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**2. LBP**

**Rotation ex more effective than stretching**

J Manipulative Physiol Ther. 2016 Sep 3. pii: S0161-4754(16)30037-9. doi: 10.1016/j.jmpt.2016.07.006.

**Effects of Motor Control Exercise Vs Muscle Stretching Exercise on Reducing Compensatory Lumbopelvic Motions and Low Back Pain: A Randomized Trial.**

Park KN<sup>1</sup>, Kwon OY<sup>2</sup>, Yi CH<sup>3</sup>, Cynn HS<sup>3</sup>, Weon JH<sup>4</sup>, Kim TH<sup>5</sup>, Choi HS<sup>6</sup>.

**OBJECTIVES:**

The purpose of this study was to investigate the effectiveness of a 6-week motor control exercise (MCE) vs stretching exercise (SE) on reducing compensatory pelvic motion during active prone knee flexion (APKF) and intensity of low back pain.

**METHODS:**

Thirty-six people in the lumbar-rotation-extension subgroup were randomly assigned equally into 2 exercise groups (18 people in each an MCE or SE group). A 3-dimensional motion-analysis system was used to measure the range and onset time of pelvic motion and knee flexion during APKF. Surface electromyography was used to measure the muscle activity and onset time of the erector spinae and the hamstrings during APKF. The level of subjective low back pain was measured using a visual analog scale.

**RESULTS:**

The MCE group had more significant decreases in and delay of anterior pelvic tilt, pelvic rotation, and erector spinae muscle activity during APKF, as well as reduced intensity of low back pain compared with the SE group (P < .05).

**CONCLUSIONS:**

For rehabilitation in patients in the lumbar-rotation-extension subgroup, MCE was more effective than SE in reducing compensatory pelvic motion and muscle activity during APKF and minimizing low back pain.

## 8. VISCERA

### Probiotics and MS

#### **Clinical and metabolic response to probiotic supplementation in patients with multiple sclerosis: A randomized, double-blind, placebo-controlled trial**

Clinical Nutrition, 09/20/2016

Kouchaki E, et al.

The authors performed this randomized, double-blind, placebo-controlled trial to investigate the effects of probiotic intake on disability, mental health and metabolic condition in subjects with multiple sclerosis (MS). As per this study, the use of probiotic capsule for 12 weeks among subjects with MS had favorable effects on Expanded disability status scale (EDSS), parameters of mental health, inflammatory factors, markers of insulin resistance, HDL-, total-/HDL-cholesterol and malondialdehyde (MDA) levels.

#### Methods

- The authors enrolled 60 MS patients.
- They randomly allocated participants into 2 groups to receive either a probiotic capsule (n=30) or placebo containing starch (n=30) for 12 weeks.
- They recorded expanded disability status scale (EDSS) scoring and parameters of mental health at the baseline and 12 weeks after the intervention.

#### Results

- As compared with the placebo, probiotic intake improved EDSS ( $-0.3 \pm 0.6$  vs.  $+0.1 \pm 0.3$ ,  $P=0.001$ ), beck depression inventory ( $-5.6 \pm 4.9$  vs.  $-1.1 \pm 3.4$ ,  $P<0.001$ ), general health questionnaire ( $-9.1 \pm 6.2$  vs.  $-2.6 \pm 6.4$ ,  $P<0.001$ ) and depression anxiety and stress scale ( $-16.5 \pm 12.9$  vs.  $-6.2 \pm 11.0$ ,  $P=0.001$ ).

- Also, in the probiotic group changes in high-sensitivity C-reactive protein ( $-1.3 \pm 3.5$  vs.  $+0.4 \pm 1.4$   $\mu\text{g/mL}$ ,  $P=0.01$ ), plasma nitric oxide metabolites ( $+1.0 \pm 7.9$  vs.  $-6.0 \pm 8.3$   $\mu\text{mol/L}$ ,  $P=0.002$ ) and malondialdehyde (MDA) ( $+0.009 \pm 0.4$  vs.  $+0.3 \pm 0.5$   $\mu\text{mol/L}$ ,  $P=0.04$ ) were significantly different from the changes in these parameters in the placebo group.
- The consumption of probiotic capsule significantly diminished serum insulin ( $-2.9 \pm 3.7$  vs.  $+1.1 \pm 4.8$   $\mu\text{IU/mL}$ ,  $P<0.001$ ), homeostasis model of assessment-estimated insulin resistance ( $-0.6 \pm 0.8$  vs.  $+0.2 \pm 1.0$ ,  $P=0.001$ ), Beta cell function ( $-12.1 \pm 15.5$  vs.  $+4.4 \pm 17.5$ ,  $P<0.001$ ) and total-/HDL-cholesterol ( $-0.1 \pm 0.3$  vs.  $0.1 \pm 0.3$ ,  $P=0.02$ ), and significantly increased quantitative insulin sensitivity check index ( $+0.01 \pm 0.02$  vs.  $-0.005 \pm 0.01$ ,  $P<0.001$ ) and HDL-cholesterol levels ( $2.7 \pm 3.4$  vs.  $0.9 \pm 2.9$   $\text{mg/dL}$ ,  $P=0.02$ ) as compared with the placebo

### Childhood IBS

J Pediatr. 2016 Sep 14. pii: S0022-3476(16)30727-2. doi: 10.1016/j.jpeds.2016.08.045.

#### **Childhood Irritable Bowel Syndrome Characteristics Are Related to Both Sex and Pubertal Development.**

Chumpitazi BP<sup>1</sup>, Weidler EM<sup>2</sup>, Czyzewski DI<sup>3</sup>, Self MM<sup>3</sup>, Heitkemper M<sup>4</sup>, Shulman RJ<sup>2</sup>.

#### **OBJECTIVE:**

To determine the relationship of both pubertal development and sex to childhood irritable bowel syndrome (IBS) clinical characteristics including gastrointestinal symptoms (eg, abdominal pain) and psychological factors.

#### **STUDY DESIGN:**

Cross-sectional study with children ages 7-17 years ( $n = 143$ ) with a pediatric Rome III IBS diagnosis recruited from both primary and tertiary clinics between January 2009 and January 2014. Subjects completed 14-day prospective pain and stool diaries, as well as validated questionnaires assessing several psychological factors (somatization, depression, anxiety) and Tanner stage. Stool form ratings were completed using the Bristol Stool Form Scale.

#### **RESULTS:**

Girls with higher Tanner scores (more mature pubertal development) had both decreased pain severity and pain interference; in contrast, boys with higher Tanner scores had both increasing pain severity ( $\beta = 0.40$ ,  $P = .02$ ) and pain interference ( $\beta = 0.16$ ,  $P = .02$ ). Girls (vs boys), irrespective of pubertal status, had both increased somatic complaints ( $P = .005$ ) and a higher percentage ( $P = .01$ ) of hard (Bristol Stool Form Scale type 1 or 2) stools. Pubertal status and sex did not significantly relate to IBS subtype, pain frequency, stooling frequency, anxiety, or depression.

#### **CONCLUSIONS:**

In children with IBS, both pubertal development and/or sex are associated with abdominal pain severity, stool form, and somatization. These differences provide insight into the role of pubertal maturation during the transition from childhood to adult IBS.

**PT and childhood constipation****Effectiveness of Pelvic Physiotherapy in Children With Functional Constipation, Compared with Standard Medical Care**

Marieke L. van Engelenburg – van Lonkhuyzen Esther M.J. Bols Marc A. Benninga Wim A. Verwijns Rob A. de Bie

DOI: <http://dx.doi.org/10.1053/j.gastro.2016.09.015>

**Background & Aims**

Functional constipation (FC) is a common childhood problem often related to pelvic floor muscle dysfunction. We compared the effectiveness of pelvic physiotherapy (PPT) vs standard medical care (SMC) in children with FC.

**Methods**

We performed a multicenter randomized controlled trial of 53 children (5–16 years old) with FC according to the Rome III criteria, at hospitals in The Netherlands from December 2009 to May 2014. Group allocation was concealed using a central computer system. SMC consisted of education, toilet training, and laxatives (n=26), whereas PPT included SMC plus specific physiotherapeutic interventions (n=27). Results were obtained from written reports from the subjects' pediatricians and parents. The primary outcome was absence of FC, according to Rome III criteria, after a 6 month follow-up period. Secondary outcomes were global perceived effect (range 1–9; success defined as score  $\geq$  8), numeric rating scales assessing quality of life (parent and child; scale, 1–10), and the strengths and difficulties questionnaire (SDQ).

**Results**

Treatment was effective for 92.3% of the children receiving PPT and 63.0% of the children receiving SMC (adjusted odds ratio for success of PPT, 11.7; 95% CI, 1.8–78.3) ( $P=.011$ ). Significantly more children undergoing PPT stopped using laxatives (adjusted odds ratio, 6.5; 95% CI, 1.6–26.4) ( $P=.009$ ). Treatment success (based on global perceived effect) was achieved for 88.5% of subjects receiving PPT vs 33.3% of subjects receiving SMC) ( $P<.001$ ). PPT also produced larger adjusted mean differences, before vs after treatment, in numeric rating scales to

assess quality of life: an increase of 1.8 point for parents ( $P=.047$ ) and 2.0 points for children ( $P=.028$ ). Results from the SDQ did not differ significantly between groups ( $P=.78$ ).

### Conclusions

In a randomized controlled trial of children with FC, PPT was more effective than SMC on all outcomes measured, with the exception of findings from the SDQ. PPT should be considered as a treatment option for FC in children 5–16 years old. Dutch Clinical Trial Registration no: NL30551.068.09

## 12 A. WHIPLASH

### Vibration as an evaluation

Man Ther. 2016 Sep;25:81-6. doi: 10.1016/j.math.2016.06.006. Epub 2016 Jun 15.

### **Vibration sensibility of the median nerve in a population with chronic whiplash associated disorder: Intra- and inter-rater reliability study.**

Tyros I<sup>1</sup>, Soundy A<sup>2</sup>, Heneghan NR<sup>2</sup>.

Whiplash Associated Disorders (WAD) grade II are the most prevalent group of whiplash patients seen on a regular basis by musculoskeletal physiotherapists. Impairment of vibration sensibility may be an early indicator of nerve pathology and it has previously been demonstrated in individuals with chronic WAD symptoms utilising vibrameters. A less expensive option, such the tuning fork (TF) may assist with these measures, but research regarding its measurement properties is lacking.

#### **OBJECTIVES:**

To investigate the intra- and inter-rater reliability of vibration sensibility of the median nerve in chronic WAD II (CWAD II).

#### **METHODS:**

A double blinded, within day intra- and inter-rater reliability study was undertaken. A convenience sample of 26 individuals (8 males, 18 females, age mean  $29.9 \pm 10.0$  years) with CWADII was recruited.

#### **EXCLUSION CRITERIA:**

WAD I, III & indications of neuropathic pain. Vibration attenuation times were recorded from skin innervated by the median nerve (thenar eminence).

#### **RESULTS:**

Descriptive statistics (mean scores) and reliability statistics [intraclass correlation coefficient (ICC<sub>2,1</sub>) and Bland and Altman limits of agreement] were undertaken with  $p = 0.05$ . Almost perfect intra-rater reliability (Intraclass Correlation Coefficiency (ICC): 0.972-0.955) and inter-rater reliability (ICC: 0.983) were identified. Confidence Intervals (CI) for inter-rater reliability were 95% CI: -1.461 to -0.056.

**CONCLUSIONS:**

Almost perfect reliability scores across intra- and inter-rater reliability were found. This provides evidence that, with a standardised testing protocol the TF can be a highly reliable means of vibration sensibility testing. Future studies assessing the validity of the TF in different WAD populations may provide further information about the usefulness of this protocol.

**13. CRANIUM/TMJ****Tinnitus**

Man Ther. 2016 Aug 26;26:125-131. doi: 10.1016/j.math.2016.08.005.

**Does multi-modal cervical physical therapy improve tinnitus in patients with cervicogenic somatic tinnitus?**

Michiels S<sup>1</sup>, Van de Heyning P<sup>2</sup>, Truijen S<sup>3</sup>, Hallemans A<sup>4</sup>, De Hertogh W<sup>5</sup>.

**BACKGROUND:**

Tinnitus can be related to many different aetiologies such as hearing loss or a noise trauma, but it can also be related to the somatosensory system of the cervical spine, called cervicogenic somatic tinnitus (CST). Case studies suggest a positive effect of cervical spine treatment on tinnitus complaints in patients with CST, but no experimental studies are available.

**OBJECTIVE:**

To investigate the effect of a multimodal cervical physical therapy treatment on tinnitus complaints in patients with CST.

**DESIGN:**

Randomized controlled trial.

**PATIENTS:**

Patients with a combination of severe subjective tinnitus (Tinnitus Functional Index (TFI): 25-90 points) and neck complaints (Neck Bournemouth Questionnaire (NBQ) > 14 points).

**INTERVENTION:**

All patients received cervical physical therapy for 6 weeks (12 sessions). Patients were randomized in an immediate-start therapy group (n = 19) and a 6-week delayed-start therapy group (n = 19).

**MEASUREMENTS:**

TFI and NBQ-scores were documented at baseline, after the wait-and-see period in the delayed-start group, after treatment and after 6 weeks follow-up. The Global Perceived Effect (GPE) was documented at all measuring moments, except at baseline.

**RESULTS:**

In all patients (n = 38) TFI and NBQ-scores decreased significantly after treatment (p = 0.04 and p < 0.001). NBQ-scores remained significantly lower after follow-up (p = 0.001). Immediately after treatment, 53% (n = 38) experienced substantial improvement of tinnitus. This effect was maintained in 24% of patients after follow-up at six weeks.

**CONCLUSION:**

Cervical physical therapy can have a positive effect on subjective tinnitus complaints in patients with a combination of tinnitus and neck complaints. Larger studies, using more responsive outcome measures, are however necessary to prove this effect

**Sleep apnea**

Clin Respir J. 2016 Sep 10. doi: 10.1111/crj.12554.

**Effect of continuous positive airway pressure on liver enzymes in obstructive sleep apnea: A meta-analysis: CPAP on liver enzymes.**

Chen LD<sup>1</sup>, Lin L<sup>1</sup>, Zhang LJ<sup>1</sup>, Zeng HX<sup>1</sup>, Wu QY<sup>1</sup>, Hu MF<sup>1</sup>, Xie JJ<sup>2</sup>, Liu JN<sup>3</sup>.

**BACKGROUND:**

Previous studies have suggested that obstructive sleep apnea (OSA) was associated with nonalcoholic fatty liver disease (NAFLD). However, the impact of OSA treatment using continuous positive airway pressure (CPAP) on liver enzymes remained controversial. This meta-analysis was conducted to determine whether CPAP therapy could reduce liver enzyme levels.

**METHODS:**

Two reviewers independently searched PubMed, Cochrane library, Embase and Web of Science before December 2015. Information on characteristics of subjects, study design and pre- and post-CPAP treatment of serum ALT and AST was extracted for analysis. A total of 5 studies with 7 cohorts that included 192 patients were pooled into meta-analysis.

**RESULTS:**

CPAP was associated with a statistically significant decrease on both ALT and AST levels in OSA patients (WMD=8.036, 95% CI=2.788 to 13.285, z=3.00, p=0.003 and WMD=4.612, 95% CI=0.817 to 8.407, z=2.38, p=0.017, respectively). Subgroup analyses indicated that CPAP therapy was more effective in OSA patients with treatment duration >3 months (WMD=12.374, 95% CI=2.727 to 22.020, z=2.51, p=0.012 for ALT and WMD=7.576, 95% CI=1.781 to 13.370, z=2.56, p=0.010 for AST).

**CONCLUSION:**

This meta-analysis suggested that CPAP was associated with a statistically significant decrease on liver enzymes in OSA patients. Further large-scale well-designed RCTs with long-term follow-up are required to clarify this issue. This article is protected by copyright. All rights reserved.

## 14. HEADACHES

### Sound therapy

#### **Sound therapy may balance brain signals to reduce blood pressure, migraines**

American Heart Association News, 09/20/2016

**A**noninvasive neurotechnology, which uses sound to balance right- and left-side brain frequencies was associated with lowered blood pressure, improved heart rate variability, and reduced symptoms of migraine headaches, according to two small studies presented at the American Heart Association's Council on Hypertension 2016 Scientific Sessions.

The neurotechnology, called High-resolution, relational, resonance based, electroencephalic mirroring, or HIRREM (Brain State Technologies, Scottsdale, Arizona), uses sensors placed on the scalp to measure brain electrical activity, and detect right/left imbalances, or hyperarousal, according to study author Hossam A. Shaltout, R.Ph., Ph.D., assistant professor in the Hypertension and Vascular Research Center at Wake Forest School of Medicine in Winston-Salem, North Carolina. "Most people have relatively balanced electrical activity between the right side and left sides of the brain," Shaltout said. "Imbalance, with one side dominant, or more active, may reflect autonomic dysregulation associated with the effects of chronic stress, which is thought to play a role in high blood pressure, migraines, insomnia, depression, hot flashes and more." In real time, HIRREM monitors brain electrical activity and translates dominant brain frequencies into computer-generated audible tones that are reflected back simultaneously via ear buds. "Gradually, and on its own, with no conscious, cognitive activity required, the electrical pattern tends to shift towards improved balance and reduced hyperarousal," Shaltout said. In one study (Abstract P310), researchers looked at HIRREM's impact on 10 men and women with stage one hypertension at the start of the study. After an average of 17.7 HIRREM sessions received over 10.2 in-office days, hypertensive patients showed an average reduction in their systolic blood pressure, from 152 to 136 millimeters of mercury (mm Hg), and a reduction in their diastolic pressure from 97 to 81 mmHg. Insomnia severity improved in the small study group, and anxiety seemed to improve. The researchers also found that heart rate variability increased from an average 42 to 57 milliseconds, which is a good thing, Shaltout said. "The more flexibility and dynamic range the body has to be able to change the heart rate in response to the blood

pressure, the better,” Shaltout said.

In another study (Abstract P602), the researchers examined the effect of HIRREM on 52 adults who had reported they suffered from migraines. The patients studied received 15.9 sessions over nine in-office days. Comparing the data they collected before the therapy to two weeks after, researchers found patients reported improvements for insomnia, mood, and headaches. These results are the first to suggest that HIRREM could offer cardiovascular as well as behavioral benefits in the treatment of high blood pressure. More research is needed to verify these preliminary findings, Shaltout said. These studies looking at hypertension and migraine are part of a larger research program that has now enrolled over 400 participants in one of five studies to assess the effect of HIRREM for multiple symptoms and conditions. “If these findings are confirmed in larger controlled studies, HIRREM may prove to be a valuable new approach for brain-based health care,” Shaltout said.

### 15. VESTIBULAR

#### Cervicogenic dizziness

Eur J Phys Rehabil Med. 2016 Aug 30.

#### **The effect of normalizing the sagittal cervical configuration on dizziness, neck pain , and cervicocephalic kinesthetic sensibility: a 1-year randomized controlled study.**

Moustafa IM<sup>1</sup>, Diab AA, Harrison DE.

**BACKGROUND:** Cervicogenic dizziness is a disabling condition commonly associated with cervical dysfunction. Although the growing interest with the importance of normal sagittal configuration of cervical spine, the missing component in the management of cervicogenic dizziness might be altered structural alignment of the cervical spinal region itself.

**AIM:** To investigate the immediate and long-term effects of a 1-year multimodal program, with the addition of cervical lordosis restoration and anterior head translation (AHT) correction, on the severity of dizziness, disability, cervicocephalic kinesthetic sensibility, and cervical pain in patients with cervicogenic dizziness.

**DESIGN:** A randomized controlled study with a 1-year and 10-week follow-up.

**SETTING:** University research laboratory.

**POPULATION:** 72 (25 female) patients between 40 and 55 years with cervicogenic dizziness, a definite hypolordotic cervical spine and AHT posture were randomly assigned to the control or an experimental group.

#### **METHODS:**

Both groups received the multimodal program; additionally, the experimental group received the denneroll™ cervical traction. Outcome measures included AHT distance, cervical lordosis, dizziness handicap inventory (DHI), severity of dizziness, dizziness frequency, head repositioning accuracy (HRA) and cervical pain. Measures were assessed at three time intervals: baseline, 10 weeks, and 1 year after the 10 week follow up.

#### **RESULTS:**

Significant group × time effects at both the 10 week post treatment and the 1-year follow up were identified favoring the experimental group for measures of cervical lordosis (P<0.0005) and anterior head translation (P<0.0005). At 10 weeks, the between group analysis showed equal improvements in dizziness outcome measures, pain intensity, and HRA; DHI scale (P=0.5),

severity of dizziness (P=0.2), dizziness frequency (P= .09), HRA (P= ,1) and neck pain (P=0.3),. At the 1 year follow-up, the between group analysis identified statistically significant differences for all of the measured variables including anterior head translation (2.4 cm [-2.3, - 1.8], P<.0005), cervical lordosis (-14.4° [-11.6, -8.3], P<.0005), dizziness handicap inventory (29.9 [-34.4, -29.9], P<.0005), severity of dizziness (5.4 [-5.9, -4.9], P<.0005), dizziness frequency (2.6 [-3.1, -2.5], P<.0005), HRA for RT rotation ( 2.8[-3.9 -3.3], P<.005), HRA for LT rotation( 3.1 [-3.5 -3.4, P<.0005] , neck pain (4.97 [-5.3, -4.3], P<.0005); indicating greater improvements in the experimental group.

**CONCLUSION:**

The addition of dennerollTM cervical extension traction to a multimodal program positively affected pain, cervicocephalic kinesthetic sensibility, dizziness management outcomes at long term follow up.

**CLINICAL REHABILITATION IMPACT:**

Appropriate physical therapy rehabilitation for cervicogenic dizziness should include structural rehabilitation of the cervical spine (lordosis and head posture correction), as it might to lead greater and longer lasting improved function.

**18. CLAVICLE**

**AC joint injury**

BMC Musculoskelet Disord. 2016 Sep 6;17(1):385. doi: 10.1186/s12891-016-1240-3.

**Injury patterns of the acromioclavicular ligament complex in acute acromioclavicular joint dislocations: a cross-sectional, fundamental study.**

Maier D<sup>1</sup>, Jaeger M<sup>2</sup>, Reising K<sup>2</sup>, Feucht MJ<sup>2</sup>, Südkamp NP<sup>2</sup>, Izadpanah K<sup>2</sup>.

**BACKGROUND:**

Horizontal instability impairs clinical outcome following acute acromioclavicular joint (ACJ) reconstruction and may be caused by insufficient healing of the superior acromioclavicular ligament complex (ACLCL). However, characteristics of acute ACLCL injuries are poorly understood so far. Purposes of this study were to identify different ACLCL tear types, assess type-specific prevalence and determine influencing cofactors.

**METHODS:**

This prospective, cross-sectional study comprised 65 patients with acute-traumatic Rockwood-5 (n = 57) and Rockwood-4 (n = 8) injuries treated operatively by means of mini-open ACJ reduction and hook plate stabilization. Mean age at surgery was 38.2 years (range, 19-57 years). Standardized pre- and intraoperative evaluation included assessment of ACLCL tear patterns and cofactors related to the articular disc, the deltoid-trapezoidal (DT) fascia and bony ACJ morphology. Articular disc size was quantified as 0 = absent, 1 = remnant, 2 = meniscoid and 3 = complete.

**RESULTS:**

All patients showed complete ruptures of the superior ACLCL, which could be assigned to four different tear patterns. Clavicular-sided (AC-1) tears were observed in 46/65 (70.8 %), oblique (AC-2) tears in 12/65 (18.5 %), midportion (AC-3) tears in 3/65 (4.6 %) and acromial-sided (AC-4) tears in 4/65 (6.1 %) of cases. Articular disc size manifestation was significantly (P < .001) more pronounced in patients with AC-1 tears (1.89 ± 0.57) compared to patients with AC-2 tears (0.67 ± 0.89). Other cofactors did not influence ACLCL tear patterns. ACLCL dislocation with incarceration caused mechanical impediment to anatomical ACJ reduction in 14/65 (21.5 %) of

cases including all Rockwood-4 dislocations. Avulsion "in continuity" was a consistent mode of failure of the DT fascia. Type-specific operative strategies enabled anatomical ACLC repair of all observed tear types.

**CONCLUSIONS:**

Acute ACLC injuries follow distinct tear patterns. There exist clavicular-sided (AC-1), oblique (AC-2), midportion (AC-3) and acromial-sided (AC-4) tears. Articular disc size was a determinant factor of ACLC tear morphology. Mini-open surgery was required in Rockwood-4 and a relevant proportion of Rockwood-5 dislocations to achieve both anatomical ACLC and ACJ reduction. Type-specific operative repair of acute ACLC tears might promote biological healing and lower rates of horizontal ACJ instability following acute ACJ reconstruction.

## 20 A. ROTATOR CUFF

### Scapula rehabilitation

Man Ther. 2016 Sep;25:35-42. doi: 10.1016/j.math.2016.05.337. Epub 2016 Jun 4.

#### Effectiveness of scapula-focused approaches in patients with rotator cuff related shoulder pain: A systematic review and meta-analysis.

Bury J<sup>1</sup>, West M<sup>2</sup>, Chamorro-Moriana G<sup>3</sup>, Littlewood C<sup>4</sup>.

**BACKGROUND:**

Rotator cuff related shoulder pain (RCSP) is common with a range of conservative treatments currently offered. Evidence supporting superiority of one approach over another is lacking. Scapula focused approaches (SFA) are frequently prescribed and warrant investigation.

**OBJECTIVE:**

To evaluate the effectiveness of SFA in RCSP.

**DESIGN:**

Systematic review of randomised controlled trials.

**METHODS:**

An electronic search including MEDLINE, PEDro, ENFISPO to January 2016 was supplemented by hand searching. Randomised controlled trials were included; appraised using the PEDro scale and synthesised via meta-analysis or narratively, where appropriate.

**RESULTS:**

Four studies (n = 190) reported on pain and three studies (n = 122) reported on disability. Regarding pain, there was statistical but not clinically significant benefit of SFA versus generalised approaches (mean difference (VAS) 0.714; 95% CI 0.402-1.026) in the short term (<6 weeks); regarding disability, there was significant benefit of SFA versus generalised approaches (mean difference 14.0; 95% CI 11.2-16.8) in the short term (<6 weeks). One study (n = 22) reported disability at 3 months, which was not statistically significant. Evidence is conflicting from four studies relating to the effect of SFA on scapula position/movement.

**CONCLUSION:**

SFA for RCSP confers benefit over generalised approaches up to six weeks but this benefit is not apparent by 3 months. Early changes in pain are not clinically significant. With regards to scapula

position/movement, the evidence is conflicting. These preliminary conclusions should be treated with significant caution due to limitations of the evidence base.

### 32 A. KNEE/ACL

#### Rehabilitation of

Br J Sports Med. 2016 Aug 18. pii: bjsports-2015-095898. doi: 10.1136/bjsports-2015-095898.

#### **Evidence-based clinical practice update: practice guidelines for anterior cruciate ligament rehabilitation based on a systematic review and multidisciplinary consensus.**

van Melick N<sup>1</sup>, van Cingel RE<sup>2</sup>, Brooijmans F<sup>3</sup>, Neeter C<sup>4</sup>, van Tienen T<sup>5</sup>, Hullegie W<sup>6</sup>, Nijhuis-van der Sanden MW<sup>7</sup>.

#### **AIM:**

The Royal Dutch Society for Physical Therapy (KNGF) instructed a multidisciplinary group of Dutch anterior cruciate ligament (ACL) experts to develop an evidence statement for rehabilitation after ACL reconstruction.

#### **DESIGN:**

Clinical practice guideline underpinned by systematic review and expert consensus.

#### **DATA SOURCES:**

A multidisciplinary working group and steering group systematically reviewed the literature and wrote the guideline. MEDLINE and the Cochrane Library were searched for meta-analyses, systematic reviews, randomised controlled trials and prospective cohort studies published between January 1990 and June 2015.

#### **ELIGIBILITY CRITERIA FOR SELECTING STUDIES:**

Included literature must have addressed 1 of 9 predetermined clinical topics: (1) preoperative predictors for postoperative outcome, (2) effectiveness of physical therapy, (3) open and closed kinetic chain quadriceps exercises, (4) strength and neuromuscular training, (5) electrostimulation and electromyographic feedback, (6) cryotherapy, (7) measurements of functional performance, (8) return to play and (9) risk for reinjury.

#### **SUMMARY:**

Ninety studies were included as the basis for the evidence statement. Rehabilitation after ACL injury should include a prehabilitation phase and 3 criterion-based postoperative phases: (1) impairment-based, (2) sport-specific training and (3) return to play. A battery of strength and hop tests, quality of movement and psychological tests should be used to guide progression from one rehabilitation stage to the next. Postoperative rehabilitation should continue for 9-12 months. To

assess readiness to return to play and the risk for reinjury, a test battery, including strength tests, hop tests and measurement of movement quality, should be used.

### 34. PATELLA

#### Patellar pain isometric and isotonic

J Sci Med Sport. 2016 Sep;19(9):702-6. doi: 10.1016/j.jsams.2015.11.006. Epub 2015 Dec 7.

#### **Do isometric and isotonic exercise programs reduce pain in athletes with patellar tendinopathy in-season? A randomised clinical trial.**

van Ark M<sup>1</sup>, Cook JL<sup>2</sup>, Docking SI<sup>2</sup>, Zwerver J<sup>3</sup>, Gaida JE<sup>4</sup>, van den Akker-Scheek I<sup>3</sup>, Rio E<sup>2</sup>.

#### **OBJECTIVES:**

Many athletes with patellar tendinopathy participate in sports with symptoms during or after activities. Current treatments do not decrease pain in-season; eccentric exercises in-season result in an increase in pain. This study examined if isometric and isotonic exercises relieved pain in competing athletes with patellar tendinopathy.

#### **DESIGN:**

Randomised clinical trial.

#### **METHODS:**

Jumping athletes with patellar tendinopathy playing at least three times per week participated in this study. Athletes were randomised into an isometric or isotonic exercise group. The exercise programs consisted of four isometric or isotonic exercise sessions per week for four weeks. Pain during a single leg decline squat (SLDS) on a Numeric Rating Scale (NRS; 0-10) was used as the main outcome measure; measurements were completed at baseline and at 4-week follow-up.

#### **RESULTS:**

Twenty-nine athletes were included in this study. Median pain scores improved significantly over the 4-week intervention period in both the isometric group ( $Z=-2.527$ ,  $p=0.012$ ,  $r=-0.63$ ) and isotonic group ( $Z=-2.952$ ,  $p=0.003$ ,  $r=-0.63$ ). There was no significant difference in NRS pain score change ( $U=29.0$ ,  $p=0.208$ ,  $r=0.29$ ) between the isometric group (median (IQR), 2.5 (1-4.5)) and isotonic group (median (IQR), 3.0 (2-6)).

#### **CONCLUSIONS:**

This is the first study to show a decrease in patellar tendon pain without a modification of training and competition load and the first study to investigate isometric exercises in a clinical setting. Both isometric and isotonic exercise programs are easy-to-use exercises that can reduce pain from patellar tendinopathy for athletes in-season.

**Fat Pad**

Osteoarthritis Cartilage. 2016 Sep 9. pii: S1063-4584(16)30266-7. doi: 10.1016/j.joca.2016.09.001.

**Infrapatellar fat pad aggravates degeneration of acute traumatized cartilage: a possible role for interleukin-6.**

He J<sup>1</sup>, Jiang Y<sup>2</sup>, Alexander PG<sup>2</sup>, Ulici V<sup>2</sup>, Zhu Y<sup>2</sup>, Wu S<sup>3</sup>, Tuan RS<sup>4</sup>.

**OBJECTIVES:**

The infrapatellar fat pad (IPFP), which is located underneath the patella, close to cartilage surfaces, functions in distributing mechanical load and has been shown to produce cytokines. This study aims to assess the involvement of the IPFP in the progression of post-traumatic osteoarthritis (OA) through investigating the crosstalk between the IPFP and injured cartilage in vitro.

**METHODS:**

A single blunt impact (36 MPa) on healthy bovine articular cartilage explants was used to generate traumatized cartilage. Conditioned media from IPFP and traumatized cartilage (FP-CM and TC-CM) were prepared separately. After culturing in FP-CM, the posttraumatic cartilage explants were analyzed for expression of cartilage degeneration associated genes and secretion of the interleukin (IL)-6, into the culture medium. The effect of traumatized cartilage on IPFP was studied by treating IPFP-derived adipocytes and IPFP adipose-derived stromal cells (ADSC) with TC-CM followed by analysis of cytokine expression.

**RESULTS:**

FP-CM aggravated glycosaminoglycan (GAG) release in traumatized cartilage, but did not significantly affect healthy cartilage. FP-CM raised gene expression of cyclooxygenase-2, inducible nitric oxide synthase, and IL-6 in traumatized cartilage explants, and lowered expression of tissue inhibitor of metalloproteinases-1, 2, 3, compared to non-conditioned medium. Of particular significance is that medium IL-6 levels increased substantially in both FP-CM and FP-CM treated traumatized cartilage cultures. Extrinsic IL-6 treatment of traumatized cartilage simulated part of the effects of FP-CM. TC-CM elevated levels of IL-6 expression in IPFP derived adipocytes and ADSCs.

**CONCLUSIONS:**

IPFP aggravates post-traumatized cartilage degeneration, and IL-6 is a candidate tissue degeneration mediator.

**37. OSTEOARTHRITIS/KNEE****Lysophosphatidic Acid and joint and nerve pain****Lysophosphatidic Acid Provides a Missing Link Between Osteoarthritis and Joint Neuropathic Pain**

Dr. Jason J. McDougall Samantha Albacete Niklas Schuelert Peter G. Mitchell  
Chaohua Lin Jennifer L. Oskins Hai H. Bui Mark. G. Chambers

DOI: <http://dx.doi.org/10.1016/j.joca.2016.08.016>

**Summary****Objective**

Emerging evidence suggests that osteoarthritis (OA) has a neuropathic component; however, the identity of the molecules responsible for this peripheral neuropathy is unknown. The aim of this study was to determine the contribution of the bioactive lipid lysophosphatidic acid (LPA) to joint neuropathy and pain.

**Design**

Male Lewis rats received an intra-articular injection of 50µg of LPA into the knee and allowed to recover for up to 21 days. Saphenous nerve myelination was assessed by g-ratio calculation from electronmicrographs and afferent nerve damage visualised by activation transcription factor-3 (ATF-3) expression. Nerve conduction velocity was measured electrophysiologically and joint pain was determined by hindlimb incapacity. The effect of the LPA antagonist Ki-16425 was also evaluated. Experiments were repeated in the sodium monoiodoacetate (MIA) model of OA.

**Results**

LPA caused joint nerve demyelination which resulted in a drop in nerve conduction velocity. Sensory neurones were ATF-3 positive and animals exhibited joint pain and knee joint damage. MIA-treated rats also showed signs of demyelination and joint neuropathy with concomitant pain. Nerve damage and pain could be ameliorated by Ki-16425 pre-treatment.

**Conclusion**

Intra-articular injection of LPA caused knee joint neuropathy, joint damage and pain. Pharmacological blockade of LPA receptors inhibited joint nerve damage and hindlimb incapacitation. Thus, LPA is a candidate molecule for the development of OA nerve damage and the origin of joint neuropathic pain.

## Cause of wide spread knee pain

**Arthritis Care Res (Hoboken). 2016 Sep 16. doi: 10.1002/acr.23086.**

**Knee Pain Severity Rather Than Structural Damage is a Risk Factor for Incident Widespread Pain: The Multicenter Osteoarthritis (MOST) Study.**

Carlesso LC<sup>1</sup>, Segal N<sup>2</sup>, Curtis JR<sup>3</sup>, Wise BL<sup>4</sup>, Law LF<sup>5</sup>, Nevitt M<sup>6</sup>, Neogi T<sup>7</sup>.

**OBJECTIVES:**

To examine the longitudinal relation of knee pain, radiographic osteoarthritis (ROA), symptomatic knee OA (SxOA) and knee pain severity to incident widespread pain (WSP).

**METHODS:**

The Multicenter Osteoarthritis Study is a longitudinal cohort of persons with or at risk of knee OA. Participants were characterized with regards to consistent frequent knee pain (CFKP), ROA (Kellgren & Lawrence grade  $\geq 2$ ), SxOA, and knee pain severity at the 60-month visit (baseline). WSP was defined as pain above and below the waist, on both sides of the body and axially, using a standard homunculus, excluding knee pain. Incident WSP was defined as presence of WSP at 84 months among those who were free of WSP at baseline. We assessed the relation of baseline ROA, SxOA, CFKP and knee pain severity, respectively, to incident WSP using logistic regression, adjusting for potential confounders including models with and without pain severity.

**RESULTS:**

At baseline 1129 subjects were eligible for analysis (age mean, SD 66.7, 7.8; BMI 30.1, 5.8 kg/m<sup>2</sup>; 52% women). ROA in either knee [aOR 0.90 (0.63, 1.30) p=0.587] was not associated with incident WSP. Baseline bilateral CFKP [adjusted Odds ratio (aOR) 2.35 (1.37, 4.03)], and bilateral SxOA [aOR 2.11 (1.04, 4.24)] and knee pain severity (worst knee) [aOR 1.11 (1.05, 1.17) p<0.001] were significantly associated with incident WSP.

**CONCLUSION:**

CFKP, SxOA and Knee pain severity increased the risk of developing WSP independent of structural pathology. These results suggest that knee pain and not structural pathology contributes to the onset of WSP. This article is protected by copyright. All rights reserved

#### 40. ANKLE SPRAINS AND INSTABILITY

##### Manual therapy

Man Ther. 2016 Aug 29;26:141-149. doi: 10.1016/j.math.2016.08.006.

##### **Manual therapy in joint and nerve structures combined with exercises in the treatment of recurrent ankle sprains: A randomized, controlled trial.**

Plaza-Manzano G<sup>1</sup>, Vergara-Vila M<sup>2</sup>, Val-Otero S<sup>3</sup>, Rivera-Prieto C<sup>4</sup>, Pecos-Martin D<sup>5</sup>, Gallego-Izquierdo T<sup>6</sup>, Ferragut-Garcías A<sup>7</sup>, Romero-Franco N<sup>8</sup>.

##### **BACKGROUND:**

Recurrent ankle sprains often involve residual symptoms for which subjects often perform proprioceptive or/and strengthening exercises. However, the effectiveness of mobilization to influence important nerve structures due to its anatomical distribution like tibial and peroneal nerves is unclear.

##### **OBJECTIVES:**

To analyze the effects of proprioceptive/strengthening exercises versus the same exercises and manual therapy including mobilizations to influence joint and nerve structures in the management of recurrent ankle sprains.

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

A randomized single-blind controlled clinical trial.

##### **METHOD:**

Fifty-six patients with recurrent ankle sprains and regular sports practice were randomly assigned to experimental or control group. The control group performed 4 weeks of proprioceptive/strengthening exercises; the experimental group performed 4 weeks of the same exercises combined with manual therapy (mobilizations to influence joint and nerve structures). Pain, self-reported functional ankle instability, pressure pain threshold (PPT), ankle muscle strength, and active range of motion (ROM) were evaluated in the ankle joint before, just after and one month after the interventions.

**RESULTS:**

The within-group differences revealed improvements in all of the variables in both groups throughout the time. Between-group differences revealed that the experimental group exhibited lower pain levels and self-reported functional ankle instability and higher PPT, ankle muscle strength and ROM values compared to the control group immediately after the interventions and one month later.

**CONCLUSIONS:**

A protocol involving proprioceptive and strengthening exercises and manual therapy (mobilizations to influence joint and nerve structures) resulted in greater improvements in pain, self-reported functional joint stability, strength and ROM compared to exercises alone.

**44. RHUMATOID ARTHRITIS****MRI finds inflammation**

Rheumatology (Oxford). 2016 Sep 15. pii: kew334.

**Magnetic resonance imaging-detected inflammation is associated with functional disability in early arthritis-results of a cross-sectional study.**

Burgers LE<sup>1</sup>, Nieuwenhuis WP<sup>2</sup>, van Steenberg HW<sup>2</sup>, Newsum EC<sup>2</sup>, Huizinga TW<sup>2</sup>, Reijnders M<sup>3</sup>, le Cessie S<sup>4</sup>, van der Helm-van Mil AH<sup>2</sup>.

**OBJECTIVES:**

MRI sensitively detects inflammation, but the clinical relevance of MRI-detected inflammation is undetermined in early arthritis. Therefore, the aim of this cross-sectional study was to investigate the association between MRI-detected inflammation of hands and feet and functional disability in early arthritis.

**METHODS:**

Five hundred and fourteen early arthritis patients, consecutively included in the Leiden Early Arthritis Clinic, were studied. At baseline a unilateral 1.5 T MRI of the wrist, MCP and MTP joints was performed and functional disability was measured using the HAQ. MRIs were scored for tenosynovitis, synovitis and bone marrow oedema (BME) by two readers. The sum of these types of MRI-detected inflammation yielded the total MRI-inflammation score. Linear and nonlinear regression analyses were performed with HAQ as outcome.

**RESULTS:**

The total MRI-inflammation score was associated with the HAQ score ( $\beta = 0.014$ ,  $P < 0.001$ ), as were tenosynovitis ( $\beta = 0.046$ ,  $P < 0.001$ ), synovitis ( $\beta = 0.039$ ,  $P < 0.001$ ) and bone marrow oedema scores ( $\beta = 0.015$ ,  $P < 0.001$ ) separately. Analysing these three types of MRI-detected inflammation in one multivariable model revealed that only tenosynovitis was independently associated with the HAQ score ( $\beta = 0.039$ ,  $P < 0.001$ ). Also after correction for age, gender, joint counts, CRP and auto-antibodies, this association remained significant ( $\beta = 0.034$ ,  $P < 0.001$ ). MRI-detected inflammation at wrists or MCP joints associated significantly with impairments in hand functioning (e.g. difficulties with opening milk cartons or jars). Exploring the relation

between MRI-detected inflammation and HAQ scores showed no evidence of a floor effect, suggesting that even low scores of MRI-detected inflammation are functionally relevant.

**CONCLUSION:**

MRI-detected inflammation, and tenosynovitis in particular, is associated with functional disability. This demonstrates the functional relevance of MRI-detected inflammation in early arthritis.

## 45 A. MANUAL THERAPY LUMBAR & GENERAL

### P/A mobs

PLoS One. 2016 Sep 1;11(9):e0161624. doi: 10.1371/journal.pone.0161624. eCollection 2016.

#### **Kinematic Analyses of the Thumb during Simulated Posteroanterior Glide Mobilization.**

Hu MT<sup>1,2</sup>, Hsu AT<sup>3,4</sup>, Su FC<sup>1,5</sup>.

**OBJECTIVE:**

Thumb problems are common in some health professionals such as physical therapists. The purpose of this case-control study is to investigate the influence of clinical experience and different mobilization techniques on the kinematics of the thumb.

**METHODS:**

Twenty-three participants without exposure to manual techniques (the Novice Group) and fifteen physical therapists with at least 3 years of orthopedic experience (the Experienced Group) participated. The kinematics of the thumb while performing 3 different simulated posteroanterior (PA) glide mobilization techniques on a load cell was monitored. These 3 techniques were: 1) unsupported, 2) with digital support and 3) with thumb interphalangeal joint supported by the index finger. The amount of forces exerted were 25% to 100% of maximum effort at 25% increments. The main effects of experience and technique on thumb kinematics were assessed.

**RESULTS:**

Both experience and technique had main effects on the flexion/extension angles of the thumb joints. Experienced participants assumed a more flexed position at the carpometacarpal (CMC) joint, and the novice participants performed with angles closer to the neutral position ( $F = 7.593$ ,  $p = 0.010$ ). Participants' metacarpophalangeal (MCP) joints were in a more flexed position while performing PA glide with thumb interphalangeal (IP) joint supported by the index as compared to the other two techniques ( $p < .001$ ).

**CONCLUSIONS:**

Negative correlations were generally obtained between the sagittal plane angles of adjacent thumb joints during mobilization/manipulation. Therapists are recommended to treat patient with

more stable PA glide mobilization techniques, such as PA glide with thumb interphalangeal joint supported by the index finger, to prevent potential mobilization-related thumb disorders.

PMID: [27583407](#)

### 45 B. MANUAL THERAPY CERVICAL

#### Neck tongue syndrome

J Orthop Sports Phys Ther. 2016 Mar;46(3):217-24. doi: 10.2519/jospt.2016.6195. Epub 2016 Feb 11.

#### **Manual Therapy and Exercise for a Patient With Neck-Tongue Syndrome: A Case Report.**

Niethamer L, Myers R.

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

Case report.

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

Neck-tongue syndrome (NTS) is defined as neck and/or head pain accompanied by ipsilateral dysesthesia of the tongue with sudden rotation of the head. Proposed causes include compression or irritation of the C2 nerve root as it courses behind the atlantoaxial joint or hypertrophy of the inferior oblique muscle. The primary purpose of this case report was to describe the conservative physical therapy treatment of a patient with uncomplicated NTS.

#### ***CASE DESCRIPTION:***

The patient was a 13-year-old girl who reported insidious onset of sharp pain in the neck, numbness/tingling of the ipsilateral tongue/face, and tinnitus with cervical rotation. Symptoms occurred several times a week for approximately 10 seconds. Examination revealed impaired function, increased forward head posture, decreased cervical range of motion, and positive neurodynamic assessment. The patient's treatment included manual therapy and exercise for postural stabilization.

#### ***OUTCOMES:***

Following 8 visits, pain of the neck and tongue numbness had resolved. Score on the Patient-Specific Functional Scale (PSFS), cervical range of motion, and posture had also improved. At the 22-month follow-up, infrequent, momentary symptoms in the neck and dysesthesia of the tongue were reported. The PSFS remained the same. Objective measures were normal.

**DISCUSSION:**

This case report describes the physical therapy management of an individual with NTS. The management strategy followed a protocol similar to that used for cervicogenic headaches, due to the involvement of the upper cervical spine with both NTS and cervicogenic headache and the lack of evidence for the treatment of NTS. Level of Evidence Therapy, level 4.

**Tinnitus**

Man Ther. 2016 Aug 26;26:125-131. doi: 10.1016/j.math.2016.08.005.

**Does multi-modal cervical physical therapy improve tinnitus in patients with cervicogenic somatic tinnitus?**

Michiels S<sup>1</sup>, Van de Heyning P<sup>2</sup>, Truijen S<sup>3</sup>, Halleman A<sup>4</sup>, De Hertogh W<sup>5</sup>.

**BACKGROUND:**

Tinnitus can be related to many different aetiologies such as hearing loss or a noise trauma, but it can also be related to the somatosensory system of the cervical spine, called cervicogenic somatic tinnitus (CST). Case studies suggest a positive effect of cervical spine treatment on tinnitus complaints in patients with CST, but no experimental studies are available.

**OBJECTIVE:**

To investigate the effect of a multimodal cervical physical therapy treatment on tinnitus complaints in patients with CST.

**DESIGN:**

Randomized controlled trial.

**PATIENTS:**

Patients with a combination of severe subjective tinnitus (Tinnitus Functional Index (TFI): 25-90 points) and neck complaints (Neck Bournemouth Questionnaire (NBQ) > 14 points).

**INTERVENTION:**

All patients received cervical physical therapy for 6 weeks (12 sessions). Patients were randomized in an immediate-start therapy group (n = 19) and a 6-week delayed-start therapy group (n = 19).

**MEASUREMENTS:**

TFI and NBQ-scores were documented at baseline, after the wait-and-see period in the delayed-start group, after treatment and after 6 weeks follow-up. The Global Perceived Effect (GPE) was documented at all measuring moments, except at baseline.

**RESULTS:**

In all patients (n = 38) TFI and NBQ-scores decreased significantly after treatment (p = 0.04 and p < 0.001). NBQ-scores remained significantly lower after follow-up (p = 0.001). Immediately after treatment, 53% (n = 38) experienced substantial improvement of tinnitus. This effect was maintained in 24% of patients after follow-up at six weeks.

**CONCLUSION:**

Cervical physical therapy can have a positive effect on subjective tinnitus complaints in patients with a combination of tinnitus and neck complaints. Larger studies, using more responsive outcome measures, are however necessary to prove this effect

### Cervicogenic dizziness

Eur J Phys Rehabil Med. 2016 Aug 30.

**The effect of normalizing the sagittal cervical configuration on dizziness, neck pain , and cervicocephalic kinesthetic sensibility: a 1-year randomized controlled study.**

Moustafa IM<sup>1</sup>, Diab AA, Harrison DE.

**BACKGROUND:** Cervicogenic dizziness is a disabling condition commonly associated with cervical dysfunction. Although the growing interest with the importance of normal sagittal configuration of cervical spine, the missing component in the management of cervicogenic dizziness might be altered structural alignment of the cervical spinal region itself.

**AIM:** To investigate the immediate and long-term effects of a 1-year multimodal program, with the addition of cervical lordosis restoration and anterior head translation (AHT) correction, on the severity of dizziness, disability, cervicocephalic kinesthetic sensibility, and cervical pain in patients with cervicogenic dizziness.

**DESIGN:** A randomized controlled study with a 1-year and 10-week follow-up.

**SETTING:** University research laboratory.

**POPULATION:** 72 (25 female) patients between 40 and 55 years with cervicogenic dizziness, a definite hypolordotic cervical spine and AHT posture were randomly assigned to the control or an experimental group.

**METHODS:**

Both groups received the multimodal program; additionally, the experimental group received the denneroll™ cervical traction. Outcome measures included AHT distance, cervical lordosis, dizziness handicap inventory (DHI), severity of dizziness, dizziness frequency, head repositioning accuracy (HRA) and cervical pain. Measures were assessed at three time intervals: baseline, 10 weeks, and 1 year after the 10 week follow up.

**RESULTS:**

Significant group × time effects at both the 10 week post treatment and the 1-year follow up were identified favoring the experimental group for measures of cervical lordosis (P<0.0005) and anterior head translation (P<0.0005). At 10 weeks, the between group analysis showed equal

improvements in dizziness outcome measures, pain intensity, and HRA; DHI scale (P=0.5), severity of dizziness (P=0.2), dizziness frequency (P= .09), HRA (P= .1) and neck pain (P=0.3). At the 1 year follow-up, the between group analysis identified statistically significant differences for all of the measured variables including anterior head translation (2.4 cm [-2.3, - 1.8], P<.0005), cervical lordosis (-14.4° [-11.6, -8.3], P<.0005), dizziness handicap inventory (29.9 [-34.4, -29.9], P<.0005), severity of dizziness (5.4 [-5.9, -4.9], P<.0005), dizziness frequency (2.6 [-3.1, -2.5], P<.0005), HRA for RT rotation ( 2.8[-3.9 -3.3], P<.005), HRA for LT rotation( 3.1 [-3.5 -3.4, P<.0005] , neck pain (4.97 [-5.3, -4.3], P<.0005); indicating greater improvements in the experimental group.

**CONCLUSION:**

The addition of dennerollTM cervical extension traction to a multimodal program positively affected pain, cervicocephalic kinesthetic sensibility, dizziness management outcomes at long term follow up.

**CLINICAL REHABILITATION IMPACT:**

Appropriate physical therapy rehabilitation for cervicogenic dizziness should include structural rehabilitation of the cervical spine (lordosis and head posture correction), as it might lead to greater and longer lasting improved function.

**MT and stretching**

BMC Musculoskelet Disord. 2016 Apr 23;17:176. 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; Musculoskeletal manipulations; Naprapathy; Neck pain

**MT and stab ex**

J Orthop Sports Phys Ther. 2016 Feb;46(2):44-55. doi: 10.2519/jospt.2016.5979. Epub 2016 Jan 11.

**A Comparison of the Effects of Stabilization Exercises Plus Manual Therapy to Those of Stabilization Exercises Alone in Patients With Nonspecific Mechanical Neck Pain: A Randomized Clinical Trial.**

Celenay ST, Akbayrak T, Kaya DO.

**STUDY DESIGN:**

Randomized clinical trial.

**BACKGROUND:**

Little is known about the efficacy of providing manual therapy in addition to cervical and scapulothoracic stabilization exercises in people with mechanical neck pain (MNP). Objectives To compare the effects of stabilization exercises plus manual therapy to those of stabilization exercises alone on disability, pain, range of motion (ROM), and quality of life in patients with MNP.

**METHODS:**

One hundred two patients with MNP (18-65 years of age) were recruited and randomly allocated into 2 groups: stabilization exercise without ( $n = 51$ ) and with ( $n = 51$ ) manual therapy. The program was carried out 3 days per week for 4 weeks. The Neck Disability Index, visual analog pain scale, digital algometry of pressure pain threshold, goniometric measurements, and Medical Outcomes Study 36-Item Short-Form Health Survey were used to assess participants at baseline and after 4 weeks.

**RESULTS:**

Improvements in Neck Disability Index score, night pain, rotation ROM, and the Medical Outcomes Study 36-Item Short-Form Health Survey score were greater in the group that received stabilization exercise with manual therapy compared to the group that only received stabilization

exercise. Between-group differences (95% confidence interval) were 2.2 (0.1, 4.3) points for the Neck Disability Index, 1.1 (0.0, 2.3) cm for pain at night measured on the visual analog scale, -4.3° (-8.1°, -0.5°) and -5.0° (-8.2°, -1.7°) for right and left rotation ROM, respectively, and -2.9 (-5.4, -0.4) points and -3.1 (-6.2, 0.0) points for the Medical Outcomes Study 36-Item Short-Form Health Survey physical and mental components, respectively. Changes in resting and activity pain, pressure pain threshold, and cervical extension or lateral flexion ROM did not differ significantly between the groups. Pressure pain threshold increased only in those who received stabilization exercise with manual therapy ( $P < .05$ ).

**CONCLUSION:**

The results of this study suggest that stabilization exercises with manual therapy may be superior to stabilization exercises alone for improving disability, pain intensity at night, cervical rotation motion, and quality of life in patients with MNP.

**LEVEL OF EVIDENCE:**

Therapy, level 1b.

### 45 C. MANUAL THERAPY THORACIC

#### Comparisons of MT for thoracic pain

Chiropr Man Therap. 2016 May 16;24:16. doi: 10.1186/s12998-016-0096-9. eCollection 2016.

**Spinal manipulative therapy, Graston technique® and placebo for non-specific thoracic spine pain: a randomised controlled trial.**

Crothers AL<sup>1</sup>, French SD<sup>2</sup>, Hebert JJ<sup>3</sup>, Walker BF<sup>4</sup>.

**BACKGROUND:**

Few controlled trials have assessed the efficacy of spinal manipulative therapy (SMT) for thoracic spine pain. No high quality trials have been performed to test the efficacy and effectiveness of Graston Technique® (GT), an instrument-assisted soft tissue therapy. The objective of this trial was to determine the efficacy of SMT and GT compared to sham therapy for the treatment of non-specific thoracic spine pain.

**METHODS:**

People with non-specific thoracic pain were randomly allocated to one of three groups: SMT, GT, or a placebo (de-tuned ultrasound). Each participant received up to 10 supervised treatment sessions at Murdoch University chiropractic student clinic over a 4 week period. The participants and treatment providers were not blinded to the treatment allocation as it was clear which therapy they were receiving, however outcome assessors were blinded and we attempted to blind the participants allocated to the placebo group. Treatment outcomes were measured at baseline, 1 week, and at one, three, six and 12 months. Primary outcome measures included a modified Oswestry Disability Index, and the Visual Analogue Scale (VAS). Treatment effects were estimated with intention to treat analysis and linear mixed models.

**RESULTS:**

One hundred and forty three participants were randomly allocated to the three groups (SMT = 36, GT = 63 and Placebo = 44). Baseline data for the three groups did not show any meaningful differences. Results of the intention to treat analyses revealed no time by group interactions,

indicating no statistically significant between-group differences in pain or disability at 1 week, 1 month, 3 months, 6 months, or 12 months. There were significant main effects of time ( $p < 0.01$ ) indicating improvements in pain and disability from baseline among all participants regardless of intervention. No significant adverse events were reported.

**CONCLUSION:**

This study indicates that there is no difference in outcome at any time point for pain or disability when comparing SMT, Graston Technique® or sham therapy for thoracic spine pain, however all groups improved with time. These results constitute the first from a fully powered randomised controlled trial comparing SMT, Graston technique® and a placebo.

**TRIAL REGISTRATION:**

This trial was registered with the Australia and New Zealand Clinical Trials Registry on the 7(th) February, 2008.

**TRIAL NUMBER:**

ACTRN12608000070336.

### 45 D. MANUAL THERAPY EXTREMITIES

#### Ankle manipulation

Man Ther. 2016 Aug 29;26:141-149. doi: 10.1016/j.math.2016.08.006.

**Manual therapy in joint and nerve structures combined with exercises in the treatment of recurrent ankle sprains: A randomized, controlled trial.**

Plaza-Manzano G<sup>1</sup>, Vergara-Vila M<sup>2</sup>, Val-Otero S<sup>3</sup>, Rivera-Prieto C<sup>4</sup>, Pecos-Martin D<sup>5</sup>, Gallego-Izquierdo T<sup>6</sup>, Ferragut-Garcías A<sup>7</sup>, Romero-Franco N<sup>8</sup>.

**BACKGROUND:**

Recurrent ankle sprains often involve residual symptoms for which subjects often perform proprioceptive or/and strengthening exercises. However, the effectiveness of mobilization to influence important nerve structures due to its anatomical distribution like tibial and peroneal nerves is unclear.

**OBJECTIVES:**

To analyze the effects of proprioceptive/strengthening exercises versus the same exercises and manual therapy including mobilizations to influence joint and nerve structures in the management of recurrent ankle sprains.

**STUDY DESIGN:**

A randomized single-blind controlled clinical trial.

**METHOD:**

Fifty-six patients with recurrent ankle sprains and regular sports practice were randomly assigned to experimental or control group. The control group performed 4 weeks of proprioceptive/strengthening exercises; the experimental group performed 4 weeks of the same exercises combined with manual therapy (mobilizations to influence joint and nerve structures). Pain, self-reported functional ankle instability, pressure pain threshold (PPT), ankle muscle strength, and active range of motion (ROM) were evaluated in the ankle joint before, just after and one month after the interventions.

**RESULTS:**

The within-group differences revealed improvements in all of the variables in both groups throughout the time. Between-group differences revealed that the experimental group exhibited lower pain levels and self-reported functional ankle instability and higher PPT, ankle muscle strength and ROM values compared to the control group immediately after the interventions and one month later.

**CONCLUSIONS:**

A protocol involving proprioceptive and strengthening exercises and manual therapy (mobilizations to influence joint and nerve structures) resulted in greater improvements in pain, self-reported functional joint stability, strength and ROM compared to exercises alone.

## 47. STRETCHING/MUSCLES

### Massage to MT junctions

*Phys Ther Sport.* 2016 Sep;21:38-45. doi: 10.1016/j.ptsp.2016.01.003. Epub 2016 Jan 28.

Effects of long-term self-massage at the musculotendinous junction on hamstring extensibility, stiffness, stretch tolerance, and structural indices: A randomized controlled trial.

Akazawa N<sup>1</sup>, Okawa N<sup>2</sup>, Kishi M<sup>3</sup>, Nakatani K<sup>4</sup>, Nishikawa K<sup>5</sup>, Tokumura D<sup>6</sup>, Matsui Y<sup>7</sup>, Moriyama H<sup>8</sup>.

[Author information](#)

[Abstract](#)

**OBJECTIVES:**

The purpose of this study was to examine the effect of long-term self-massage at the musculotendinous junction on hamstring extensibility, stiffness, stretch tolerance, and structural indices.

**DESIGN:**

Single-blind, randomized, controlled trial.

**SETTING:**

Laboratory.

**PARTICIPANTS:**

Thirty-seven healthy men.

**INTERVENTION:**

The right or left leg of each participant was randomly assigned to the massage group, and the other leg was assigned to the control group. The participants conducted self-massage at the musculotendinous junction for 3 min daily, five times per week, for 12 weeks.

**MAIN OUTCOME MEASURES:**

Hamstring extensibility, stiffness, stretch tolerance, and structural indices were measured by a blinded examiner prior to the massage intervention and after 6 and 12 weeks of intervention.

**RESULTS:**

The maximum hip flexion angle (HFA) and the maximum passive pressure after 6 and 12 weeks of intervention in the massage group were significantly higher than prior to intervention. The visual analog scale (for pain perception) at maximum HFA, the stiffness of the hamstring, and the structural indices did not differ in either group over the 12 week period.

**CONCLUSIONS:**

Our results suggest that long-term self-massage at the musculotendinous junction increases hamstring extensibility by improving stretch tolerance. However, this intervention does not change hamstring stiffness.

**CLINICAL TRIAL REGISTRATION NUMBER:**

University Hospital Medical Information Network registration number UMIN000011233.

**48 A. STM****To musculotendinous junction**

*Phys Ther Sport*. 2016 Sep;21:38-45. doi: 10.1016/j.ptsp.2016.01.003. Epub 2016 Jan 28.

Effects of long-term self-massage at the musculotendinous junction on hamstring extensibility, stiffness, stretch tolerance, and structural indices: A randomized controlled trial.

Akazawa N<sup>1</sup>, Okawa N<sup>2</sup>, Kishi M<sup>3</sup>, Nakatani K<sup>4</sup>, Nishikawa K<sup>5</sup>, Tokumura D<sup>6</sup>, Matsui Y<sup>7</sup>, Moriyama H<sup>8</sup>.

Author information

Abstract

**OBJECTIVES:**

The purpose of this study was to examine the effect of long-term self-massage at the musculotendinous junction on hamstring extensibility, stiffness, stretch tolerance, and structural indices.

**DESIGN:**

Single-blind, randomized, controlled trial.

**SETTING:**

Laboratory.

**PARTICIPANTS:**

Thirty-seven healthy men.

**INTERVENTION:**

The right or left leg of each participant was randomly assigned to the massage group, and the other leg was assigned to the control group. The participants conducted self-massage at the musculotendinous junction for 3 min daily, five times per week, for 12 weeks.

**MAIN OUTCOME MEASURES:**

Hamstring extensibility, stiffness, stretch tolerance, and structural indices were measured by a blinded examiner prior to the massage intervention and after 6 and 12 weeks of intervention.

**RESULTS:**

The maximum hip flexion angle (HFA) and the maximum passive pressure after 6 and 12 weeks of intervention in the massage group were significantly higher than prior to intervention. The visual analog scale (for pain perception) at maximum HFA, the stiffness of the hamstring, and the structural indices did not differ in either group over the 12 week period.

**CONCLUSIONS:**

Our results suggest that long-term self-massage at the musculotendinous junction increases hamstring extensibility by improving stretch tolerance. However, this intervention does not change hamstring stiffness.

**CLINICAL TRIAL REGISTRATION NUMBER:**

University Hospital Medical Information Network registration number UMIN000011233.

**48 B. TRIGGER POINTS NEEDLING/ACUPUNCTURE****Latent TP's**

*Arch Phys Med Rehabil.* 2016 Sep;97(9):1533-41. doi: 10.1016/j.apmr.2016.02.014. Epub 2016 Mar 10.

Latent Trigger Points: What Are the Underlying Predictors?

Kaya Mutlu E<sup>1</sup>, Birinci T<sup>2</sup>, Dizdar G<sup>3</sup>, Ozdincler AR<sup>4</sup>.

[Author information](#)

[Abstract](#)

**OBJECTIVE:**

To determine the factors predicting the presence and number of latent trigger points (LTrPs) in healthy individuals.

**DESIGN:**

Cross-sectional study.

**SETTING:**

Local faculty of health sciences.

**PARTICIPANTS:**

Healthy individuals (N=242) were divided into 2 groups: group 1, those without LTrPs (n=68); and group 2, those with LTrPs (n=174).

**INTERVENTIONS:**

None.

**MAIN OUTCOME MEASURES:**

Disability was assessed using the Quick-Disabilities of the Arm, Shoulder, and Hand questionnaire and the Neck Pain and Disability Scale. Psychological factors were evaluated using the Brief Symptom Inventory, the Beck Depression Inventory, the State-Trait Anxiety Inventory, and the Perceived Stress Scale. Quality of life was evaluated using the Short-Form-12; smoking habits were determined with questions about current smoking status; and pain level was assessed using the visual analog scale. The LTrP assessment was made with a pinching movement or flat palpation bilaterally.

**RESULTS:**

By using a hierarchical regression model, we entered age, depression, and pain level into the first block, which explained a significant amount of variance in the presence and number of LTrPs ( $R(2)=.041$ ;  $P=.033$  and  $R(2)=.197$ ;  $P<.001$ , respectively). Pain level contributed independently the presence of LTrPs, whereas age and pain level predicted the number of LTrPs ( $P<.05$ ).

**CONCLUSIONS:**

This study found that pain and age were significant predictors of the number of LTrPs, but only pain predicted the presence of LTrPs in healthy individuals.

**Dry needling in neck pain**

*Pain*. 2016 Sep;157(9):1905-17. doi: 10.1097/j.pain.0000000000000591.

Effectiveness of dry needling for chronic nonspecific neck pain: a randomized, single-blinded, clinical trial.

Cerezo-Téllez E<sup>1</sup>, Torres-Lacomba M, Fuentes-Gallardo I, Perez-Muñoz M, Mayoral-Del-Moral O, Lluch-Girbés E, Prieto-Valiente L, Falla D.

Author information

**Abstract**

Chronic neck pain attributed to a myofascial pain syndrome is characterized by the presence of muscle contractures referred to as myofascial trigger points. In this randomized, parallel-group, blinded, controlled clinical trial, we examined the effectiveness of deep dry needling (DDN) of myofascial trigger points in people with chronic nonspecific neck pain. The study was conducted at a public Primary Health Care Centre in Madrid, Spain, from January 2010 to December 2014. A total of 130 participants with nonspecific neck pain presenting with active myofascial trigger points in their cervical muscles were included. These participants were randomly allocated to receive: DDN plus stretching (n = 65) or stretching only (control group [n = 65]). Four sessions of treatment were applied over 2 weeks with a 6-month follow-up after treatment. Pain intensity, mechanical hyperalgesia, neck active range of motion, neck muscle strength, and perceived neck disability were measured at baseline, after 2 sessions of intervention, after the intervention period, and 15, 30, 90, and 180 days after the intervention. Significant and clinically relevant differences were found in favour of dry needling in all the outcomes (all P < 0.001) at both short and long follow-ups. Deep dry needling and passive stretching is more effective than passive stretching alone in people with nonspecific neck pain. The results support the use of DDN in the management of myofascial pain syndrome in people with chronic nonspecific neck pain.

PMID: 27537209

**48 C. MUSCLES**

**49. STRETCHING**

**50 A. MOTOR CONTROL**

**50 B. PNF**

**51. CFS/BET**

**52. EXERCISE**

**53. CORE**

**Cervical stabilization and MT**

*J Orthop Sports Phys Ther*. 2016 Feb;46(2):44-55. doi: 10.2519/jospt.2016.5979. Epub 2016 Jan 11.

A Comparison of the Effects of Stabilization Exercises Plus Manual Therapy to Those of Stabilization Exercises Alone in Patients With Nonspecific Mechanical Neck Pain: A Randomized Clinical Trial.

Celenay ST, Akbayrak T, Kaya DO.

Abstract

**STUDY DESIGN:**

Randomized clinical trial.

**BACKGROUND:**

Little is known about the efficacy of providing manual therapy in addition to cervical and scapulothoracic stabilization exercises in people with mechanical neck pain (MNP). Objectives To compare the effects of stabilization exercises plus manual therapy to those of stabilization exercises alone on disability, pain, range of motion (ROM), and quality of life in patients with MNP.

**METHODS:**

One hundred two patients with MNP (18-65 years of age) were recruited and randomly allocated into 2 groups: stabilization exercise without (n = 51) and with (n = 51) manual therapy. The program was carried out 3 days per week for 4 weeks. The Neck Disability Index, visual analog pain scale, digital algometry of pressure pain threshold, goniometric measurements, and Medical Outcomes Study 36-Item Short-Form Health Survey were used to assess participants at baseline and after 4 weeks.

**RESULTS:**

Improvements in Neck Disability Index score, night pain, rotation ROM, and the Medical Outcomes Study 36-Item Short-Form Health Survey score were greater in the group that received stabilization exercise with manual therapy compared to the group that only received stabilization exercise. Between-group differences (95% confidence interval) were 2.2 (0.1, 4.3) points for the Neck Disability Index, 1.1 (0.0, 2.3) cm for pain at night measured on the visual analog scale, -4.3° (-8.1°, -0.5°) and -5.0° (-8.2°, -1.7°) for right and left rotation ROM, respectively, and -2.9 (-5.4, -0.4) points and -3.1 (-6.2, 0.0) points for the Medical Outcomes Study 36-Item Short-Form Health Survey physical and mental components, respectively. Changes in resting and activity pain, pressure pain threshold, and cervical extension or lateral flexion ROM did not differ significantly between the groups. Pressure pain threshold increased only in those who received stabilization exercise with manual therapy (P<.05).

**CONCLUSION:**

The results of this study suggest that stabilization exercises with manual therapy may be superior to stabilization exercises alone for improving disability, pain intensity at night, cervical rotation motion, and quality of life in patients with MNP.

**LEVEL OF EVIDENCE:**

Therapy, level 1b.

**KEYWORDS:**

**54. POSTURE****55. SCOLIOSIS****56. ATHLETICS****Fat oxidation rates**

Medicine & Science in Sports & Exercise:

doi: 10.1249/MSS.0000000000001084

**Maximal Fat Oxidation Rates in an Athletic Population.**

**RANDELL, REBECCA K.; ROLLO, IAN; ROBERTS, TIMOTHY J.; DALRYMPLE, KORTNEY; JEUKENDRUP, ASKER E.; CARTER, JAMES M.**

**Introduction:** The aim of this study was to describe maximal fat oxidation (MFO) rates in an athletic population.

**Method:** In total, 1121 athletes (933 males, 188 females), from a variety of sports and competitive level, undertook a graded exercise test on a treadmill in a fasted state ( $\geq 5$  h fasted). Rates of fat oxidation were determined using indirect calorimetry.

**Results:** Average MFO was  $0.59 \pm 0.18$  g[BULLET OPERATOR]min<sup>-1</sup>, ranging from 0.17 - 1.27 g[BULLET OPERATOR]min<sup>-1</sup>. Maximal rates occurred at an average exercise intensity of  $49.3 \pm 14.8\%$  V[spacing dot above]O<sub>2</sub>max, ranging from 22.6 - 88.8% V[spacing dot above]O<sub>2</sub>max. In absolute terms, male athletes had significantly higher MFO compared to females (0.61 and 0.50 g[BULLET OPERATOR]min<sup>-1</sup> respectively,  $P < 0.001$ ). Expressed relative to fat free mass (FFM), MFO were higher in the females compared to males (MFO/FFM: 11.0 and 10.0 mg[BULLET OPERATOR]kg[BULLET OPERATOR]FFM<sup>-1</sup>[BULLET OPERATOR]min<sup>-1</sup> respectively,  $P < 0.001$ ). Soccer players had the highest MFO/FFM (10.8 mg[BULLET OPERATOR]kg[BULLET OPERATOR]FFM<sup>-1</sup>[BULLET OPERATOR]min<sup>-1</sup>), ranging from 4.1 - 20.5 mg[BULLET OPERATOR]kg[BULLET OPERATOR]FFM<sup>-1</sup>[BULLET OPERATOR]min<sup>-1</sup>, whereas, American Football players displayed the lowest rates of MFO/FFM (9.2 mg[BULLET OPERATOR]kg[BULLET OPERATOR]FFM<sup>-1</sup>[BULLET OPERATOR]min<sup>-1</sup>). In all athletes, and when separated by sport, large individual variations in MFO rates were observed. Significant positive correlations were found between MFO (g[BULLET OPERATOR]min<sup>-1</sup>) and the following variables: FFM, V[spacing dot above]O<sub>2</sub>max, FATMAX (the exercise intensity at which the MFO was observed), percent body fat (%BF) and duration of fasting. When taken together these variables account for 47% of the variation in MFO.

**Conclusion:** MFO and FATMAX vary significantly between athletes participating in different sports but also in the same sport. Although variance in MFO can be explained to some extent by body composition and fitness status, more than 50% of the variance is not explained by these variables and remains unaccounted for. **KEYWORDS:** Fat Oxidation; Athletes; Exercise Metabolism; Physiology

**Exercise clothing**

**Sports Med.** 2016 Sep 16. [Epub ahead of print]

The Effects of Wearable Resistance Training on Metabolic, Kinematic and Kinetic Variables During Walking, Running, Sprint Running and Jumping: A Systematic Review.

Macadam P<sup>1</sup>, Cronin JB<sup>2,3</sup>, Simperingham KD<sup>2</sup>.

[Author information](#)

[Abstract](#)

**BACKGROUND:**

Wearable resistance training (WRT) provides a means of activity- or movement-specific overloading, supposedly resulting in better transference to dynamic sporting performance.

**OBJECTIVE:**

The purpose of this review was to quantify the acute and longitudinal metabolic, kinematic and/or kinetic changes that occur with WRT during walking, running, sprint running or jumping movements.

**DATA SOURCES:**

PubMed, SPORTDiscus, Web of Science and MEDLINE (EBSCO) were searched using the Boolean phrases (limb OR vest OR trunk) AND (walk\* OR run\* OR sprint\* OR jump\* OR bound\*) AND (metabolic OR kinetic OR kinematic) AND (load\*).

**STUDY SELECTION:**

A systematic approach was used to evaluate 1185 articles. Articles with injury-free subjects of any age, sex or activity level were included.

**RESULTS:**

Thirty-two studies met the inclusion criteria and were retained for analysis. Acute trunk loading reduced velocity during treadmill sprint running, but only significantly when loads of 11 % body mass (BM) or greater were used, while over-the-ground sprint running times were significantly reduced with all loads (8-20 %BM). Longitudinal trunk loading significantly increased jump performance with all loads (7-30 %BM), but did not significantly improve sprint running performance. Acute limb loading significantly increased maximum oxygen consumption and energy cost with all loads (0.3-8.5 %BM) in walking and running, while significantly reducing velocity during sprint running.

**LIMITATIONS:**

The variation in load magnitude, load orientation, subjects, testing methods and study duration no doubt impact the changes in the variables examined and hence make definitive conclusions problematic.

**CONCLUSIONS:**

WRT provides a novel training method with potential to improve sporting performance; however, research in this area is still clearly in its infancy, with future research required into the optimum load placement, orientation and magnitude required for adaptation.

**57. GAIT**

**58. RUNNING**

**59. PAIN**

[Chronic wide-spread pain and exercise](#)

*BMC Sports Sci Med Rehabil.* 2016 Sep 6;8(1):29. doi: 10.1186/s13102-016-0054-9. eCollection 2016.

Effects of exercise on fatigue and physical capacity in men with chronic widespread pain - a pilot study.

Ericsson A<sup>1</sup>, Bremell T<sup>2</sup>, Cider Å<sup>1</sup>, Mannerkorpi K<sup>1</sup>.

[Author information](#)

[Abstract](#)

**BACKGROUND:**

There is very limited knowledge about the effects of exercise on men with Chronic Widespread Pain (CWP), especially regarding fatigue. We wanted to investigate the effects of resistance exercise compared with pool exercise on multidimensional fatigue, psychological distress and physical capacity in men with CWP.

**METHODS:**

Thirty-four men with CWP, with a mean age of 49 (SD 8, range 26-59) years, were randomised to 12 weeks of standardised pool exercise (PE) or resistance exercise (RE). The primary outcome was the Multidimensional Fatigue Inventory (MFI-20). Depression, anxiety, isometric force, pain and health-related quality of life were also assessed.

**RESULTS:**

No significant differences were found for changes in MFI-20 between the exercise groups. The RE group improved the isometric forces of right shoulder abduction (RE:  $\Delta 2.2$  SD 1.5 N, PE:  $\Delta 0.6$  SD 1.2 N,  $p = 0.009$ ), right knee flexion (RE:  $\Delta 50$ , SD 50 N, PE:  $\Delta -17$ , SD 71 N,  $p = 0.003$ ) and left knee flexion (RE:  $\Delta 33$  SD 39, PE:  $\Delta -9$  SD 52 N,  $p = 0.017$ ) compared with the PE group. The drop-out rate was 29 % in the RE group and 18 % in the PE group.

**CONCLUSIONS:**

Both a resistance exercise programme and a pool exercise programme improved different dimensions of fatigue in men with CWP. There were no differences in the change in fatigue over time between the exercise groups. Resistance exercise improved isometric strength compared with pool exercise. Because different types of exercise appear to improve different aspects of health, the goals could guide the choice of treatment. Further exercise studies with larger groups are needed to gain more knowledge about the effect of exercise on fatigue in men with CWP.

**Abuse and chronic pain**

*J Pain.* 2016 Sep 15. pii: S1526-5900(16)30222-X. doi: 10.1016/j.jpain.2016.09.003. [Epub ahead of print]

The association between a history of lifetime traumatic events and pain severity, physical function, and affective distress in patients with chronic pain.

Nicol AL<sup>1</sup>, Sieberg CB<sup>2</sup>, Clauw DJ<sup>3</sup>, Hassett AL<sup>3</sup>, Moser SE<sup>3</sup>, Brummett CM<sup>3</sup>.

[Author information](#)

[Abstract](#)

Evidence suggests that pain patients who report lifetime abuse experience greater psychological distress, have more severe pain and other physical symptoms, and greater functional disability. The aim of the present study was to determine the associations between a history of lifetime abuse and affective distress, fibromyalgia-ness (as measured by the 2011 Fibromyalgia Survey), pain severity and interference, and physical functioning. A cross-sectional analysis of 3,081 individuals presenting with chronic pain was performed using validated measures and a history of

abuse was assessed via patient self-report. Multivariate logistic regression showed that individuals with a history of abuse (n=470; 15.25%) had greater depression, greater anxiety, worse physical functioning, greater pain severity, worse pain interference, higher catastrophizing, and higher scores on the fibromyalgia survey criteria (p<0.001 for all comparisons). Mediation models showed that both the fibromyalgia survey score and affective distress independently mediate the relationship between abuse and pain severity and physical functioning (p's<0.001). Our mediation models support a novel biopsychosocial paradigm wherein both affective distress and fibromyalgia-ness interact to play significant roles in the association between abuse and pain. We posit that having a centralized pain phenotype underlies the mediation of increased pain morbidity in individuals with a history of abuse.

***PERSPECTIVE:***

This article examines the associations between a history of lifetime abuse and affective distress, fibromyalgia-ness, pain severity and interference, and physical functioning in chronic pain patients. Our findings support a novel biopsychosocial paradigm in which affective distress and fibromyalgia-ness interact to play roles in the association between abuse and pain.

**Sleep and chronic pain**

**Sleep is key to curing chronic pain**

University of Warwick Health and Medicine News, 09/23/2016

**L**ink between chronic pain and lack of sleep identified. People with pain who believe they won't be able to sleep are more likely to suffer from insomnia, thus causing worse pain. Pioneering study could lead to specific cognitive therapy to cure insomnia and treat chronic pain. Researchers from the Sleep and Pain Lab in the Department of Psychology have demonstrated that conditions like back pain, fibromyalgia, and arthritis are directly linked with negative thoughts about insomnia and pain, and this can be effectively managed by cognitive-behavioural therapy (CBT). Afolalu and colleagues have formulated a pioneering scale to measure beliefs about sleep and pain in long-term pain patients, alongside their quality of sleep – the first of its type to combine both pain and sleep and explore the vicious cycle between sleep and pain problems. The scale was tested on four groups of patients suffering from long-term pain and bad sleeping patterns, with the result showing that people who believe they won't be able to sleep as a result of their pain are more likely to suffer from insomnia, thus causing worse pain. The results show that the scale was vital in predicting patients' level of insomnia and pain difficulties. With better sleep, pain problems are significantly reduced, especially after receiving a short course of CBT for both pain and insomnia. The study has provided therapists the means with which to identify and monitor rigid thoughts about sleep and pain that are sleep-interfering, allowing the application of the proven effective CBT for insomnia in people with chronic pain. 'Development of the Pain-Related Beliefs and Attitudes about Sleep (PBAS) Scale for the Assessment and Treatment of Insomnia Comorbid with Chronic Pain' was published in the Journal of Clinical Sleep Medicine.

**Pain and depression**

**J Pain.** 2016 Aug 30. pii: S1526-5900(16)30202-4. doi: 10.1016/j.jpain.2016.08.007. [Epub ahead of print]

Is pain perception altered in people with depression? A systematic review and meta-analysis of experimental pain research.

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**Abstract**

While clinical studies suggest depressed patients may be more vulnerable to pain, experimental research is equivocal. This meta-analysis aimed to clarify whether depression is associated with altered pain perception in response to noxious stimulation and to identify factors that might influence this association. A search of major electronic databases was conducted to identify experimental studies investigating pain response in depressed participants vs. healthy controls using established pain outcome measures. Random effects meta-analysis of standardized mean differences was conducted on data from 32 studies (N=1,317). For high-intensity noxious stimulation, overall pain tolerance was similar across depressed and control groups (Hedge's  $g=0.09$ ,  $p=0.71$ , studies=10). For low-intensity stimulation, a small, but statistically significant higher mean sensory threshold ( $g=0.35$ ,  $p=0.01$ , studies=9) and pain threshold ( $g=0.32$ ,  $p=0.02$ , studies=25) was observed in depressed participants, suggesting diminished pain. However, considerable heterogeneity in the direction and magnitude of effects was observed, indicating a likely condition-specific impact of depression on pain. Subgroup analysis found that pain threshold/tolerance was increased in depression for exteroceptive (cutaneous) stimulation but decreased for interoceptive (ischemic) stimulation, but that substantial heterogeneity remained. Overall, results provide some support for altered pain processing in depression, but suggest this link is dependent upon modality and additional, unidentified factors.

**PERSPECTIVE:**

This meta-analysis of experimental studies suggests potential effects of depression on pain perception are variable and likely to depend upon multiple factors. The contrasting pattern for ischemic vs. other noxious stimuli suggests that stimulus modality is a key factor, which could help explain discrepancies across clinical and experimental findings.

### Use of facet injections

*Curr Pain Headache Rep.* 2016 Oct;20(10):58.

Utilization of Facet Joint and Sacroiliac Joint Interventions in Medicare Population from 2000 to 2014: Explosive Growth Continues!

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**Abstract**

Increasing utilization of interventional techniques in managing chronic spinal pain, specifically facet joint interventions and sacroiliac joint injections, is a major concern of healthcare policy makers. We analyzed the patterns of utilization of facet and sacroiliac joint interventions in managing chronic spinal pain. The results showed significant increase of facet joint interventions and sacroiliac joint injections from 2000 to 2014 in Medicare FFS service beneficiaries. Overall, the Medicare population increased 35 %, whereas facet joint and sacroiliac joint interventions increased 313.3 % per 100,000 Medicare population with an annual increase of 10.7 %. While the increases were uniform from 2000 to 2014, there were some decreases noted for facet joint interventions in 2007, 2010, and 2013, whereas for sacroiliac joint injections, the decreases were noted in 2007 and 2013. The increases were for cervical and thoracic facet neurolysis at 911.5 %

compared to lumbosacral facet neurolysis of 567.8 %, 362.9 % of cervical and thoracic facet joint blocks, 316.9 % of sacroiliac joints injections, and finally 227.3 % of lumbosacral facet joint blocks.

### Induced Inflammation

*Eur J Pain*. 2016 Sep 15. doi: 10.1002/ejp.941. [Epub ahead of print]

The interaction between NGF-induced hyperalgesia and acid-provoked pain in the infrapatellar fat pad and tibialis anterior muscle of healthy volunteers.

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Author information

Abstract

#### **BACKGROUND:**

Tissue pH is lowered in inflamed tissues, and the increased proton concentration activates acid-sensing ion channels (ASICs), contributing to pain and hyperalgesia. ASICs can be upregulated by nerve growth factor (NGF). The aim of this study was to investigate two new human experimental pain models combining NGF- and acid-induced pain in a randomized, controlled, double-blind study.

#### **METHODS:**

In experiment 1, volunteers (N = 16) received an injection of either NGF or isotonic saline in each infrapatellar fat pad (IFP). One day after 5 mL of phosphate-buffered acidic saline was infused into each IFP at a rate of 20 mL/h. In experiment 2, the tibialis anterior (TA) muscle of additional volunteers (N = 16) was examined, following the same procedure except that the volume and infusion rate of acid were different (10 mL, 30 mL/h). Continuous pain ratings were recorded during and after acid infusions. In addition, soreness scores on a Likert scale and pressure pain thresholds (PPTs) were assessed.

#### **RESULTS:**

The PPT of the IFP was significantly decreased at the NGF injection site on day 1, but acid-provoked pain ratings and the change in PPT from pre- to postinfusion between the knees were similar. In the muscle pain model, local mechanical hyperalgesia developed 3 h after the NGF injection and a significant additional decrease in PPT was found after acid infusion compared to preinfusion.

#### **CONCLUSIONS:**

NGF sensitization in the IFP was not facilitated by acid, whereas an acid-provoked enhancement of muscle hyperalgesia was found. NGF sensitization of adipose tissue responds differently to acid provocation compared to muscle tissue.

#### **SIGNIFICANCE:**

Quantification of two novel pain models combining NGF and acid. Hyperalgesia developed after NGF injection in the infrapatellar fat pad, but it was not facilitated by acid provocation. Contrary, NGF-induced hyperalgesia in muscle tissue was enhanced by acid.

**60. COMPLEX REGIONAL PAIN****61. FIBROMYALGIA****Subgroups**

Eur J Pain. 2016 Sep 15. doi: 10.1002/ejp.935. [Epub ahead of print]

Identifying fibromyalgia subgroups using cluster analysis: Relationships with clinical variables.

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Author information

Abstract

**BACKGROUND:**

Patients with fibromyalgia (FM) exhibit significant clinical heterogeneity, in terms of physical, social and psychological functions, as well as therapeutic responses. Here, we examined FM patients in terms of pain, physical, social and psychological variables to identify clinical subgroups that may be predictive of treatment patterns.

**METHODS:**

A total of 313 FM patients were interviewed using a structured questionnaire that included sociodemographic data, current or past FM symptoms and current use of relevant medications. A K-means cluster analysis was conducted using variables reflecting tender points, the Fibromyalgia Impact Questionnaire, Beck Depression Inventory, State-Trait Anxiety Inventor and Social Support Scale.

**RESULTS:**

Four distinct clusters were identified in these patients. Group 1 was characterized by high pain levels, severe physical and mental impairment and low social support. Group 2 had moderate pain and physical impairment, mild mental impairment and moderate social support. Group 3 had moderate pain, low physical and moderate mental impairment and low social support. Group 4 had low pain levels, nearly normal physical and mental function and high social support. Group 1 was more often a current or past smoker, more likely to have a variety of symptoms, including swelling, cognitive dysfunction, dizziness, syncope, oesophageal dysmotility, dyspepsia, irritable bladder, vulvodynia and restless leg syndrome.

**CONCLUSIONS:**

We identified four subgroups of FM patients based on pain, physical, social and psychological function. These subgroups had different clinical symptoms and medication profiles, suggesting that FM may be better managed using a more comprehensive assessment of an individual patient's symptoms.

**SIGNIFICANCE:**

FM patients can be clustered into four distinct subgroups based on clinically measurable variables - pain, physical involvement, psychological function and social support. These subgroups had different clinical symptoms and medication profiles.

**62 A. NUTRITION/VITAMINS****62 B. CRYOTHERAPY**

### Cryotherapy and recovery

Open Access J Sports Med. 2016 Aug 22;7:89-97. doi: 10.2147/OAJSM.S110991. eCollection 2016.

The effect of local cryotherapy on subjective and objective recovery characteristics following an exhaustive jump protocol.

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Author information

#### Abstract

The purpose of this controlled trial was to investigate the effects of a single local cryotherapy session on the recovery characteristics over a period of 72 hours. Twenty-two young and healthy female (n=17; mean age: 21.9±1.1 years) and male (n=5; mean age: 25.4±2.8 years) adults participated in this study. Following an exhaustive jump protocol (3×30 countermovement jumps), half of the participants received either a single local cryotherapy application (+8°C) or a single local thermoneutral application (+32°C) of 20-minute duration using two thigh cuffs. Subjective measures of recovery (delayed-onset muscle soreness and ratings of perceived exertion) and objective measures of recovery (vertical jump performance and peak power output) were assessed immediately following the postexercise applications (0 hours) and at 24 hours, 48 hours, and 72 hours after the jump protocol. Local cryotherapy failed to significantly affect any subjective recovery variable during the 72-hour recovery period (P>0.05). After 72 hours, the ratings of perceived exertion were significantly lower in the thermoneutral group compared to that in the cryotherapy group (P=0.002). No significant differences were observed between the cryotherapy and the thermoneutral groups with respect to any of the objective recovery variables. In this experimental study, a 20-minute cryotherapy cuff application failed to demonstrate a positive effect on any objective measures of recovery. The effects of local thermoneutral application on subjective recovery characteristics were superior when compared to the effects of local cryotherapy application at 72 hours postapplication.

### 63. PHARMACOLOGY

### 64. ELECTROTHERAPY

### 65. NEUROLOGICAL CONDITIONS