

## 2. LBP

### Five test to determine potential for LBP

Occupational and environmental medicine Research

#### Does the performance of five back-associated exercises relate to the presence of low back pain? A cross-sectional observational investigation in regional Australian council workers

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2. Jason Osborne<sup>4,5</sup>, E-Liisa Laakso<sup>6,7</sup>, Markus Melloh<sup>8,9,10</sup>

**Objectives** Investigate the relationships between the ability/inability to perform five physical test exercises and the presence or absence of low back pain (LBP).

**Setting** Regional Australian council training facility.

**Participants** Consecutive participants recruited during 39 back education classes (8–26 participants per class) for workers in general office/administration, parks/gardens maintenance, roads maintenance, library, child care and management. Total sample (n=539) was reduced through non-consent and insufficient demographic data to n=422. Age 38.6±15.3 years, range 18–64 years, 67.1% male.

**Methods** Cross-sectional, exploratory, observational investigation. LBP presence was ascertained from a three-response option questionnaire: 0=none/rarely (no) 1=sometimes (some), 2=mostly/always (most). Statistical correlation was performed with the number of the five test exercises the individual successfully performed: (1) extension in lying: 3 s; (2) ‘toilet squat’; feet flat, feet touched: 3 s; (3) full squat then stand up: 5 times; (4) supine sit-up, knees flexed: 10 times; and (5) leg extension, supine bilateral: 10 times.

**Interventions** Nil.

**Results** For the group ‘no-some’, 94.3% completed 4–5 test exercises, while for group ‘With’, 95.7% completed 0–1 test exercises. The relationship between LBP presence and number of exercises performed was highly significant ( $\chi^2_{(10)}=300.61$ ,  $p<0.001$ ). Furthermore, multinomial logistic regression predicting LBP (0=no, 1=some, 2=most) from the number of exercises completed, substantially improved the model fit (initial-2LL=348.246, final-2LL=73.620,  $\chi^2_{(2)}=274.626$ ,  $p<0.001$ ). As the number of exercises performed increased, the odds of reporting ‘some LBP’ or ‘most LBP’ dropped substantially (ORs of 0.34 and 0.17, respectively).

**Conclusion** The ability to complete/not complete five test exercises correlated statistically and significantly with a higher LBP absence/presence in a general working population. Training individuals to complete such exercises could facilitate reductions in LBP incidence; however, causality cannot be inferred. Randomised trials are recommended to establish the potential efficacy of exercise-based approaches, considering these five selected exercises, for predicting and managing LBP.

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### Cauda equina management

**October 2018** Volume 37, Pages 69–74

#### **Assessment and management of cauda equina syndrome**

Sue Greenhalgh Laura Finucane Chris Mercer James Selfe

DOI: <https://doi.org/10.1016/j.msksp.2018.06.002>

#### **Introduction**

Cauda equina syndrome (CES) is a rare condition that affects the nerves in the spine supplying the bladder, bowel and sexual function. Identification and subsequent urgent action is required to avoid permanent damage to these essential organs. Delays in diagnosis can have devastating and life changing consequences for patients and result in high cost negligence claims.

#### **Purpose**

The purpose of this masterclass is to examine the current evidence and provide an evidence-based, clinically reasoned approach in the safe management of patients presenting with CES. It will include a focus on the importance of communication, documentation and a practical approach to safety netting those at risk.

#### **Implications for practice**

CES has significant implications for patients and clinicians alike. Timely, effective diagnosis and management of patients with CES results in a better outcome.

**Knee pain associated with LBP**

Knee Surgery, Sports Traumatology, Arthroscopy pp 1–6|

**Knee pain is associated with lower back pain in young baseball players: a cross-sectional study**

- Yutaka Yabe Ryoichi Nagatomi

**Purpose**

Considerable research has focused on shoulder and elbow injuries among baseball players; however, although lumbar spine and knee injuries are commonly experienced, they are less frequently studied. During common motions in baseball, such as throwing, hitting, and running, energy is transferred from the lower extremities through the lower back to the upper body. Lower extremity pain, as well as lower back pain (LBP), can disrupt the kinematic chain, and it is important to understand the association between lower extremity complaints and LBP. The purpose of this study was to elucidate the association between knee pain and LBP among young baseball players.

**Methods**

A cross-sectional study was conducted with young baseball players (aged 6–15 years,  $n = 1,609$ ) using a self-reported questionnaire. Multivariate logistic regression models were used for analyses. Variables considered in the models were sex, age, body mass index, team levels, number of days of training per week, number of hours in practice per day on weekdays and weekend, frequency of participation in games, practice intensity, and player position.

**Results**

The point prevalence of LBP and knee pain was 8.4% and 13.1%, respectively. Knee pain was significantly associated with LBP. Using the absence of knee pain as a reference, the adjusted odds ratio (95% confidence interval) for LBP was 5.83 (3.93–8.65) ( $p < 0.001$ ) in the presence of knee pain.

**Conclusions**

Knee pain was associated with LBP among young baseball players. Clinicians should pay attention to knee complaints to prevent and treat LBP among young baseball players.

## 7. PELVIC ORGANS/WOMAN'S HEALTH

### Childhood obesity related to infertility

September 2018 Volume 110, Issue 4, Pages 596–604.e1

#### Association of childhood obesity with female infertility in adulthood: a 25-year follow-up study

Ye He, Ph.D. Jing Tian, Ph.D. Wendy H. Oddy, Ph.D. Terence Dwyer, M.D. Alison J. Venn, Ph.D.

DOI: <https://doi.org/10.1016/j.fertnstert.2018.05.011>

**Objective** To evaluate whether childhood obesity is associated with infertility in women's reproductive-aged life.

**Design** Prospective longitudinal study.

**Setting** Not applicable.

**Intervention(s)** None.

**Patient(s)** A total of 1,544 girls, aged 7–15 years in 1985, and who completed questionnaires at follow-up in 2004-2006 and/or 2009-2011.

**Main Outcome Measure(s)** Infertility was defined as having difficulty conceiving (had tried for  $\geq 12$  months to become pregnant without succeeding) or having seen a doctor because of trouble becoming pregnant.

**Result(s)** At ages from 7–11 years, girls at both the lower and upper end of the body mass index (BMI)  $z$  score had increased risk of infertility. Compared with normal weight girls, those with obesity at ages 7–11 years were more likely in adulthood to report infertility (adjusted relative risk [aRR] = 2.94, 95% confidence interval [CI] 1.48–5.84), difficulty conceiving (aRR = 3.89, 95% CI 1.95–7.77), or having seen a doctor because of trouble becoming pregnant (aRR = 3.65, 95% CI 1.90–7.02) after adjusting for childhood age, follow-up length, highest parental education, and marital status.

**Conclusion(s)** Childhood obesity before 12 years of age appears to increase the risk of female infertility in later life.

**C section increases risk of allergies**

Article in Press

**Cesarean delivery, preterm birth, and risk of food allergy: Nationwide Swedish cohort study of more than 1 million children**

Niki Mitselou, Jenny Hallberg, PhD Olof Stephansson, MD, PhD Catarina Almqvist, MD, PhD, Erik Melén, MD, PhD Jonas F. Ludvigsson, MD, PhD

DOI: <https://doi.org/10.1016/j.jaci.2018.06.044>**Objectives**

We examined the association between perinatal characteristics and future risk of food allergy in offspring.

**Methods**

This nationwide Swedish cohort study of 1,086,378 children born in Sweden in 2001-2012 used prospectively recorded data from health care registers. Using Cox regression, we estimated hazard ratios (HRs) with 95% CIs for the association between perinatal characteristics (eg, cesarean delivery and preterm birth) and food allergy as defined by diagnoses in the National Patient Register, adjusting for infant sex and maternal factors (age at delivery, country of birth, parity, smoking, body mass index, and asthma/pulmonary disease).

**Results**

During the 13-year follow-up, 26,732 (2.5%) children were given a diagnosis of food allergy. Food allergy was positively associated with cesarean delivery (HR, 1.21; 95% CI, 1.18-1.25), large for gestational age (HR, 1.15; 95% CI, 1.10-1.19), and low 5-minute Apgar score (HR, 1.22; 95% CI, 1.10-1.36) but negatively associated with very preterm birth (<32 weeks of gestation: HR, 0.74; 95% CI, 0.56-0.98). No association was found between food allergy and moderately preterm birth, low birth weight, or small for gestational age. Risk estimates were similar when the outcome was restricted to 2 records of diagnosed food allergy. In 1,000 children undergoing cesarean delivery, an extra 5 developed food allergy compared with the reference group, suggesting that 17% of food allergy in children born by means of cesarean delivery can be explained by this exposure (attributable fraction).

**Conclusions**

Cesarean delivery was associated with increased risk of food allergy, whereas very preterm birth decreased risk.

**Hypertension in ART patients**

J Am Coll Cardiol. 2018 Sep 11;72(11):1267-1274. doi: 10.1016/j.jacc.2018.06.060.

**Association of Assisted Reproductive Technologies With Arterial Hypertension During Adolescence.**

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**BACKGROUND:**

Assisted reproductive technologies (ART) have been shown to induce premature vascular aging in apparently healthy children. In mice, ART-induced premature vascular aging evolves into arterial hypertension. Given the young age of the human ART group, long-term sequelae of ART-induced alterations of the cardiovascular phenotype are unknown.

**OBJECTIVES:**

This study hypothesized that vascular alterations persist in adolescents and young adults conceived by ART and that arterial hypertension possibly represents the first detectable clinically relevant endpoint in this group.

**METHODS:**

Five years after the initial assessment, the study investigators reassessed vascular function and performed 24-h ambulatory blood pressure (BP) monitoring (ABPM) in 54 young, apparently healthy participants conceived through ART and 43 age- and sex-matched controls.

**RESULTS:**

Premature vascular aging persisted in ART-conceived subjects, as evidenced by a roughly 25% impairment of flow-mediated dilation of the brachial artery ( $p < 0.001$ ) and increased pulse-wave velocity and carotid intima-media thickness. Most importantly, ABPM values (systolic BP,  $119.8 \pm 9.1$  mm Hg vs.  $115.7 \pm 7.0$  mm Hg,  $p = 0.03$ ; diastolic BP,  $71.4 \pm 6.1$  mm Hg vs.  $69.1 \pm 4.2$  mm Hg,  $p = 0.02$  ART vs. control) and BP variability were markedly higher in ART-conceived subjects than in control subjects. Eight of the 52 ART participants, but only 1 of the 43 control participants ( $p = 0.041$  ART vs. controls) fulfilled ABPM criteria of arterial hypertension ( $>130/80$  mm Hg and/or  $>95$ th percentile).

**CONCLUSIONS:**

ART-induced premature vascular aging persists in apparently healthy adolescents and young adults without any other detectable classical cardiovascular risk factors and progresses to arterial hypertension. (Vascular Dysfunction in Offspring of Assisted Reproduction Technologies; [NCT00837642](#)).

**10 A. CERVICAL SPINE****Neck pain helped by MT and scapula ex**

J Sport Rehabil. 2018 Sep 1;27(5):403-412. doi: 10.1123/jsr.2017-0024. Epub 2018 Jul 25.

**Neck and Scapula-Focused Exercise Training on Patients With Nonspecific Neck Pain: A Randomized Controlled Trial.**

Yildiz TI, Turgut E, Duzgun I.

Abstract

**OBJECTIVES:**

The purpose of this study was to investigate the effects of additional 6-week scapular stabilization training in patients with nonspecific neck pain (NNP).

**MATERIALS AND METHODS:**

A total of 30 patients with NNP were randomly allocated to the study. Fifteen participants in the intervention group received neck-focused exercise and scapular stabilization training, whereas 15 participants in the control group received neck-focused exercise training. All groups were evaluated at baseline and after 6 weeks of rehabilitation. The pain intensity on the neck was measured with the visual analog scale (VAS). The self-reported disability status was measured with the neck disability index (NDI). Three-dimensional scapular kinematics were recorded during dynamic shoulder elevation trials using an electromagnetic tracking device, and data were further analyzed at 30°, 60°, 90°, and 120° of humerothoracic elevations.

**RESULTS:**

Comparisons revealed that, regardless of the received treatment, after 6 weeks of training both groups showed significant improvements in VAS ( $P < .001$ ) and NDI ( $P < .001$ ) scores. Both VAS and NDI outcomes have a large effect size ( $r = .618$  and  $r = .619$ , respectively). For scapular kinematics, there were no group differences, especially for scapular upward-downward rotation and anterior-posterior tilt ( $P > .05$ ). However, in the intervention group, the scapula was more externally rotated at 120° humerothoracic elevation ( $P = .04$ ).

**CONCLUSION:**

Findings of this study showed that both manual therapy and active interventions, including neck-focused exercise and scapular stabilization training, are effective in decreasing pain and disability level in patients with NNP. More comprehensive studies with longer follow-up durations are needed to better understand the potential effects of scapular stabilization training in patients with NNP.

**Pt in neck problems**

October 2018 Volume 37, Pages 8–16

**Clinical reasoning in unimodal interventions in patients with non-specific neck pain in daily physiotherapy practice, a Delphi study**

Francois Maissan Jan Pool Eric Stutterheim Harriet Wittink Raymond Ostelo

DOI: <https://doi.org/10.1016/j.msksp.2018.06.001>

- Pain alone was deemed not be an indication for physiotherapy treatment.
- PROMs are used for evaluative purposes, physical tests also for evaluative purposes.
- Consensus regarding the use of unimodal interventions in was poor.

**Abstract****Background**

Neck pain is the fourth major cause of disability worldwide but sufficient evidence regarding treatment is not available. This study is a first exploratory attempt to gain insight into and consensus on the clinical reasoning of experts in patients with non-specific neck pain.

**Objective**

First, we aimed to inventory expert opinions regarding the indication for physiotherapy when, other than neck pain, no positive signs and symptoms and no positive diagnostic tests are present. Secondly, we aimed to determine which measurement instruments are being used and when they are used to support and objectify the clinical reasoning process. Finally, we wanted to establish consensus among experts regarding the use of unimodal interventions in patients with non-specific neck pain, i.e. their sequential linear clinical reasoning.

**Study design** A Delphi study.

**Methods** A Web-based Delphi study was conducted. Fifteen experts (teachers and researchers) participated.

**Results**

Pain alone was deemed not be an indication for physiotherapy treatment. PROMs are mainly used for evaluative purposes and physical tests for diagnostic and evaluative purposes. Eighteen different variants of sequential linear clinical reasoning were investigated within our Delphi study. Only 6 out of 18 variants of sequential linear clinical reasoning reached more than 50% consensus.

**Conclusion**

Pain alone is not an indication for physiotherapy. Insight has been obtained into which measurement instruments are used and when they are used. Consensus about sequential linear lines of clinical reasoning was poor.



**13 C. AIRWAYS/SWALLOWING/SPEECH****Exercise helps sleep problems****Exercise can improve sleep quality: a systematic review and meta-analysis**

Masahiro Banno, Yudai Harada, [...], and Akiko Noda

**Background**

Insomnia is common. However, no systematic reviews have examined the effect of exercise on patients with primary and secondary insomnia, defined as both sleep disruption and daytime impairment. This systematic review and meta-analysis aimed to examine the effectiveness/efficacy of exercise in patients with insomnia.

**Methods**

We searched the Cochrane Central Register of Controlled Trials, MEDLINE, Embase, PsycINFO, World Health Organization International Clinical Trials Registry Platform, and ClinicalTrials.gov to identify all randomized controlled trials that examined the effects of exercise on various sleep parameters in patients with insomnia. All participants were diagnosed with insomnia, using standard diagnostic criteria or predetermined criteria and standard measures. Data on outcome measures were subjected to meta-analyses using random-effects models. The Cochrane Risk of Bias Tool and Grading of Recommendations, Assessment, Development, and Evaluation approach were used to assess the quality of the individual studies and the body of evidence, respectively.

**Results**

We included nine studies with a total of 557 participants. According to the Pittsburgh Sleep Quality Index (mean difference [MD], 2.87 points lower in the intervention group; 95% confidence interval [CI], 3.95 points lower to 1.79 points lower; low-quality evidence) and the Insomnia Severity Index (MD, 3.22 points lower in the intervention group; 95% CI, 5.36 points lower to 1.07 points lower; very low-quality evidence), exercise was beneficial. However, exercise interventions were not associated with improved sleep efficiency (MD, 0.56% lower in the intervention group; 95% CI, 3.42% lower to 2.31% higher; moderate-quality evidence). Only four studies noted adverse effects. Most studies had a high or unclear risk of selection bias.

**Discussion**

Our findings suggest that exercise can improve sleep quality without notable adverse effects. Most trials had a high risk of selection bias. Higher quality research is needed.

## 21. ADHESIVE CAPSULITIS

US did not help

J Back Musculoskelet Rehabil. 2018 Jul 20. doi: 10.3233/BMR-150482.

### **Efficacy of therapeutic ultrasound in treatment of adhesive capsulitis: A prospective double blind placebo-controlled randomized trial.**

Balci TO<sup>1</sup>, Turk AC<sup>2</sup>, Sahin F<sup>3</sup>, Kotevoglu N<sup>4</sup>, Kuran B<sup>5</sup>.

#### **BACKGROUND:**

In treatment of adhesive capsulitis, deep heating agents have been shown to have positive effects on pain and function.

#### **OBJECTIVE:**

To evaluate if addition of ultrasound used in treatment of adhesive capsulitis will provide additional benefits.

#### **METHODS:**

Thirty patients with adhesive capsulitis were included in a prospective, double-blind, randomized controlled trial. Hotpack, TENS (Transcutaneous Electrical Nerve Stimulation), exercise and active ultrasound therapies were applied to the first group (n= 15), whereas sham ultrasound was applied to the second group (n= 15) in addition to hotpack, TENS and exercise. The patients were evaluated using joint range of motion, UCLA shoulder scale and Shoulder Disability Questionnaire scales at baseline and at 6th and 24th weeks post-treatment.

#### **RESULTS:**

When pain and the clinical and functional parameters were compared in both groups, significant improvement was found compared to baseline ( $p < 0.001$ ). At week 24, no difference was found in terms of pain at rest, but all other parameters were improved compared to week 6. When the groups were compared, no difference was found in any comparison between 6th and 24th week ( $p > 0.05$ ).

#### **CONCLUSION:**

Adding ultrasound treatment to a combination of physical therapy modalities did not provide any additional benefits for the treatment of adhesive capsulitis.

PT rx helps

### **Outcomes From Conservative Treatment of Shoulder Idiopathic Adhesive Capsulitis and Factors Associated With Developing Contralateral Disease**

Joseph D. Lamplot,\* MD, Olivia Lillegraven,\* BA, and Robert H. Brophy,\*† MD Investigation performed at the Department of Orthopaedic Surgery, Washington University School of Medicine, St Louis, Missouri, USA

#### Background:

Idiopathic adhesive capsulitis is a common condition resulting in painful multidirectional restriction of motion without other identifiable shoulder abnormality. First-line therapies for this condition are nonoperative, but limited data are available regarding which treatments are most effective. Factors associated with contralateral disease are not well established.

Hypothesis: Younger patients will have a better response to treatments, and older patients and patients with diabetes will be more likely to develop contralateral disease. Study Design: Cohort study; Level of evidence, 3.

Methods: Patients diagnosed with idiopathic adhesive capsulitis were treated with a single intra-articular glenohumeral injection of local anesthetic and corticosteroid as well as 4 weeks of supervised physical therapy (PT). Patients were re-evaluated monthly and received additional conservative treatment based on failure to restore normal motion. Patient-reported outcome scores and range of motion were used to assess treatment efficacy.

Results: Minimum 2-year follow-up data (mean, 3.4 years) were available for 60 of 75 eligible patients (80%). Patients who did not attend supervised PT as prescribed were more likely to undergo repeat injection due to a lack of adequate range of motion at follow-up ( $P = .003$ ). Conservative therapy failed in 2 patients (3.3%), and they underwent arthroscopic release and manipulation under anesthesia. Twenty-two patients (36.7%) were subsequently diagnosed with contralateral idiopathic adhesive capsulitis, with a higher incidence in patients with diabetes ( $P = .009$ ) and patients younger than 50 years ( $P = .005$ ). American Shoulder and Elbow Surgeons score improved from 41.2 (95% CI, 33.0-49.4) at baseline to 92.0 (95% CI, 88.4-95.6) at final follow-up ( $P < .0001$ ). Patients with diabetes had a decrease in Shoulder Activity Scale score at final follow-up ( $P = .049$ ).

Conclusion: Conservative treatment for idiopathic adhesive capsulitis resulted in good clinical outcomes with a low incidence of surgical intervention. Physical therapy reduced the use of a second injection as part of treatment in this treatment algorithm. Young patients and patients with diabetes may be more likely to develop contralateral disease. Keywords: idiopathic adhesive capsulitis; frozen shoulder; conservative treatment; physical therapy; corticosteroid injection.

## 25. WRIST AND HAND

### Protocols for care

J Bone Joint Surg Am. 2018 Aug 1;100(15):1275-1280. doi: 10.2106/JBJS.17.01157.

### **A Prospective, Randomized Trial of Mobilization Protocols Following Ligament Reconstruction and Tendon Interposition.**

Hutchinson DT<sup>1</sup>, Sueoka S<sup>1</sup>, Wang AA<sup>1</sup>, Tyser AR<sup>1</sup>, Papi-Baker K<sup>2</sup>, Kazmers NH<sup>1</sup>.

#### **BACKGROUND:**

The purpose of this study was to evaluate the hypothesis that an increased duration of immobilization following trapeziectomy with ligament reconstruction and tendon interposition (LRTI) leads to improved patient-reported outcomes compared with an early mobilization protocol.

#### **METHODS:**

At 2 institutions, we prospectively randomized 223 patients (238 thumbs) undergoing LRTI to receive 1 of 2 postoperative rehabilitation protocols. The immobilization protocol consisted of use of a postoperative forearm-based thumb-spica splint for 7 days followed by a forearm-based thumb-spica cast for 5 weeks and then by a custom forearm-based thermoplastic thumb-spica splint for an additional 6 weeks. An active range of motion (ROM) was started 6 weeks postoperatively. The early mobilization protocol consisted of the same postoperative splint for 7 days followed by use of a forearm-based thermoplastic thumb-spica splint for 3 weeks and then by a hand-based thumb-spica splint for 4 weeks. An active ROM was started 4 weeks postoperatively. The outcome measures included the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire; pinch and grip strength; 9-hole peg test (NHP); visual analog scale (VAS) for pain; VAS for patient satisfaction; and wrist and thumb ROM. These were measured preoperatively and at 6, 12, 26, 52, and 104 weeks postoperatively. Differences in continuous and categorical variables were assessed with use of Tukey multiple comparisons following 1-way analysis of variance and Fisher exact tests, respectively.

#### **RESULTS:**

A minimum follow-up of 1 year (mean, 1.7 years) was achieved for 71% (169) of the 238 randomized thumbs (157 of the 223 patients): 74 patients (80 thumbs) treated with the immobilization protocol and 83 patients (89 thumbs) treated with the early mobilization protocol. DASH scores, VAS pain scores, VAS patient satisfaction scores, and strength all improved similarly with no significant differences between groups at any time point. Wrist and thumb ROM and NHP outcomes were significantly worse for the immobilization group at 6 weeks postoperatively, with no differences observed between groups at 12 weeks and beyond.

#### **CONCLUSIONS:**

A conservative immobilization protocol does not improve functional outcomes, satisfaction, strength, or ROM following LRTI compared with an early mobilization protocol.

**29. OA****Mobilization for**

Musculoskelet Sci Pract. 2018 Aug;36:81-86. doi: 10.1016/j.msksp.2018.05.004. Epub 2018 May 29.

**Comparison of high, medium and low mobilization forces for increasing range of motion in patients with hip osteoarthritis: A randomized controlled trial.**

Estébanez-de-Miguel E<sup>1</sup>, Fortún-Agud M<sup>2</sup>, Jimenez-Del-Barrio S<sup>3</sup>, Caudevilla-Polo S<sup>4</sup>, Bueno-Gracia E<sup>4</sup>, Tricás-Moreno JM<sup>4</sup>.

**BACKGROUND:**

Manual therapy has been shown to increase range of motion (ROM) in hip osteoarthritis (OA). However, the optimal intensity of force during joint mobilization is not known.

**OBJECTIVE:**

To compare the effectiveness of high, medium and low mobilization forces for increasing range of motion (ROM) in patients with hip OA and to analyze the effect size of the mobilization.

**DESIGN:**

Randomized controlled trial.

**METHODS:**

Sixty patients with unilateral hip OA were randomized to three groups: low, medium or high force mobilization group. Participants received three treatment sessions of long-axis distraction mobilization (LADM) in open packed position and distraction forces were measured at each treatment. Primary outcomes: passive hip ROM assessed before and after each session.

**SECONDARY OUTCOMES:**

pain recorded with Western Ontario and McMaster Universities (WOMAC) pain subscale before and after the three treatment sessions.

**RESULTS:**

Hip ROM increased significantly ( $p < 0.05$ ) in the high-force mobilization group (flexion: 10.6°, extension: 8.0°, abduction: 6.4°, adduction: 3.3°, external rotation: 5.6°, internal rotation: 7.6°). These improvements in hip ROM were statistically significant ( $p < 0.05$ ) compared to the low-force group. There were no significant changes in the low-force and medium-force groups for hip ROM. No significant differences in hip pain were found between treatment groups.

**CONCLUSION:**

A high force LADM in open packed position significantly increased hip ROM in all planes of motion compared to a medium or low force mobilization in patients with hip OA. A specific intensity of force mobilization appears to be necessary for increasing ROM in hip OA.

**31. KNEE****Surgery complications with youth and smokers**

Knee Surg Sports Traumatol Arthrosc. 2018 Sep 7. doi: 10.1007/s00167-018-5125-x.

**Younger patients and smokers report a higher level of pain after knee arthroscopy: a clinical and experimental study including synovial metabolism.**

Berglund L<sup>1</sup>, Stålmán A<sup>2</sup>, Dungner E<sup>3</sup>, Qureshi AR<sup>4</sup>, Kumlin M<sup>3</sup>, Felländer-Tsai L<sup>3</sup>.

**PURPOSE:**

Factors associated with post-surgical pain are not fully explored. The aim of this study was to identify determinants of postoperative pain after arthroscopic surgery of the knee. Synovial tissue metabolism was analysed by microdialysis and the association with individual and peri-surgical factors to identify determinants important for pain management and thus patient satisfaction.

**METHODS:**

Cross-sectional study of 57 patients (22 women) with median age of 39 years. All patients were operated on with arthroscopic surgery of the knee and monitored postoperatively with synovial microdialysis. The cross-sectional cohort was investigated to determine local tissue levels of inflammatory and metabolic compounds along with postoperative pain experience.

**MEASUREMENTS:**

pain was determined by visual analogue scale (VAS). Postoperative synovial tissue levels of prostaglandin E<sub>2</sub>(PGE<sub>2</sub>), glucose, and glycerol were measured by microdialysis in the knee synovium. Patients reporting VAS  $\geq$  4 received rescue pain medication with systemic opioids.

**RESULTS:**

Initial results indicated that patients with pain (interpreted as having VAS  $\geq$  4), i.e. those receiving rescue medication with systemic opioids, were of a younger age ( $p = 0.04$ ), lower body weight ( $p = 0.02$ ), had a lower BMI ( $p = 0.04$ ) and/or were smokers ( $p = 0.02$ ). A closer analysis using multinomial logistic regression showed a significantly higher amount of pain in smokers ( $p = 0.01$ ) and patients of a younger age ( $p = 0.02$ ). A significant correlation was also found between VAS and duration of surgery ( $p = 0.007$ ). No significant correlation could be found between VAS and synovial levels of PGE<sub>2</sub>, glycerol and glucose, but a statistically significant decline with time of PGE<sub>2</sub> in both groups.

**CONCLUSIONS:**

The results from this study show a significantly higher frequency of pain, post-surgery among younger patients ( $p = 0.02$ ) and smokers ( $p = 0.01$ ), as well as an association between pain and length of surgery ( $p = 0.007$ ). These findings point out individual factors useful for the prediction of postoperative pain after arthroscopic surgery and are clinically important for personalized pain management.

**LEVEL OF EVIDENCE: II.**

### 32 A. KNEE/ACL

#### ACL and CV risk

##### **Relation of anterior cruciate ligament tears to potential chronic cardiovascular diseases**

The American Journal of Cardiology

Meehan WP, et al. |

September 11, 2018

In a cohort of former National Football League (NFL) players (N=3,506) who played since 1960, researchers evaluated potential long-term health consequences related to playing professional football.

They focused on the possible association of anterior cruciate ligament (ACL) tears with later life comorbidities, such as cardiovascular effects. They used Cox proportional hazards to estimate hazard ratios for joint replacement surgeries, myocardial infarction, sleep apnea, arthritis, dementia, and stroke by history of ACL tear during their professional career and asked each participant to complete a self-administered questionnaire, including physician-diagnosed health conditions.

After adjusting for covariates, they observed approximately 2-fold increase in muscular skeletal co-morbidities, including knee joint replacement and arthritis, among former NFL players who tore their ACL vs those without ACL tears.

An over 50% increased risk of myocardial infarction and a slight increase in sleep apnea was seen among those with a history of ACL tears. Based on these data, they concluded that the detection of those who could most benefit from prevention strategies could be possible via enhanced screening for other risk factors for these conditions among individuals who have torn their ACL.

**34. PATELLA****Adductor strengthening helps pfp**

J Strength Cond Res. 2018 Aug 2. doi: 10.1519/JSC.0000000000002658.

**Effects of Hip Abductor Muscles Exercises on Pain and Function in Patients With Patellofemoral Pain: A Systematic Review and Meta-Analysis.**

Rogan S<sup>1,2</sup>, Haehni M<sup>1</sup>, Luijckx E<sup>1</sup>, Dealer J<sup>1</sup>, Reuteler S<sup>1</sup>, Taeymans J<sup>1,3</sup>.

: A systematic review and meta-analysis. J Strength Cond Res XX(X): 000-000, 2018-

This systematic review and meta-analysis considered the effects of hip strengthening (i.e., abductor and external rotator muscles) vs. no hip strengthening on pain and of hip strengthening combined with knee strengthening vs. knee strengthening (i.e., quadriceps muscles) alone on pain and functional status in patients with patellofemoral pain (PFP).

Eleven, randomized, controlled trial (RCT) studies and 1 non-RCT study were included, totaling 604 participants. Female athletes were included in one study, whereas untrained participants were included in the other studies. On average, the studies showed a low methodological quality. Hip muscle strengthening showed greater pain-reducing effects when compared with no hip strengthening (standardized mean difference [SMD] = -1.91; 95% confidence interval [CI], -2.92 to -0.9; p = 0.0002). When comparing a combined hip and knee muscle strengthening with knee muscle strengthening alone, pain was reduced in the combined hip and knee-strengthening group (SMD -0.99; 95% CI, -1.99 to 0.02; p = 0.05), whereas function showed a SMD of 0.70 (95% CI, 0.25-1.14; p = 0.002) again favoring the combined hip and knee-strengthening group.

This meta-analysis showed evidence that the strengthening of the hip abductor muscles can reduce pain and function in patients with PFP. Because studies including highly trained patients with PFP are currently lacking, one should be careful when applying the clinical findings of this meta-analysis when working with athletes.



**Isometric exercise short vs long duration**

Clin J Sport Med. 2018 Aug 8. doi: 10.1097/JSM.0000000000000625.

**Immediate and Short-Term Effects of Short- and Long-Duration Isometric Contractions in Patellar Tendinopathy.**

Pearson SJ<sup>1</sup>, Stadler S<sup>2</sup>, Menz H<sup>3</sup>, Morrissey D<sup>4</sup>, Scott I<sup>2</sup>, Munteanu S<sup>3</sup>, Malliaras P<sup>2</sup>.

**OBJECTIVES:**

Isometric muscle contractions are used in the management of patellar tendinopathy to manage pain and improve function. Little is known about whether long- or short-duration contractions are optimal to improve pain. This study examined the immediate and short-term (4 weeks) effects of long- and short-duration isometric contraction on patellar tendon pain, and tendon adaptation.

**DESIGN:**

Repeated measures within groups.

**SETTING:**

Clinical primary care.

**PATIENTS:**

Participants (n = 16, males) with patellar tendinopathy.

**INTERVENTION:**

Short-duration (24 sets of 10 seconds) or long-duration (6 sets of 40 seconds) isometric knee extension loading (85% maximal voluntary contraction), for 4 weeks.

**MAIN OUTCOME MEASURE:**

Immediate change in pain with single-leg decline squat (SLDS) and hop, as well as change in pain and tendon adaptation [within-session anterior-posterior (AP) strain] were assessed over 4 weeks.

**RESULTS:**

Pain was significantly reduced after isometric loading on both SLDS ( $P < 0.01$ ) and hop tests ( $P < 0.01$ ). Pain and quadriceps function improved over the 4 weeks ( $P < 0.05$ ). There was significant AP strain at each measurement occasion ( $P < 0.01$ ). Although transverse strain increased across the training period from ~14% to 22%, this was not significant ( $P = 0.08$ ).

**CONCLUSIONS:**

This is the first study to show that short-duration isometric contractions are as effective as longer duration contractions for relieving patellar tendon pain when total time under tension is equalized. This finding provides clinicians with greater options in prescription of isometric loading and may be particularly useful among patients who do not tolerate longer duration contractions. The trend for tendon adaptation over the short 4-week study period warrants further investigation.

**37. OSTEOARTHRITIS/KNEE****Exercise helps**

Osteoarthritis Cartilage. 2018 Jul 24. pii: S1063-4584(18)31369-4. doi: 10.1016/j.joca.2018.07.002.

**Reallocating time spent in sleep, sedentary behavior and physical activity and its association with pain: a pilot sleep study from the Osteoarthritis Initiative.**

Song J<sup>1</sup>, Dunlop DD<sup>2</sup>, Semanik PA<sup>3</sup>, Chang AH<sup>4</sup>, Lee YC<sup>5</sup>, Gilbert AL<sup>6</sup>, Jackson RD<sup>7</sup>, Chang RW<sup>8</sup>, Lee J<sup>9</sup>.

**OBJECTIVE:**

Being physically active has broad health benefits for people with osteoarthritis (OA), including pain relief. Increasing physical activity (PA) requires reducing time in other behaviors within a fixed 24-h day. We examined the potential benefits in relation to pain from trading time in one type of wake or sleep behavior for another.

**METHOD:**

In this cross-sectional study, we used isotemporal logistic regression models to examine the estimated effect on pain from replacing time in one behavior with equal time in another, controlling for sociodemographic and health factors. Stratified analysis was conducted by the report of restless sleep. Sleep and wake behaviors [sedentary behavior (SB), light PA, moderate PA] were monitored by accelerometer in a pilot study of 185 Osteoarthritis Initiative (OAI) participants. Outcomes were bodily pain interference and knee pain.

**RESULTS:**

Moderate PA substituted for an equivalent time in sleep or other types of wake behaviors was most strongly associated with lower odds of pain (bodily pain interference odds reduced 21-25%, knee pain odds reduced 17-20% per 10-min exchange). These beneficial associations were particularly pronounced in individuals without restless sleep, but not in those with restless sleep, especially for bodily pain interference.

**CONCLUSION:**

Interventions promoting moderate physical activities may be most beneficial to address pain among people with or at high risk for knee OA. In addition to encouraging moderate-intensity PA, pain management strategies may also include the identification and treatment of sleep problems.

## 40. ANKLE SPRAINS AND INSTABILITY

## Hip weakness

J Athl Train. 2018 Jul;53(7):672-678. doi: 10.4085/1062-6050-238-17. Epub 2018 Aug 7.

**Isometric Hip Strength and Dynamic Stability of Individuals With Chronic Ankle Instability.**

McCann RS<sup>1</sup>, Bolding BA<sup>2</sup>, Terada M<sup>3</sup>, Kosik KB<sup>4</sup>, Crossett ID<sup>5</sup>, Gribble PA<sup>4</sup>.

Compared with individuals who have a history of lateral ankle sprain (LAS) without markers of chronic ankle instability (CAI; LAS copers) and healthy people, those with CAI often exhibit neuromuscular impairments and dynamic-stability deficits at the hip. However, the influence of hip-strength deficits on dynamic stability remains unknown.

**OBJECTIVE:** To compare isometric hip strength and dynamic stability in individuals with or without CAI and examine the degree of dynamic-stability variance explained by isometric hip strength.

**DESIGN:** Case-control study.

**SETTING:** Research laboratory.

**PATIENTS OR OTHER PARTICIPANTS:** Sixty individuals (47 women, 13 men; age = 23.7 ± 4.6 years, height = 166.6 ± 7.7 cm, mass = 70.8 ± 15.7 kg) separated into CAI, LAS copers, and control groups based on previously established criteria.

**MAIN OUTCOME MEASURE(S):** Group differences in resultant vector time to stabilization (RVTTS) and isometric hip-extension, -abduction, and external-rotation strength were determined using 1-way analyses of covariance that controlled for sex and limb (dominant or nondominant) tested and Cohen d effect sizes (95% confidence intervals). Backward linear regressions and Cohen  $f^2$  effect sizes (95% confidence intervals) determined the amount of RVTTS variance explained by isometric hip strength. Significance was set a priori at  $P < .05$ .

**RESULTS:** The CAI group had less isometric hip-extension strength than LAS copers ( $P = .02$ ,  $d = 0.72$  [0.06, 1.34]) and controls ( $P = .01$ ,  $d = 1.19$  [0.50, 1.84]) and less external-rotation strength than LAS copers ( $P = .03$ ,  $d = 0.78$  [0.13, 1.41]) and controls ( $P = .01$ ,  $d = 1.02$  [0.34, 1.65]). No group differences existed for RVTTS ( $F_{2,57} = 1.16$ ,  $P = .32$ ) or abduction strength ( $F_{2,57} = 2.84$ ,  $P = .07$ ). Resultant vector time to stabilization was explained by isometric hip strength for LAS copers ( $R^2 = 0.21$ ,  $f^2 = 0.27$  [0.22, 0.32],  $P = .04$ ) but not for the CAI ( $R^2 = 0.12$ ,  $f^2 = 0.14$  [0.06, 0.22],  $P = .22$ ) or control ( $R^2 = 0.10$ ,  $f^2 = 0.11$  [0.03, 0.19],  $P = .18$ ) groups.

**CONCLUSIONS:** Participants with CAI had decreased isometric hip strength, but that did not equate to dynamic-stability deficits. Clinicians should include hip-muscle strengthening in rehabilitation protocols for patients with CAI, yet these gains may not enhance dynamic stability when landing from a jump.

**45 A. MANUAL THERAPY LUMBAR & GENERAL****MT to improve respiration**

J Manipulative Physiol Ther. 2018 Jun;41(5):372-382. doi: 10.1016/j.jmpt.2017.11.004. Epub 2018 Jul 9.

**Effect of Manual Therapy, Motor Control Exercise, and Inspiratory Muscle Training on Maximum Inspiratory Pressure and Postural Measures in Moderate Smokers: A Randomized Controlled Trial.**

Balbás-Álvarez L<sup>1</sup>, Candelas-Fernández P<sup>1</sup>, Del Corral T<sup>2</sup>, La Touche R<sup>3</sup>, López-de-Uralde-Villanueva I<sup>4</sup>.

**OBJECTIVE:**

The aim of this study is to assess whether adding manual therapy to motor control exercises protocol with inspiratory muscle training (IMT) (combined intervention) resulted in a greater effect than IMT alone in enhancing maximum inspiratory pressure (MIP) in the short term.

**METHODS:**

This was a single-blind, randomized, controlled trial. Fifty-one healthy moderate smokers were randomized into 2 groups: (1) IMT and (2) combined intervention. All participants received 8 individual sessions, 2 per week during a 4-week period. The primary outcome (MIP) and the secondary outcome (pulmonary function, forward head posture, and thoracic kyphosis) were recorded at baseline and after the treatments.

**RESULTS:**

There were differences between groups in change score for MIP (mean, 23.8; 95% confidence interval [CI]: 16.48-31.12), forward head posture (-1.57; 95% CI: -2.79 to -0.35), and thoracic kyphosis (-0.92; 95% CI: -1.74 to -0.1). The combined intervention revealed statistically significant differences for MIP (mean, -34; 95% CI: -39.12 to -28.88) and for postural measures (forward head posture 2.31; 95% CI: 1.45-3.16; thoracic kyphosis, 1.39; 95% CI: 0.8-1.97), whereas the IMT was only observed for MIP (mean, -10.2; 95% CI: -15.42 to -4.98). In addition, the intraclass correlation coefficient and minimal detectable change for MIP were 0.96; 95% CI: 0.93-0.97, and 17.70, respectively.

**CONCLUSION:**

Inspiratory muscle training protocol combined with manual therapy and motor control exercise had greater effect in enhancing MIP than did IMT in isolation in moderate smokers in the short term. In addition, both groups experienced changes in MIP but not in lung function.

### P/A pressures

Musculoskelet Sci Pract. 2018 Aug;36:25-31. doi: 10.1016/j.msksp.2018.04.005. Epub 2018 Apr 16.

#### **Spinal PA movements behave 'as if' there are limitations of local segmental mobility and are large enough to be perceivable by manual palpation: A synthesis of the literature.**

Tuttle N<sup>1</sup>, Hazle C<sup>2</sup>.

#### **BACKGROUND:**

Posterior-anterior (PA) movements are one type of passive intervertebral movement used to assess and treat perceived deficits in localized segmental mobility.

#### **OBJECTIVES:**

To describe: 1) The specific effects that reductions in segmental mobility would be expected to have on PA movements; 2) How differences in PA movements in clinical situations compare to what would be expected with reduced segmental mobility; and 3) Whether such differences in PA movements are likely to be perceivable by manual palpation.

#### **METHODS:**

Multiple modelling studies and in vivo measurements of PA movements are described.

#### **RESULTS:**

The findings indicate the differences in PA movements present in clinical conditions corresponds with the differences that would be expected with decreased segmental mobility. The differences both predicted from the modelling and found in clinical conditions were greatest at low levels of force. Additionally, the differences are large enough that individuals with training are likely to be capable of 1) consistently producing controlled movements with sufficiently small magnitudes of force to assess the movements, and 2) detecting the differences in stiffness expected from modelling and found in clinical situations.

#### **CONCLUSIONS:**

Implications for clinical practice and teaching include the need to attend to the stiffness of PA movements at lower levels of force than those typically described. The authors recommend a three tiered approach to assessment of PA movements which may assist in both clinical practice and teaching manual therapy skills.

**45 B. MANUAL THERAPY CERVICAL****Visual assistance**

Eur J Pain. 2018 Jul 12. doi: 10.1002/ejp.1290.

**Seeing the site of treatment improves habitual pain but not cervical joint position sense immediately after manual therapy in chronic neck pain patients.**

Beinert K<sup>1</sup>, Lutz B<sup>1</sup>, Zieglgänsberger W<sup>2</sup>, Diers M<sup>3</sup>.

**BACKGROUND:**

Visual analgesia refers to the phenomena where people report decreased pain intensity when they see the painful or painfully stimulated body part. Alongside pain, sensorimotor impairment (i.e., disturbed proprioception) is also evident in chronic pain. This study aims to investigate whether real-time visual feedback offers additional pain relief and proprioceptive improvement when used in combination with recommended therapies in neck pain patients who received manual therapy with or without real-time visual feedback.

**METHODS:**

A total of 29 neck pain patients were recruited in an outpatient physical therapy practice. Patients were randomly allocated to receive manual therapy of the cervical spine with real-time visual feedback or to a control group where patients received manual therapy without real-time visual feedback. Habitual pain intensity, the pressure pain threshold at the zygapophyseal joint of C2-C3 and the superior angle of the scapulae and cervical proprioception were assessed before and immediately after the intervention by a blinded assessor.

**RESULTS:**

A between-group comparison revealed a significant reduction in habitual pain in the real-time visual feedback group. No differences were found for the pressure pain threshold or proprioceptive performance.

**CONCLUSIONS:**

Real-time visual feedback combined with manual therapy enhanced the analgesic effect of manual therapy in neck pain patients, but had no positive effect on the pressure pain threshold and cervical joint position sense. The technical demands for integrating real-time visual feedback into daily practice to reduce habitual pain are low, have low costs and are easy to apply.

**SIGNIFICANCE:**

Real-time visual feedback reduces habitual pain immediately after the intervention. Due to its easy integration, it may be an effective adjunct to recommended interventions (i.e., manual therapy) in patients with neck pain.

**45 D. MANUAL THERAPY EXTREMITIES****Hip OA high force helps ROM**

Musculoskelet Sci Pract. 2018 Aug;36:81-86. doi: 10.1016/j.msksp.2018.05.004. Epub 2018 May 29.

**Comparison of high, medium and low mobilization forces for increasing range of motion in patients with hip osteoarthritis: A randomized controlled trial.**

Estébanez-de-Miguel E<sup>1</sup>, Fortún-Agud M<sup>2</sup>, Jimenez-Del-Barrio S<sup>3</sup>, Caudevilla-Polo S<sup>4</sup>, Bueno-Gracia E<sup>4</sup>, Tricás-Moreno JM<sup>4</sup>.

**BACKGROUND:**

Manual therapy has been shown to increase range of motion (ROM) in hip osteoarthritis (OA). However, the optimal intensity of force during joint mobilization is not known.

**OBJECTIVE:**

To compare the effectiveness of high, medium and low mobilization forces for increasing range of motion (ROM) in patients with hip OA and to analyze the effect size of the mobilization.

**DESIGN:**

Randomized controlled trial.

**METHODS:**

Sixty patients with unilateral hip OA were randomized to three groups: low, medium or high force mobilization group. Participants received three treatment sessions of long-axis distraction mobilization (LADM) in open packed position and distraction forces were measured at each treatment. Primary outcomes: passive hip ROM assessed before and after each session.

**SECONDARY OUTCOMES:**

pain recorded with Western Ontario and McMaster Universities (WOMAC) pain subscale before and after the three treatment sessions.

**RESULTS:**

Hip ROM increased significantly ( $p < 0.05$ ) in the high-force mobilization group (flexion: 10.6°, extension: 8.0°, abduction: 6.4°, adduction: 3.3°, external rotation: 5.6°, internal rotation: 7.6°). These improvements in hip ROM were statistically significant ( $p < 0.05$ ) compared to the low-force group. There were no significant changes in the low-force and medium-force groups for hip ROM. No significant differences in hip pain were found between treatment groups.

**CONCLUSION:**

A high force LADM in open packed position significantly increased hip ROM in all planes of motion compared to a medium or low force mobilization in patients with hip OA. A specific intensity of force mobilization appears to be necessary for increasing ROM in hip OA.

**Knee OA mob**

Physiother Theory Pract. 2018 Aug;34(8):600-612. doi: 10.1080/09593985.2018.1423591. Epub 2018 Jan 8.

**A comparison of two manual physical therapy approaches and electrotherapy modalities for patients with knee osteoarthritis: A randomized three arm clinical trial.**

Kaya Mutlu E<sup>1</sup>, Ercin E<sup>2</sup>, Razak Ozdincler A<sup>1</sup>, Ones N<sup>2</sup>.

A broad spectrum of physical therapy exercise programs provides symptom relief and functional benefit for patients with knee OA. Manual physical therapy, including tailored exercise programs provide relatively higher level benefit that persists to one year. It is currently unknown if there are important differences in the effects of different manual physical therapy techniques for patients with knee OA and there are virtually no studies comparing manual physical therapy and electrotherapy modalities.

The aim of the study was to compare long-term results between three treatment groups (mobilization with movements [MWMs], passive joint mobilization [PJM], and electrotherapy) to determine which treatment is most effective in patients with knee OA. A single-blind randomized clinical trial with parallel design was conducted in patients with knee OA. Seventy-two consecutive patients (mean age  $56.11 \pm 6.80$  years) with bilateral knee OA were randomly assigned to one of three treatment groups: MWMs, PJM, and electrotherapy. All groups performed an exercise program and received 12 sessions. The primary outcome measures of the functional assessment were the Western Ontario and McMaster Universities Osteoarthritis index (WOMAC) and Aggregated Locomotor Function (ALF) test scores. The secondary outcome measures were pain level, measured using a pressure algometer and a visual analogue scale (VAS), range of motion (ROM), measured using a digital goniometer, and muscle strength, evaluated with a handheld dynamometer. Patients were assessed before treatment, after treatment and after 1 year of follow-up. Patients receiving the manual physical therapy interventions consisting of either MWM or PJM demonstrated a greater decrease in VAS scores at rest, during functional activities, and during the night compared to those in the electrotherapy group from baseline to after the treatment ( $p < 0.05$ ).

This improvement continued at the 1-year follow-up ( $p < 0.05$ ). The MWMs and PJM groups also showed significantly improved WOMAC and ALF scores, knee ROM and quadriceps muscle strength compared to those in the electrotherapy group from baseline to 1-year follow-up ( $p < 0.05$ ).

In the treatment of patients with knee OA, manual physical therapy consisting of either MWM or PJM provided superior benefit over electrotherapy in terms of pain level, knee ROM, quadriceps muscle strength, and functional level.



**46 A. UPPER LIMB NEUROMOBILIZATION****Carpel bone mobilization increases carpel tunnel size**

Musculoskelet Sci Pract. 2018 Aug;36:12-16. doi: 10.1016/j.msksp.2018.04.002. Epub 2018 Apr 4.

**Dimensional changes of the carpal tunnel and the median nerve during manual mobilization of the carpal bones.**

Bueno-Gracia E<sup>1</sup>, Ruiz-de-Escudero-Zapico A<sup>2</sup>, Malo-Urriés M<sup>2</sup>, Shacklock M<sup>3</sup>, Estébanez-de-Miguel E<sup>2</sup>, Fanlo-Mazas P<sup>2</sup>, Caudevilla-Polo S<sup>2</sup>, Jiménez-Del-Barrio S<sup>2</sup>.

**INTRODUCTION:**

The carpal tunnel is a clinically important fibro-osseous conduit for the median nerve and associated tendons. It is mechanically dynamic, such that the dimensions of the tunnel and median nerve change with position, movement and application of externally applied force with mechanical devices. Therapeutic manual techniques that appear to move and change tunnel shape are part of clinical practice. The aim of this study was therefore to measure changes in dimensions of the carpal tunnel and median nerve with manual mobilization of the carpal bones.

**MATERIAL AND METHODS:**

An analytical descriptive study with 18 volunteer subjects and a total of 33 records was designed. Ultrasound measurements of the cross-sectional area (CSA), anteroposterior diameter (APD), transverse diameter (TD), perimeter, flattening ratio and circularity of the carpal tunnel and of the median nerve, were measured, both in the anatomical position of the wrist and during mobilization techniques of the carpal bones.

**RESULTS:**

During the mobilization technique, the tunnel ( $p = 0.003$ ) CSA significantly increased. APD also increased significantly for the tunnel ( $<0.001$ ) while TD decreased. The median nerve showed similar and significant ( $p < 0.001$ ) changes than the tunnel. However, because several of the obtained differences were smaller than the SDD obtained in a previous study, these differences were considered as irrelevant.

**CONCLUSIONS:**

Manual mobilization of the carpal bones produced significant changes in the dimensions of the carpal tunnel.

## 46 B. LOWER LIMB NEUROMOILIZATION

## Femoral nerve mobility

October 2018 Volume 37, Pages 58–63 DOI: <https://doi.org/10.1016/j.msksp.2018.06.007>

**Femoral nerve excursion with knee and neck movements in supine, sitting and side-lying slump: An *in vivo* study using ultrasound imaging**

Eva Sierra-Silvestre Francesca Bosello Josué Fernández-Carnero Marco J.M. Hoozemans  
Michel W. Coppieters

## Highlights

- Longitudinal and transverse excursions of the femoral nerve can be measured reliably with ultrasound imaging.
- Although the femoral nerve terminates proximal to the knee, it slides 3.5 mm in the upper thigh with knee flexion.
- Neck flexion in Slump<sub>FEMORAL</sub> is associated with excursion of the femoral nerve in a medial, but not longitudinal direction.

**Background** Neurodynamic assessment and management are advocated for femoral nerve pathology. Contrary to neurodynamic techniques for other nerves, there is limited research that quantifies femoral nerve biomechanics.

**Objectives** To quantify longitudinal and transverse excursion of the femoral nerve during knee and neck movements.

**Design** Single-group, experimental study, with within-participant comparisons.

**Methods** High-resolution ultrasound recordings of the femoral nerve were made in the proximal thigh/groin region in 30 asymptomatic participants. Scans were made during knee flexion in supine and a semi-seated position, and during neck flexion in side-lying slump (Slump<sub>FEMORAL</sub>). Healthy participants were assessed to reveal normal nerve biomechanics, not influenced by pathology. Data were analysed with one-sample and paired t-tests. Reliability was assessed with intraclass correlation coefficients (ICC).

## Results

Longitudinal and transverse excursion measurements were reliable ( $ICC \geq 0.87$ ). With knee flexion, longitudinal femoral nerve excursion was significant and larger in supine than in sitting (supine (mean (SD)): 3.6 (2.0) mm;  $p < 0.001$ ; sitting: 1.1 (1.6) mm;  $p = 0.001$ ; comparison:  $p = 0.001$ ). There was also excursion in a medial direction (supine: 1.4 (0.3) mm;  $p < 0.001$ ; sitting: 0.7 (0.6) mm;  $p < 0.001$ ) and anterior direction (supine: 0.2 (0.2) mm;  $p < 0.001$ ; sitting: 0.1 (0.2) mm;  $p = 0.06$ ). Neck flexion in Slump<sub>FEMORAL</sub> did not result in longitudinal (0.0 (0.3) mm;  $p = 0.55$ ) or anteroposterior (0.0 (0.1) mm;  $p = 0.10$ ) excursion, but resulted in medial excursion (1.1 (0.5) mm;  $p < 0.001$ ).

## Conclusion

Although the femoral nerve terminates proximal to the knee, femoral nerve excursion in the proximal thigh occurred with knee flexion; Neck flexion in Slump<sub>FEMORAL</sub> resulted in medial excursion.

**48 A. STM****Hamstring shortness STM**

*J Back Musculoskelet Rehabil.* 2018 Jul 20. doi: 10.3233/BMR-170854.

**Effects of instrument-assisted soft tissue mobilization technique on strength, knee joint passive stiffness, and pain threshold in hamstring shortness.**

Kim DH<sup>1</sup>, Lee JJ<sup>2</sup>, Sung Hyun You J<sup>2</sup>.

**BACKGROUND:**

Hamstring shortness is the most common musculoskeletal condition in sports athletes, which often contributes to hamstring strain injury. To effectively mitigate the hamstring shortness, contemporary HR, SCS, and IASTM soft tissue techniques have been used. The best practical evidence about the therapeutic effects and the biomechanical mechanisms underpinning these manual techniques remain unknown.

**OBJECTIVE:**

The purpose of this study was to compare the effects of HR, SCS, and IASTM techniques on improving hamstring and quadriceps muscle strength, related ratio, knee joint passive stiffness, and pain threshold.

**METHODS:**

Forty-five participants (21 males and 24 females) with hamstring shortness participated in this study. The participants were randomly assigned to each of the three soft tissue mobilization technique groups. A Biodex System Isokinetic Dynamometer was used to measure muscle strength and knee joint passive stiffness during knee extension and flexion. Pressure algometry was used to measure hamstring pain threshold. One-way ANOVA were used to determine the statistical significance of the hamstring and quadriceps strength, related ratios, knee joint passive stiffness, and pain threshold in each technique. The significance level was set at  $\alpha = 0.05$ .

**RESULTS:**

The IASTM group showed greater improvement in the peak quadriceps strength ( $p = 0.000$ ), the peak quadriceps and hamstring (Q:H) strength ratio ( $p = 0.004$ ), passive knee stiffness ( $p = 0.000$ ), and pain threshold ( $p = 0.017$ ) than the HR or SCS groups.

**CONCLUSION:**

The present comparative study provided first clinical evidence that IASTM technique is a best soft tissue mobilization technique to improve the strength, associated strength ratio, knee joint passive stiffness, and pain threshold among individuals with hamstring shortness.

## 59. PAIN

## Cannabinoids helps chronic pain

## ORIGINAL RESEARCH

**Cannabinoids and spinal cord stimulation for the treatment of failed back surgery syndrome refractory pain**

**Authors** Mondello E, Quattrone D, Cardia L, Bova G, Mallamace R, Barbagallo AA, Mondello C, Mannucci C, Di Pietro M, Arcoraci V, Calapai G

**DOI** <https://doi.org/10.2147/JPR.S166617>

**Objective:** This study aimed to evaluate pain and its symptoms in patients with failed back surgery syndrome (FBSS) refractory to other therapies, treated with a combination of delta-9-tetrahydrocannabinol (THC) and cannabidiol (CBD), in association with spinal cord stimulation (SCS).

**Settings:** Outpatients referred at Pain Unit of San Vincenzo Hospital in Taormina (Italy), between September 2014 and January 2016.

**Subjects:** Eleven FBSS patients diagnosed with neuropathic pain using the Douleur - Neuropathique 4 questionnaire and suffering from moderate to severe chronic refractory pain, and undergoing treatment with SCS and a combination of THC/CBD for 12 consecutive months.

**Materials and methods:** All the included patients discontinued previous unsuccessful therapy at least 2 months before the beginning of the cannabinoid therapy, with the exception of the SCS that was continued. Patients received a fixed dosage of cannabinoid agonists (THC/CBD) that could be increased subjective to pain control response. A Brief Pain Inventory questionnaire was administered to measure pain and its interference with characteristic dimensions of feelings and functions. The duration of treatment with SCS and THC/CBD combination was 12 months.

**Results:** Effective pain management as compared to baseline result was achieved in all the cases studied. The positive effect of cannabinoid agonists on refractory pain was maintained during the entire duration of treatment with minimal dosage titration. Pain perception, evaluated through numeric rating scale, decreased from a baseline mean value of  $8.18 \pm 1.07$ – $4.72 \pm 0.9$  by the end of the study duration (12 months) ( $P < 0.001$ ).

**Conclusion:** The results indicate that cannabinoid agonists (THC/CBD) can have remarkable analgesic capabilities, as adjuvant of SCS, for the treatment of chronic refractory pain of FBSS patients.

**Keywords:** cannabinoids, delta-9-tetrahydrocannabinol, THC, cannabidiol, CBD, failed back surgery syndrome, FBSS, refractory pain, spinal cord stimulation, SCS, cannabis