disability in the chronic pain population in order to improve treatment outcomes.

**KEYWORDS:**

Chronic pain; fear avoidance; kinesiophobia; pain education; pain neurophysiology

PMID: 27049810

**Behavioral changes 10 year post**

*Clin Rehabil.* 2016 Mar 23. pii: 0269215516639356.

**A 10-year follow-up of tailored behavioural treatment and exercise-based physiotherapy for persistent musculoskeletal pain.**

Emilson C<sup>1</sup>, Demmelmaier I<sup>2</sup>, Bergman S<sup>3</sup>, Lindberg P<sup>4</sup>, Denison E<sup>5</sup>, Åsenlöf P<sup>2</sup>.

**OBJECTIVE:**

To study the long-term outcomes of two interventions targeting patients with sub-acute and persistent pain in a primary care physiotherapy setting.

**DESIGN:**

A 10-year follow-up of a two-armed randomised controlled trial, initially including 97 participants.

**INTERVENTIONS:**

Tailored behavioural medicine treatment, applied in a physiotherapy context (experimental condition), and exercise-based physiotherapy (control condition).

**MAIN MEASURES:**

Pain-related disability was the primary outcome. The maximum pain intensity, pain control, fear of movement, sickness-related absence (register data) and perceived benefit and confidence in coping with future pain problems were the secondary outcomes.

**RESULTS:**

Forty-three (44%) participants responded to the follow-up survey, 20 in the tailored behavioural medicine treatment group and 23 in the exercise-based physiotherapy group. The groups did not differ in terms of the change in the scores for the primary outcome ( $p=0.17$ ) of pain-related disability between the experimental group (median: 2.5, Q1-Q3: -2.5-14.25), and the control group (median: 0, Q1-Q3: -5-6). Further, there were also no significant differences found for the secondary outcomes except for sickness-related absence, where the exercise-based physiotherapy group had more days of sickness-related absence three months before treatment ( $p=0.02$ ), and at the 10-year follow-up ( $p=0.03$ ).

**DISCUSSION:**

The beneficial effects favouring tailored behavioural medicine treatment that observed post-treatment and at the two-year follow-up were not maintained 10 years after treatment.

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**KEYWORDS:**

Chronic pain; behavioural medicine; long-term compliance; physical exercise; primary care

PMID: 27009057

### Management of

*Curr Pain Headache Rep.* 2016 Jun;20(6):39. doi: 10.1007/s11916-016-0567-7.

#### **The Role of Resilience in the Clinical Management of Chronic Pain.**

Hassett AL<sup>1</sup>, Finan PH<sup>2</sup>.

Chronic pain affects more individuals than does cancer, heart disease, and diabetes combined. Yet, our treatment options remain remarkably limited.

Often, highly effective psychotherapeutic approaches are limited by many barriers such as access, reimbursement, and acceptability; however, resilience-based positive activity interventions could offer a promising alternative. These interventions are engaging, non-stigmatizing, and do not require a mental health professional for their provision. This article reviews the new, but limited, research exploring the use of positive activity interventions for the treatment of patients with chronic pain.

The related psychological and biological mechanisms are addressed, as are suggestions for more systematically evaluating the potential for positive activity interventions to become an adjunct to or stand-alone intervention strategy for patients with chronic pain.

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

Chronic pain; Fibromyalgia; Inflammation; Positive activity interventions; Positive affect; Resilience; Well-being

PMID: 27115770

**Pain education impact**

April 2016 Volume 22, Pages 56–61

**A qualitative exploration of people's experiences of pain neurophysiological education for chronic pain: The importance of relevance for the individual**

Victoria Robinson Richard King Cormac G. Ryan Denis J. Martin

DOI: <http://dx.doi.org/10.1016/j.math.2015.10.001>

**Highlights**

- Chronic pain patients received 2 h of Pain Neurophysiology education (PNE).
- Patients were interviewed about their PNE experience.
- The majority (8/10) of patients found PNE relevant to them and reported benefits.
- A minority (2/10) did not find PNE relevant to them and reported no benefits.
- There was evidence of pain reconceptualisation but it was partial and patchy.

**Abstract**

Pain neurophysiology education (PNE) is a distinct form of patient education in pain management.

The aims of this study were to explore the experience of PNE for people with chronic pain and to gain insight into their understanding of their pain after PNE. This was a qualitative study, based on Interpretive Phenomenology Analysis, using individual semi-structured interviews to collect data. We recruited a purposive sample of 10 adults with chronic musculoskeletal pain (men and women; mean age 48 years; with a mean pain duration of 9 years) who had recently completed PNE delivered as a single 2-h group session. The interview transcripts were analysed for emerging themes. We identified three themes: perceived relevance for the individual participant; perceived benefits for the individual participant; and evidence of reconceptualisation. An interlinking narrative was the importance of relevance. Eight participants viewed the session as relevant and reported benefits ranging from a better understanding of pain, improved ability to cope with the pain, and some suggested improved levels of physical activity. Four of these participants showed evidence of reconceptualisation, which we describe as partial and patchy. Two participants reported no benefit and did not perceive the material delivered within PNE to be relevant to themselves.

Relevance to the individual needs of a person with chronic pain may be a key factor in the success of PNE, and this is a particular challenge when it is delivered in a group situation.

**Keywords:**

Chronic musculoskeletal pain, Patient education, Qualitative

**62 A. NUTRITION/VITAMINS****Vit E and recovery**

*J Hum Nutr Diet.* 2016 Apr 8. doi: 10.1111/jhn.12361. [

**Vitamin E supplementation inhibits muscle damage and inflammation after moderate exercise in hypoxia.**

Santos SA<sup>1</sup>, Silva ET<sup>1</sup>, Caris AV<sup>2</sup>, Lira FS<sup>3</sup>, Tufik S<sup>2</sup>, Dos Santos RV<sup>1,2</sup>.

**BACKGROUND:**

Exercise under hypoxic conditions represents an additional stress in relation to exercise in normoxia. Hypoxia induces oxidative stress and inflammation as mediated through tumour necrosis factor (TNF)- $\alpha$  release that might be exacerbated through exercise. In addition, vitamin E supplementation might attenuate oxidative stress and inflammation resulting from hypoxia during exercise. The present study aimed to evaluate the effects of vitamin E supplementation (250 mg) on inflammatory parameters and cellular damage after exercise under hypoxia simulating an altitude of 4200 m.

**METHODS:**

Nine volunteers performed three sessions of 60 min of exercise (70% maximal oxygen uptake) interspersed for 1 week under normoxia, hypoxia and hypoxia after vitamin E supplementation 1 h before exercise. Blood was collected before, immediately after and at 1 h after exercise to measure inflammatory parameters and cell damage.

**RESULTS:**

Percentage oxygen saturation of haemoglobin decreased after exercise and recovered 1 h later in the hypoxia + vitamin condition ( $P < 0.05$ ). Supplementation decreased creatine kinase (CK)-TOTAL, CK-MB and lactate dehydrogenase 1 h after exercise ( $P < 0.05$ ). The exercise in hypoxia increased interleukin (IL)-6, TNF- $\alpha$ , IL-1ra and IL-10 immediately after exercise ( $P < 0.05$ ). Supplementation reversed the changes observed after exercise in hypoxia without supplementation ( $P < 0.05$ ).

**CONCLUSIONS:**

We conclude that 250 mg of vitamin E supplementation at 1 h before exercise reduces cell damage markers after exercise in hypoxia and changes the concentration of cytokines, suggesting a possible protective effect against inflammation induced by hypoxia during exercise.

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**KEYWORDS:**

altitude; cellular damage; inflammation; physical exercise; supplementation; vitamin E

PMID: 27062041

**Paleo and Inflammation**

J Nutr. 2016 Apr 20. pii: jn224048.

**Paleolithic and Mediterranean Diet Pattern Scores Are Inversely Associated with Biomarkers of Inflammation and Oxidative Balance in Adults.**

Whalen KA<sup>1</sup>, McCullough ML<sup>2</sup>, Flanders WD<sup>3</sup>, Hartman TJ<sup>4</sup>, Judd S<sup>5</sup>, Bostick RM<sup>6</sup>.

**BACKGROUND:**

Chronic inflammation and oxidative balance are associated with poor diet quality and risk of cancer and other chronic diseases. A diet-inflammation/oxidative balance association may relate to evolutionary discordance.

**OBJECTIVE:**

We investigated associations between 2 diet pattern scores, the Paleolithic and the Mediterranean, and circulating concentrations of 2 related biomarkers, high-sensitivity C-reactive protein (hsCRP), an acute inflammatory protein, and F<sub>2</sub>-isoprostane, a reliable marker of in vivo lipid peroxidation.

**METHODS:**

In a pooled cross-sectional study of 30- to 74-y-old men and women in an elective outpatient colonoscopy population (n= 646), we created diet scores from responses on Willett food-frequency questionnaires and measured plasma hsCRP and F<sub>2</sub>-isoprostane concentrations by ELISA and gas chromatography-mass spectrometry, respectively. Both diet scores were calculated and categorized into quintiles, and their associations with biomarker concentrations were estimated with the use of general linear models to calculate and compare adjusted geometric means, and via unconditional ordinal logistic regression.

**RESULTS:**

There were statistically significant trends for decreasing geometric mean plasma hsCRP and F<sub>2</sub>-isoprostane concentrations with increasing quintiles of the Paleolithic and Mediterranean diet scores. The multivariable-adjusted ORs comparing those in the highest with those in the lowest quintiles of the Paleolithic and Mediterranean diet scores were 0.61 (95% CI: 0.36, 1.05;P-trend = 0.06) and 0.71 (95% CI: 0.42, 1.20;P-trend = 0.01), respectively, for a higher hsCRP concentration, and 0.51 (95% CI: 0.27, 0.95;P-trend 0.01) and 0.39 (95% CI: 0.21, 0.73;P-trend = 0.01), respectively, for a higher F<sub>2</sub>-isoprostane concentration.

**CONCLUSION:**

These findings suggest that diets that are more Paleolithic- or Mediterranean-like may be associated with lower levels of systemic inflammation and oxidative stress in humans.

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**KEYWORDS:**

C-reactive protein; F<sub>2</sub>-isoprostanes; Mediterranean diet; Paleolithic diet; cross-sectional study; diet patterns; inflammation; oxidative balance

PMID: 27099230

**Omega 3 and asthma****Fish oil supplementation during pregnancy and allergic respiratory disease in the adult offspring**

The Journal of Allergy and Clinical Immunology, 04/26/2016 Hansen s, et al.

In a randomized controlled trial (RCT) from 1990 with 24 years of follow-up, the aim was to determine if supplementation with 2.7 g long chain n-3 polyunsaturated fatty acids (PUFAs) in pregnancy can reduce the risk of offspring asthma and allergic respiratory disease. Maternal supplementation with fish oil may have prophylactic potential for long-term prevention of offspring asthma.

**Methods**

- The RCT included 533 women who were randomly assigned to receive fish oil during the 3rd trimester of pregnancy, olive oil, or no oil in the ratio 2:1:1.
- The offspring were followed in a mandatory national prescription register with complete follow-up for prescriptions related to the treatment of asthma and allergic rhinitis as primary outcomes.
- The offspring were furthermore invited to complete a questionnaire (74% participated) and to attend a clinical examination (47% participated) at age 18–19 years.

**Results**

- In intention-to-treat analyses, the probability of having had asthma medication prescribed was significantly reduced in the fish oil group compared to the olive oil group (HR=0.54, 95% CI: 0.32–0.90, p=0.02).
- The probability of having had allergic rhinitis medication prescribed was also reduced in the fish oil group compared to the olive oil group (HR=0.70, 95% CI: 0.47–1.05, p=0.09), but the difference was not statistically significant.

**62 B. CRYOTHERAPY****Cold immersion**

*Sports Med.* 2016 Apr;46(4):503-14. doi: 10.1007/s40279-015-0431-7.

**Can Water Temperature and Immersion Time Influence the Effect of Cold Water Immersion on Muscle Soreness? A Systematic Review and Meta-Analysis.**

Machado AF<sup>1</sup>, Ferreira PH<sup>2</sup>, Micheletti JK<sup>1</sup>, de Almeida AC<sup>3</sup>, Lemes ÍR<sup>1</sup>, Vanderlei FM<sup>1</sup>, Netto Junior J<sup>1</sup>, Pastre CM<sup>4</sup>.

**BACKGROUND:**

Cold water immersion (CWI) is a technique commonly used in post-exercise recovery. However, the procedures involved in the technique may vary, particularly in terms of water temperature and immersion time, and the most effective approach remains unclear.

**OBJECTIVES:**

The objective of this systematic review was to determine the efficacy of CWI in muscle soreness management compared with passive recovery. We also aimed to identify which water temperature and immersion time provides the best results.

**METHODS:**

The MEDLINE, EMBASE, SPORTDiscus, PEDro [Physiotherapy Evidence Database], and CENTRAL (Cochrane Central Register of Controlled Trials) databases were searched up to January 2015. Only randomized controlled trials that compared CWI to passive recovery were included in this review. Data were pooled in a meta-analysis and described as weighted mean differences (MDs) with 95 % confidence intervals (CIs).

**RESULTS:**

Nine studies were included for review and meta-analysis. The results of the meta-analysis revealed that CWI has a more positive effect than passive recovery in terms of immediate (MD = 0.290, 95 % CI 0.037, 0.543;  $p = 0.025$ ) and delayed effects (MD = 0.315, 95 % CI 0.048, 0.581;  $p = 0.021$ ). Water temperature of between 10 and 15 °C demonstrated the best results for immediate (MD = 0.273, 95 % CI 0.107, 0.440;  $p = 0.001$ ) and delayed effects (MD = 0.317, 95 % CI 0.102, 0.532;  $p = 0.004$ ). In terms of immersion time, immersion of between 10 and 15 min had the best results for immediate (MD = 0.227, 95 % CI 0.139, 0.314;  $p < 0.001$ ) and delayed effects (MD = 0.317, 95 % CI 0.102, 0.532,  $p = 0.004$ ).

**CONCLUSIONS:**

The available evidence suggests that CWI can be slightly better than passive recovery in the management of muscle soreness. The results also demonstrated the presence of a dose-response relationship, indicating that CWI with a water temperature of between 11 and 15 °C and an immersion time of 11-15 min can provide the best results.

PMID: 26581833