

Suppression of anger and subsequent pain intensity and behavior among chronic low back pain patients: the role of symptom-specific physiological reactivity

Journal of Behavioral Medicine, 05/26/2011

Burns JW et al.

Abstract

Suppression of anger may be linked to heightened pain report and pain behavior during a subsequent painful event among chronic low back patients, but it is not clear whether these effects are partly accounted for by increased physiological reactivity during suppression. Chronic low back pain patients ($N = 58$) were assigned to Suppression or No Suppression conditions for a “cooperative” computer maze task during which a confederate harassed them. During baseline and maze task, patients’ lower paraspinal and trapezius muscle tension, blood pressure and heart rate were recorded. After the maze task, patients underwent a structured pain behavior task (behaviors were videotaped and coded). Results showed that: (a) Suppression condition patients revealed greater lower paraspinal muscle tension and systolic blood pressure (SBP) increases during maze task than No Suppression patients (previously published results showed that Suppression condition patients exhibited more pain behaviors than No Suppression patients); (b) residualized lower paraspinal and SBP change scores were related significantly to pain behaviors; (c) both lower paraspinal and SBP reactivity significantly mediated the relationship between Condition and frequency of pain behaviors. Results suggest that suppression-induced lower paraspinal muscle tension and SBP increases may link the actual suppression of anger during provocation to signs of clinically relevant pain among chronic low back pain patients.

Differences in the Relationship Between Psychosocial Distress and Self-Reported Disability in Patients with Chronic Low Back Pain in Six Pain Rehabilitation Centers in the Netherlands

Spine, 05/26/2011

Preuper HRS et al. –

Study Design. A cross sectional multicenter study in six outpatient Rehabilitation Centers (RCs) in the Netherlands.

Objective. This study aims to confirm or refute the finding that a strong relationship exists between psychosocial distress and self-reported disability in patients with nonspecific chronic low back pain (CLBP) by analyzing this relationship in patients with CLBP admitted for treatment in six RCs.

Summary of Background Data. A strong relationship between psychosocial distress and self-reported disability in patients with CLBP is suggested. However, in former research weak relationships were found in two of the RCs participating in this study.

Methods. Total study sample consisted of 293 patients (30–66 per RC) with CLBP, admitted for outpatient multidisciplinary rehabilitation in one of the six participating RCs. Psychosocial distress was measured with the Symptom Checklist-90-Revised (SCL-90-R), self-reported disability with the Roland Morris Disability Questionnaire (RMDQ). Pearson correlation coefficients between psychosocial distress and self-reported disability were calculated. Multivariate regression analysis was performed to analyze the relationship between SCL-90-R and VAS pain (independent variables) and RMDQ (dependent variable) for the total group and for each RC separately. A multivariate regression analysis was performed to analyze the relationship between all baseline characteristics and RMDQ in the total group.

Results. Correlation coefficient between the SCL-90-R and RMDQ was $r = 0.38$ for the total sample, indicating a significant ($P < 0.05$), but weak relationship. For the six individual RCs, correlation coefficients ranged between $r = 0.22$ and 0.67 (three of the six correlation coefficients were significant). The explained variance (r^2) of the regression models (SCL-90 and pain intensity as predictors of RMDQ) was 29% for the total sample, and varied between the RCs from 17% to 52%. Results of the multivariate regression analysis of all baseline characteristics of the total group revealed that the model explained 36% of the total variance observed in RMDQ score. Overall, the contributions of psychosocial distress to the models were smaller and more variable compared with pain intensity.

Conclusion. The overall relationship between psychosocial distress and self reported disability was weak, and differences between RCs were considerable. This indicates that the relationship between psychosocial distress and disability in patients with CLBP is not uniform

Coding of Incisional Pain in the Brain: A Functional Magnetic Resonance Imaging Study in Human Volunteers

Pogatzki-Zahn, Esther M. M.D.*; Wagner, Christian M.D.†; Meinhardt-Renner, Anne M.A.‡; Burgmer, Markus M.D.§; Beste, Christian Ph.D.¶; Zahn, Peter K. M.D.#; Pfeiderer, Bettina M.D., Ph.D.**

[Free Access](#)

Anesthesiology:

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Pain Medicine

Abstract

Introduction: In this study, the activation of different brain areas after an experimental surgical incision was assessed by functional magnetic resonance imaging, and the pathophysiological role of distinct brain activation patterns for pain perception after incision was analyzed.

Methods: Thirty male volunteers (mean age \pm SD, 25 ± 5 yr) received an experimental incision (4 mm) within the volar aspect of the right forearm using a ceramic scalper blade, and 14 volunteers (mean age \pm SD, 25 ± 4 yr) received a sham procedure. Magnetic resonance images were taken before, during (0–2 min), and after incision or sham procedure (2–4.5, 4.5–10, 24–29, and 44–49 min) at a 3T scanner using a block design. Subjective pain ratings by a numerical pain scale were performed between the scans.

Results: Functional magnetic resonance imaging analysis showed a distinct temporal profile of activity within specific brain regions during and after the injury. Lateralization (predominantly contralateral to the incision) and increased brain activity of the somatosensory cortex, frontal cortex, and limbic system were observed in subjects after incision, when compared with individuals receiving sham procedure. Peak brain activation occurred about 2 min after incision and decreased subsequently. A distinct correlation between evoked pain ratings and brain activity was observed for the anterior cingulate cortex, insular cortex, thalamus, frontal cortex, and somatosensory cortex.

Conclusion: These findings show different and distinct cortical and subcortical activation patterns over a relevant time period after incision. Pain sensitivity hereby has an influence on the activity profile. This may have important implications for encoding ongoing pain after a tissue injury, for example, resting pain in postoperative patients.

Reporting outcomes of back pain trials: A modified Delphi study

European Journal of Pain, 05/25/2011

Froud R et al. – A group of back pain experts reached a high level of consensus on a statement recommending reporting methods for patient–reported outcomes in future low back pain trials. The statement has the potential to increase interpretability and improve patient care.

Methods

- Authors presented experts with clinicians' views on different reporting methods and asked them to rate and comment on the suitability reporting methods for inclusion in a standardized set
- Panellists developed a statement of recommendation over three online rounds.
- Authors used a modified Delphi process and the RAND/UCLA appropriateness method as a formal framework for establishing appropriateness and quantifying panel disagreement.

Results

- A group of 63 experts from 14 countries participated.
- Consensus was reached on a statement recommending that the continuous patient–reported outcomes commonly used in back pain trials, are reported using between–group mean differences (accompanied by minimally important difference (between–group/population–level) thresholds where these exist), the proportion of participants improving and deteriorating according to established and relevant minimally important change thresholds, and the number needed to treat; all with 95% confidence intervals.
- Outcomes may additionally be reported using alternative approaches (e.g. relative risks, odds ratios, or standardized mean difference) according to the needs of a particular trial.

A systematic review of instruments for the assessment of work-related psychosocial factors (Blue Flags) in individuals with non-specific low back pain

[Heather Gray](#) [Abiodun T. Adefolarin](#)^b, [Tracey E. Howe](#)^a

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Corrected Proof *Manual Therapy*

Abstract

In individuals with low back pain (LBP) psychosocial factors can act as obstacles to return to work. A coloured Flags Framework has been conceptualised, in which Blue Flags represent work-related psychosocial issues. This systematic review was conducted to appraise available instruments for the assessment of Blue Flags in working age adults with non-specific LBP.

The Ovid versions of MEDLINE, EMBASE, PsycINFO, AMED and CINAHL databases were searched from inception until the first week of March 2010; additionally, experts and study authors were contacted. Two authors independently selected studies, extracted data and assessed methodological quality.

Eight studies (recruiting 5630 participants) met the review inclusion criteria, reporting six instruments: the Back Disability Risk Questionnaire (BDRQ); Occupational Role Questionnaire (ORQ); Obstacles to Return to Work Questionnaire (ORTWQ); Psychosocial Aspects of Work Questionnaire (PAWQ); Vermont Disability Prediction Questionnaire (VDPQ); and Modified Work Adaptation, Partnership, Growth, Affection and Resolve. Limited psychometric testing had been performed on the instruments, and solely by the original developers.

None of the instruments, in their current stage of development, can be recommended as Blue Flags assessment instruments. The ORTWQ was the only instrument that showed adequate psychometric properties but was not considered clinically feasible in its present format. Future research should focus on further psychometric development of the ORTWQ.

Individuals With Low Back Pain Breathe Differently Than Healthy Individuals During a Lifting Task

[Marshall Hagins](#), [Eric M. Lamberg](#)

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STUDY DESIGN: Case control, repeated-measures, experimental laboratory study. **OBJECTIVE:** To determine if, during a whole-body lifting task, individuals with low back pain (LBP) breathe differently than age-matched controls. **BACKGROUND:** Breath control may be optimized to provide increased intersegmental control of the lumbar spine through the generation of intra-abdominal pressure. Consequently, impairments in respiratory and trunk muscle coordination during lifting tasks may contribute to the occurrence or maintenance of LBP. **METHODS:** Participants without LBP ($n = 30$) were matched by gender and age with those presenting with chronic mechanical LBP ($n = 32$) of at least 1 year in duration. Participants completed a total of 8 self-paced lifts of a crate from the floor to a table, with the crate empty during 4 of the lifts and loaded to 25% of the participant's body weight during 4 of the lifts. The amount of volume in the lungs, measured as a percentage of the individual's vital capacity (%VC), was identified at 9 points during the lifting task. A $2 \times 2 \times 2 \times 9$ (group by gender by load by time) mixed-model analysis of covariance (ANCOVA), with age as the covariate, was used to identify differences among conditions and groups of %VC used during the lift. **RESULTS:** Individuals with LBP performed the lifting task with more volume in their lungs (48.2 %VC) than healthy peers (40.9 %VC). Age significantly affected %VC used during the lift: with increasing age, participants with LBP increased inspired volume and participants without LBP decreased inspired volume. **CONCLUSIONS:** Individuals with LBP performed a lifting task with more inhaled lung volume than individuals without LBP. These findings are consistent with the theoretical link between breath control, intra-abdominal pressure, and lumbar segmental control.

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Spinal Manipulative Therapy for Chronic Low-Back Pain: An Update of a Cochrane Review

Rubinstein, Sidney M. DC, PhD*; van Middelkoop, Marienke PhD†; Assendelft, Willem J.J. MD, PhD‡; de Boer, Michiel R. PhD§; van Tulder, Maurits W. PhD¶



Abstract

Study Design. Systematic review of interventions.

Objective. To assess the effects of spinal manipulative therapy (SMT) for chronic low-back pain.

Summary of Background Data. SMT is one of the many therapies for the treatment of low-back pain, which is a worldwide, extensively practiced intervention.

Methods. *Search methods.* An experienced librarian searched for randomized controlled trials (RCTs) in multiple databases up to June 2009. *Selection criteria.* RCTs that examined manipulation or mobilization in adults with chronic low-back pain were included. The primary outcomes were pain, functional status, and perceived recovery. Secondary outcomes were return-to-work and quality of life. *Data collection and analysis.* Two authors independently conducted the study selection, risk of bias assessment, and data extraction. GRADE was used to assess the quality of the evidence.

Results. We included 26 RCTs (total participants = 6070), 9 of which had a low risk of bias. Approximately two-thirds of the included studies (N = 18) were not evaluated in the previous review. There is a high-quality evidence that SMT has a small, significant, but not clinically relevant, short-term effect on pain relief (mean difference -4.16, 95% confidence interval -6.97 to -1.36) and functional status (standardized mean difference -0.22, 95% confidence interval -0.36 to -0.07) in comparison with other interventions. There is varying quality of evidence that SMT has a significant short-term effect on pain relief and functional status when added to another intervention. There is a very low-quality evidence that SMT is not more effective than inert interventions or sham SMT for short-term pain relief or functional status. Data were particularly sparse for recovery, return-to-work, quality of life, and costs of care. No serious complications were observed with SMT.

Conclusions. High-quality evidence suggests that there is no clinically relevant difference between SMT and other interventions for reducing pain and improving function in patients with chronic low-back pain. Determining cost-effectiveness of care has high priority.

Fixed Dystonia in Complex Regional Pain Syndrome: a Descriptive and Computational Modeling Approach

Alexander G. Munts ✉, Winfred Mugge ✉, Thomas S. Meurs ✉, Alfred C. Schouten ✉, Johan Marinus ✉, G. LORIMER Moseley ✉, Frans C.T. van der Helm ✉ and Jacobus J. van Hilten ✉

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Abstract (provisional)

Background

Complex regional pain syndrome (CRPS) may occur after trauma, usually to one limb, and is characterized by pain and disturbed blood flow, temperature regulation and motor control. Approximately 25% of cases develop fixed dystonia. Involvement of dysfunctional GABAergic interneurons has been suggested, however the mechanisms that underpin fixed dystonia are still unknown. We hypothesized that dystonia could be the result of aberrant proprioceptive reflex strengths of position, velocity or force feedback.

Methods

We systematically characterized the pattern of dystonia in 85 CRPS-patients with dystonia according to the posture held at each joint of the affected limb. We compared the patterns with a neuromuscular computer model simulating aberrations of proprioceptive reflexes. The computer model consists of an antagonistic muscle pair with explicit contributions of the musculotendinous system and reflex pathways originating from muscle spindles and Golgi tendon organs, with time delays reflective of neural latencies. Three scenarios were simulated with the model: (i) increased reflex sensitivity (increased sensitivity of the agonistic and antagonistic reflex loops); (ii) imbalanced reflex sensitivity (increased sensitivity of the agonistic reflex loop); (iii) imbalanced reflex offset (an offset to the reflex output of the agonistic proprioceptors).

Results

For the arm, fixed postures were present in 123 arms of 77 patients. The dominant pattern involved flexion of the fingers (116/123), the wrists (41/123) and elbows (38/123). For the leg, fixed postures were present in 114 legs of 77 patients. The dominant pattern was plantar flexion of the toes (55/114 legs), plantar flexion and inversion of the ankle (73/114) and flexion of the knee (55/114). Only the computer simulations of imbalanced reflex sensitivity to muscle force from Golgi tendon organs caused patterns that closely resembled the observed patient characteristics. In parallel experiments using robot manipulators we have shown that patients with dystonia were less able to adapt their force feedback strength.

Conclusions

Findings derived from a neuromuscular model suggest that aberrant force feedback regulation from Golgi tendon organs involving an inhibitory interneuron may underpin the typical fixed flexion postures in CRPS patients with dystonia.

Efficacy of acupuncture for migraine prophylaxis: a single-blinded, double-dummy, randomized controlled trial

- [Lin-Peng Wang](#), [Xiao-Zhe Zhang](#), [Jia Guo](#), [Hui-Lin Liu](#), [Yan Zhang](#), [Cun-Zhi Liu](#), [Jing-Hong Yi](#), [Li-Ping Wang](#), [Ji-Ping Zhao](#), [Shan-Shan Li](#)

Summary

This multicenter, double-dummy trial suggested that acupuncture was more effective than flunarizine in decreasing days of migraine attacks.

Abstract

Insufficient clinical trial data were available to prove the efficacy of acupuncture for migraine prophylaxis. A multicenter, double-dummy, single-blinded, randomized controlled clinical trial was conducted at the outpatient departments of acupuncture at 5 hospitals in China to evaluate the effectiveness of acupuncture. A total of 140 patients with migraine without aura were recruited and assigned randomly to 2 different groups: the acupuncture group treated with verum acupuncture plus placebo and the control group treated with sham acupuncture plus flunarizine. Treated by acupuncture 3 times per week and drugs every night, patients from both groups were evaluated at week 0 (baseline), week 4, and week 16. The primary outcome was measured by the proportion of responders (defined as the proportion of patients with a reduction of migraine days by at least 50%). The secondary outcome measures included the number of migraine days, visual analogue scale (VAS, 0 to 10 cm) for pain, as well as the physical and mental component summary scores of the 36-item short-form health survey (SF-36). The patients in the acupuncture group had better responder rates and fewer migraine days compared with the control group ($P < .05$), whereas there were no significant differences between the 2 groups in VAS scores and SF-36 physical and mental component summary scores ($P > .05$). The results suggested that acupuncture was more effective than flunarizine in decreasing days of migraine attacks, whereas no significant differences were found between acupuncture and flunarizine in reduction of pain intensity and improvement of the quality of life.

Post-Traumatic Stress Disorder and Migraine: Epidemiology, Sex Differences, and Potential Mechanisms B. Lee Peterlin DO, Satnam S. Nijjar MD, Gretchen E. Tietjen MD
Headache: The Journal of Head and Face Pain **Volume 51, Issue 6, pages 860–868, June 2011**

Migraine is a common, often disabling disorder associated with a significant personal and societal burden. The presence of post-traumatic stress disorder (PTSD) may increase this disability substantially. Migraine and PTSD are both up to 3 times more common in women than in men. The divergence in prevalence rates of migraine and PTSD that occurs between the sexes after puberty suggests that gonadal hormones play an important role. In addition, the preponderance of PTSD in women may be related to their higher rates of interpersonal trauma, the most common cause of PTSD. However, recent data suggest that although the odds of PTSD are increased in both women and men with episodic migraine, this association is stronger in men than women. In this paper, we examine the epidemiology of PTSD and migraine, with an emphasis on the known sex differences. We then discuss the neurobiological changes associated with PTSD, the current hypotheses for the mechanisms relating PTSD and migraine, and the treatment implications of these findings.

SPINE

RAISED PARASPINAL MUSCLE ACTIVITY REDUCES RATE OF STATURE RECOVERY AFTER LOADED EXERCISE IN INDIVIDUALS WITH CHRONIC LOW BACK PAIN

Healey EL, Fowler NE, Burden AM, McEwan IM. Arch Phys Med Rehabil. 2005;86:710-15.

Abstracted by John Hoops PT, COMT from St. Paul, Minnesota

The intervertebral discs contribute about 20% of total body height. The discs of the spine narrow when subjected to compressive forces; the resultant loss in height is referred to as decreased stature. The narrowing of the discs occurs because of a loss of water within the disc. Previous research has established that stature loss occurs after loaded exercise, and that subjects with chronic low back pain recover this loss in stature less quickly.¹ The authors of this study investigated the loss of subjects' height after walking on a treadmill with a weighted vest. They measured how quickly the subjects regained the lost height upon lying down in a sidelying position. The authors also wanted to investigate what effect lumbar paraspinal muscle activity had on stature loss and recovery.

In this study 20 patients with chronic low back pain and 20 age, gender, body mass index, and activity level matched controls were compared. All subjects walked for 20 minutes on a treadmill at similar speeds while they wore a weighted vest (10% body mass). After walking they rested for 40 minutes in a relaxed sidelying posture. Stature was measured using a stabilometer which was shown to be reliable (intraclass correlation coefficient =.99). In addition surface EMG was used to measure activity in the lumbar paraspinals. Height and EMG measures were taken prior to walking, after walking, during, and after the rest period.

The results were that both controls and patients lost an equal amount of height after walking, about 5 millimeters. The back pain patients regained significantly less of the loss in height after the 40 minutes of rest. The back patients also had significantly more muscle activity in the lumbar spine during the rest period. The authors concluded that the increase in muscle activity may be the cause of the decreased ability to regain lost height due to spinal compression loads created by lumbar paraspinal muscle contraction.

IAOM-US Comment

One of our senior faculty, Omer Matthijs, PT, has been studying disc hydration and re-hydration. He has developed a treatment proposal that uses the discs' tendency to repeatedly hydrate and dehydrate to control pain and promote disc health by maximizing the patients' ability to move fluid in and out of their discs. The discs rely on movement of fluid through diffusion to take in nutrients, and expel waste products. The best example of this is the documented increase in height people experience when arising from a night in bed.^{2,3}

The basis of this treatment proposal is to promote an environment where the disc can move fluid in a pain-free way.

How that is done depends on the patient. Flexion postures and exercises will be used for patients who have pain in extension, and extension exercises and postures for patients who have pain in flexion. For patients with pain when the disc is hydrated, in the morning for example, dehydrating maneuvers are used. If patients have pain in the evening, after prolonged standing, or after intense physical activity, re-hydrating activities are given. For example, if a patient with an internal disc disruption frequently wakes in the morning with pain, they would be instructed to do dynamic exercise that would help dehydrate the disc upon waking up. Generally dehydrating exercises involve dynamic movement, muscle activity, avoid end range positions, and are done with the spine vertical.⁴

Examples could be standing pelvic tilts either anterior or posterior, whichever the patient tolerates better. Non-weight bearing exercises can also be dehydrating, and these could include sub-maximal prone press ups, side bridging, supine pelvic tilts or quadruped pelvic tilts. The important principle is to move the spine in the direction that is least painful, use dynamic muscle activity because muscle contraction will promote compression on the spine and expulsion of fluid, and to keep movements submaximal. Movements to end range may decompress a part of the disc, and thus create a tendency to imbibe fluid.⁵

A different patient may complain more of pain when their disc is dehydrated, such as later in the day, after physically demanding activity like athletics or running, or after prolonged standing.⁶ These patients may do well if they perform re-hydrating exercises or positions. Exercises that re-hydrate are best done non-weight bearing, are static positions that don't require muscle activity of the back extensors, and often need to be maintained for 10 to 20 minutes. This could include prone on elbows, supine lying with legs supported in 90 degrees of hip flexion, "prayer stretch" position, or sidelying in flexion or extension, whichever the patient prefers. A patient with chronic or recurrent discogenic low back pain who likes to run should be encouraged to do so if they can do it with minimal increase in pain. But, they may feel better the rest of the day after their run, and help maintain the health of their lumbar discs if they use the following principle. Even if they are not painful after running, it has been shown that running is a dehydrating activity.⁷

So, they would be instructed to lie down in a comfortable position for 20 minutes after they run. We have had patients who run in the morning, feel good, go to work and sit at their desk and have considerable pain by mid day. They have noticed less pain at work if they follow their morning run with a re-hydrating position.

An alternative scenario is a runner who can only run pain-free for 15 minutes. They may be instructed to sit on a park bench in a reclined posture for 10 minutes to re-hydrate their disc after 10 minutes of running, and then resume running. Sitting in a supported slouched posture can be a position of relatively low intradiscal pressure because the lower lumbar spine is not vertical.^{8,9} This position also follows the other requirements of a rehydrating activity: it is prolonged, static, and does not require activity of the back extensors. The examples above are some concepts we can immediately try with our patients in the clinic.

These principles are now covered in more detail in our lumbar spine courses. An additional benefit of encouraging our patients to promote dehydration/re-hydration of their discs described is that it may have beneficial prolonged effects on the health and metabolism of their discs. One study supported this notion that exercise may improve the discs ability to dehydrate and re-hydrate. Subjects with chronic low back pain underwent intense physical training,

and afterward, they had improved ability to gain height upon waking in the morning.¹⁰ After 4 days of exercise, these patients were 4 mm taller in the morning. After three weeks of training they were 7 mm taller upon waking. There was significant correlation between gain in height and decreased pain and improved Oswestry scores. So, it seems that the discs improved their ability to re-hydrate at night as a result of the increased physical activity. This improved re-hydration could well result in a disc that will better withstand the stresses placed upon it.

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J Urol

Issue: 4, 1294-9Anderson RU et, al.

6-day intensive treatment protocol for refractory chronic prostatitis/chronic pelvic pain syndrome using myofascial release and paradoxical relaxation training. [Anderson RU](#), [Wise D](#), [Sawyer T](#), [Glowe P](#), [Orenberg EK](#)

201104185(4):1294-9Language: engCountry: United StatesDepartment of Urology, School of Medicine, Stanford University, Stanford, California.

PURPOSE: Chronic prostatitis/chronic pelvic pain syndrome continues to elude conventional therapy. Evidence supports the concept that phenotypes of pelvic muscular tenderness and psychosocial distress respond to myofascial trigger point release and specific relaxation training. This case series reports long-term outcomes of a 6-day intensive combination of such therapies in refractory cases.

MATERIALS AND METHODS: A total of 200 men with pain for a median of 4.8 years referred themselves to Stanford University Urology for participation in an established protocol. Daily 3 to 5-hour sessions including intrapelvic/extrapelvic physiotherapy, self-treatment training and paradoxical relaxation training provided a solid introduction to facilitate self-management. Subjects answered baseline and followup questionnaires at variable intervals after initiation of therapy including the National Institutes of Health Chronic Prostatitis Symptom Index, global response assessment and a psychological query.

RESULTS: We followed 116 men for a median of 6 months. Baseline total symptom index was 26 out of a maximum 43 points. Scores decreased by 30% ($p < 0.001$) at followup with 60% of subjects demonstrating a 6-point or greater decrease (range 6 to 30). Domains of pain, urinary dysfunction and quality of life showed significant improvement ($p < 0.001$). Global response assessment revealed that 82% of subjects reported improvement (59% marked to moderate, 23% slight).

CONCLUSIONS: Men with chronic pelvic pain refractory to traditional treatment benefit from intensive myofascial trigger point therapy and concomitant paradoxical relaxation training. Education in techniques for self-administered trigger point release and continued pelvic muscle relaxation help patients reduce pain and dysfunction. Refinement of clinical phenotyping and selection of patients with pelvic muscle tenderness should enhance the success rate with this treatment modality.

Cerebral and muscle oxygenation changes during static and dynamic knee extensions to voluntary fatigue in healthy men and women: a near infrared spectroscopy study. [Matsuura C](#), [Gomes PS](#), [Haykowsky M](#), [Bhambhani Y](#)

20110331(2):114-23 Language: eng Country: England Escola de Educação Física do Exército, Exército Brasileiro, Rio de Janeiro, Brazil Laboratório Crossbridges, Programa de Pós-graduação em Educação Física, Universidade Gama Filho, Rio de Janeiro, Brazil Faculty of Rehabilitation Medicine, University of Alberta, Edmonton, AB, Canada.

The aim of the study was to examine the changes in cerebral and muscle blood volume (C_{bv}, M_{bv}) and oxygenation (C_{ox}, M_{ox}) during static and dynamic knee extensions to fatigue in men (N = 10; 29 ± 9 years) and women (N = 14; 27 ± 8 years). After assessment of 1 repetition maximum (1RM) during unilateral knee extensions with the dominant limb, each subject exercised at 50%, 75% and 100% of 1 RM in random order on separate occasions. Simultaneous changes in C_{bv}, C_{ox}, M_{bv} and M_{ox} from the contralateral prefrontal lobe and the dominant limb were measured by near infrared spectroscopy. During all three contractions, C_{bv} and C_{ox} increased while M_{bv} and M_{ox} decreased until fatigue in both genders. There were no signs of levelling off or decline in C_{bv} and C_{ox} during any of these contractions, implying that there was no reduction in cerebral neuronal activation. Conversely, there was a rapid decline in M_{bv} and M_{ox} during the early stages of the contractions, with a plateau or slight increase towards the end. The respective delta values at 50%, 75% and 100% of 1RM for C_{bv} (0.088 versus 0.062 versus 0.070), C_{ox} (0.042 versus 0.033 versus 0.038), M_{bv} (-0.225 versus -0.198 versus -0.196), and M_{ox} (-0.169 versus -0.146 versus -0.158) were not significantly different in the total group (N = 24). These findings suggest that fatigue during resistance exercise lasting up to 60 s is mediated peripherally because of reduced blood volume and oxygen availability and is independent of the type and intensity of muscle contraction and gender.

Nurs Times

Issue: 12, 20-2 McClurg D et, al.

Does abdominal massage relieve constipation? [McClurg D](#), [Lowe-Strong A](#)

2011 Mar 29-Apr 4 107(12):20-2 Language: eng Country: England Midwifery and Allied Health Professions Research Unit, Glasgow Caledonian University, USA.

BACKGROUND: Abdominal massage has been used to treat constipation since the 19th century, yet questions remain over its effectiveness and which patient groups benefit from it the most.

AIM: To determine whether abdominal massage is effective for the relief of constipation.

METHOD: A review of observational studies, case reports and randomised controlled trials was carried out to determine whether abdominal massage is effective in relieving constipation.

RESULTS: Abdominal massage can relieve constipation of various physiological causes. It stimulates peristalsis, decreases colonic transit time and increases the frequency of bowel movements. It also reduces discomfort and pain, induces.

CONCLUSION: Abdominal massage should be considered when treating patients with constipation. It has no adverse side-effects and can easily be taught to patients and carers so they can undertake it themselves.

Validity of the Straight-Leg Raise Test for Patients With Sciatic Pain With or Without Lumbar Pain Using Magnetic Resonance Imaging Results as a Reference Standard

Journal of Manipulative and Physiological Therapeutics, 06/03/2011

Capra F et al. – This results indicate low accuracy of the straight-leg raise (SLR) in diagnosis of lumbar disk herniation (LDH) if compared with MRI results. The discriminative power of the SLR seemed to decrease as age increased; thus, positive and negative results may be less conclusive in older patients.

Methods

- The charts of 2352 patients with sciatic pain with/without lumbar pain were examined.
- Results of the SLR were then compared with previous spinal MRI. A 2 × 2 contingency table was created, and analysis of sensitivity, specificity, positive and negative predictive values, diagnostic odds ratio, likelihood ratio (LR), and receiver operating characteristic (ROC) curve was carried out.
- Homogeneous age classes were created to compare them statistically.

Results

- Magnetic resonance imaging findings showed lumbar disk herniation (LDH) in 1305 patients.
- Of these subjects, 741 were positive on SLR testing. Sensitivity was 0.36, whereas specificity was 0.74.
- Positive and negative predictive values were 0.69 and 0.52, respectively. Positive LR was 1.38, and negative LR was 0.87.
- Diagnostic odds ratio was 1.59, and ROC analysis showed an area under the curve (AUC) of 0.596.
- The AUC decreased from 0.730 in the 16– to 25–year subgroup to 0.515 in the 76– to 85–year subgroup.
- Similar results were obtained in subjects with LDH and nerve root compression.
- **Results**
- Magnetic resonance imaging findings showed lumbar disk herniation (LDH) in 1305 patients. Of these subjects, 741 were positive on SLR testing. Sensitivity was 0.36, whereas specificity was 0.74. Positive and negative predictive values were 0.69 and 0.52, respectively. Positive LR was 1.38, and negative LR was 0.87. Diagnostic odds ratio was 1.59, and ROC analysis showed an area under the curve (AUC) of 0.596. The AUC decreased from 0.730 in the 16- to 25-year subgroup to 0.515 in the 76- to 85-year subgroup. Similar results were obtained in subjects with LDH and nerve root compression.
- **Conclusions**
- Our results indicate low accuracy of the SLR in diagnosis of LDH if compared with MRI results. The discriminative power of the SLR seemed to decrease as age increased; thus, positive and negative results may be less conclusive in older patients.

Pain Mechanisms in Osteoarthritis: Understanding the Role of Central Pain and Current Approaches to Its Treatment

Journal of Rheumatology, 06/03/2011

Mease PJ et al. – Preclinical and clinical evidence for the sensitization hypothesis is discussed, along with recently identified genetic variations that may increase sensitivity to pain in patients with osteoarthritis (OA). Evidence is presented for the efficacy of centrally acting analgesics for OA pain (opioids, antiepileptics, tricyclic antidepressants, and serotonin/norepinephrine receptor inhibitors).

- In this literature review, the mechanisms underlying pain associated with osteoarthritis (OA) are discussed, along with evidence for the efficacy of medications thought to act centrally to relieve OA pain.
- The authors survey the cascade of events from inflammation to activation of nociceptive and neuropathic pathways, to the development and maintenance of central and peripheral sensitization.

In this literature review, the mechanisms underlying pain associated with osteoarthritis (OA) are discussed, along with evidence for the efficacy of medications thought to act centrally to relieve OA pain. We survey the cascade of events from inflammation to activation of nociceptive and neuropathic pathways, to the development and maintenance of central and peripheral sensitization. Preclinical and clinical evidence for the sensitization hypothesis is discussed, along with recently identified genetic variations that may increase sensitivity to pain in patients with OA. Evidence is presented for the efficacy of centrally acting analgesics for OA pain (opioids, antiepileptics, tricyclic antidepressants, and serotonin/norepinephrine receptor inhibitors).

Development and validation of a questionnaire assessing volitional competencies to enhance the performance of physical activities in chronic low back pain patients.

Celine Mathy ✉, Jean Paul Broonen ✉, Yves Henrotin ✉, Marc Marty ✉, Valerie Legout ✉, Stephane Genevay ✉, Bernard Duplan ✉, Thierry Bazin ✉, Françoise Laroche ✉, Bernard Savarieau ✉ and Christine Cedraschi ✉

BMC Musculoskeletal Disorders 2011, **12**:111doi:10.1186/1471-2474-12-111

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Abstract (provisional)

Background

Motivation has long been emphasized as the most important determinant of action. However, there is a substantial gap between people's goals and their attainment. Patients may be motivated and yet unable to take action if their volitional competencies are insufficient. One of the important tasks of volition is goal-maintenance. Research has stressed the importance of a volitional tool, the implementation intentions. Implementation intentions indicate where, when, and how the action leading to the goal will be performed. Forming implementation intentions favours the execution of goal-directed efforts, and reinforces the relationship between intentions and behaviours. Results from various studies clearly suggest that volitional competencies and implementation intentions could play a role in low back pain (LBP) patients. However, there is at present no questionnaire allowing assessing the capacity of implementation intentions of physical activities in LBP patients.

Methods

This study will develop such a questionnaire, using a 3-step approach. A first qualitative step to build categories and generate items; 30 patients suffering chronic LBP will be invited to participate in semi-structured interviews; verbatim and derived items will then be submitted to a panel of experts, using a Delphi method; a second quantitative step to examine the properties of items, and determine the factorial structure of the questionnaire; 100 patients suffering chronic LBP will be recruited to respond to this phase; and third, preliminary psychometric analyses (item-scale correlations, construct validity, reliability); 180 chronic LBP patients will be recruited for this phase of the study. The relationships between implementation intentions and variables affecting physical activity on chronic LBP patients, i.e. pain, physical capacities, fear-avoidance beliefs, kinesiophobia, work status, and level of physical activity will be considered.

Discussion

Developing a questionnaire to assess implementation intentions would allow investigating the role of these intentions in the transition from acute to chronic LBP. The results of this study should contribute to the understanding of the psychological processes at stake in the development of chronic LBP, and in particular to the identification of factors eventually favouring patients' participation in and adherence to active physical treatments.

How to explain central sensitization to patients with 'unexplained' chronic musculoskeletal pain: Practice guidelines

Jo Nijs^a, C. Paul van Wilgen^{ef}, Jessica Van Oosterwijck^{abc}, Miriam van Ittersum^{de}, Mira Meeus^{ab}

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Corrected Proof

Abstract

Central sensitization provides an evidence-based explanation for many cases of 'unexplained' chronic musculoskeletal pain. Prior to commencing rehabilitation in such cases, it is crucial to change maladaptive illness perceptions, to alter maladaptive pain cognitions and to reconceptualise pain. This can be accomplished by patient education about central sensitization and its role in chronic pain, a strategy known as pain physiology education. Pain physiology education is indicated when: 1) the clinical picture is characterized and dominated by central sensitization; and 2) maladaptive illness perceptions are present. Both are prerequisites for commencing pain physiology education. Face-to-face sessions of pain physiology education, in conjunction with written educational material, are effective for changing pain cognitions and improving health status in patients with various chronic musculoskeletal pain disorders. These include patients with chronic low back pain, chronic whiplash, fibromyalgia and chronic fatigue syndrome. After biopsychosocial assessment pain physiology education comprises of a first face-to-face session explaining basic pain physiology and contrasting acute nociception versus chronic pain (Session 1). Written information about pain physiology should be provided as homework in between session 1 and 2. The second session can be used to correct misunderstandings, and to facilitate the transition from knowledge to adaptive pain coping during daily life. Pain physiology education is a continuous process initiated during the educational sessions and continued within both the active treatment and during the longer term rehabilitation program.

Patellofemoral Pain Syndrome and Its Association with Hip, Ankle, and Foot Function in 16- to 18-Year-Old High School Students

A Single-blind Case-control Study

Carsten Mølgaard, MHSc, PT^{*}, Michael Skovdal Rathleff, BSc, PT[†] and Ole Simonsen, MD[†]

Corresponding author: Carsten Mølgaard, MHSc, PT, Department of Occupational and Physiotherapy, Aalborg Hospital, Aarhus University Hospital, Hobrovej 15–18, Aalborg, 9000 Denmark. (E-mail:

Background: An increased pronated foot posture is believed to contribute to patellofemoral pain syndrome (PFPS), but the relationship between these phenomena is still controversial. The objectives of this study were to investigate the prevalence of PFPS in high school students and to compare passive internal and external hip rotation, passive dorsiflexion, and navicular drop and drift between healthy high school students and students with PFPS.

Methods: All 16- to 18-year-old students in a Danish high school were invited to join this single-blind case-control study (N = 299). All of the students received a questionnaire regarding knee pain. The main outcome measurements were prevalence of PFPS, navicular drop and drift, passive ankle dorsiflexion, passive hip rotation in the prone position, and activity level. The case group consisted of all students with PFPS. From the same population, a randomly chosen control group was formed.

Results: The prevalence of knee pain was 25%. Of the 24 students with knee pain, 13 were diagnosed as having PFPS. This corresponds to a PFPS prevalence of 6%. Mean navicular drop and drift were higher in the PFPS group versus the control group (navicular drop: 4.2 mm [95% confidence interval (CI), 3.2–5.3 mm] versus 2.9 mm [95% CI, 2.5–3.3 mm]; and navicular drift: 2.6 mm [95% CI, 1.6–3.7 mm] versus 1.4 mm [95% CI, 0.9–2.0 mm]). Higher passive ankle dorsiflexion was also identified in the PFPS group (22.2° [95% CI, 18°–26°] versus 17.7° [95% CI, 15°–20°]).

Conclusions: This study demonstrated greater navicular drop, navicular drift, and dorsiflexion in high school students with PFPS compared with healthy students and highlights that foot posture is important to consider as a factor where patients with PFPS diverge from healthy individuals. (J Am Podiatr Med Assoc 101(3): 215–222, 2011)

Is There Altered Activity of the Extensor Muscles in Chronic Mechanical Neck Pain? A Functional Magnetic Resonance Imaging Study

- [Shaun O'Leary](#), PT, PhD



- [Barbara Cagnie](#), PT, PhD

- [Ashton Reeve](#), BSc

- [Gwendolen Jull](#), PT, PhD

- [James M. Elliott](#), PT, PhD

published online 29 April 2011.

- [Abstract](#)
 - [Full Text](#)
 - [PDF](#)
 - [Images](#)
 - [References](#)
-

Abstract

O'Leary S, Cagnie B, Reeve A, Jull G, Elliott JM. Is there altered activity of the extensor muscles in chronic mechanical neck pain? A functional magnetic resonance imaging study.

Objective

To compare the pattern of neck extensor muscle use in participants with chronic mechanical neck pain to that of healthy controls during 2 different extension exercises by use of muscle functional magnetic resonance imaging (mfMRI).

Design

Cross-sectional.

Setting

University laboratory.

Participants

Data recorded from subjects with chronic mechanical neck pain (n=12; 10 women, 2 men) were compared with previously recorded data from healthy subjects (n=11; 7 men, 4 women).

Interventions

Not applicable.

Main Outcome Measures

mfMRI measures of shifts in T2 relaxation were made for the multifidus, semispinalis cervicis, semispinalis capitis, and splenius capitis muscles, at C2-3, C5-6, and C7-T1 levels, prior and immediately after 2 different exercises: cervical extension in craniocervical neutral (CCN) and cervical extension in craniocervical extension. T2 shift values (difference between pre- and postexercise T2 relaxation values) for each muscle and exercise condition were used for analysis.

Results

While there were observed differences in differential activation of the extensor muscles in participants with mechanical neck pain compared with controls, these differences were only evident for the CCN exercise condition and were only observed for 3 out of the 7 muscle regions of interest during this exercise.

Conclusions

Results of this study suggest some alteration in the differential activation of the cervical extensors in patients with mechanical neck pain and indicate that further investigation of this muscle group in mechanical neck pain disorders is warranted.

Subgroup analyses on return to work in sick-listed employees with low back pain in a randomised trial comparing brief and multidisciplinary intervention.

Christina M Stapelfeldt , David H Christiansen , Ole K Jensen , Claus V Nielsen , Karin D Petersen  and Chris Jensen  *BMC Musculoskeletal Disorders* 2011, **12**:112doi:10.1186/1471-2474-12-112

25 May
2011

Background

Multidisciplinary intervention is recommended for rehabilitation of employees sick-listed for 4-12 weeks due to low back pain (LBP). However, comparison of a brief and a multidisciplinary intervention in a randomised comparative trial of sick-listed employees showed similar return to work (RTW) rates in the two groups. The aim of the present study was to identify subgroups, primarily defined by work-related baseline factors, that would benefit more from the multidisciplinary intervention than from the brief intervention.

Methods

A total of 351 employees sick-listed for 3-16 weeks due to LBP were recruited from their general practitioners. They received a brief or a multidisciplinary intervention. Both interventions comprised clinical examination and advice by a rehabilitation doctor and a physiotherapist. The multidisciplinary intervention also comprised assignment of a case manager, who made a rehabilitation plan in collaboration with the patient and a multidisciplinary team. Using data from a national database, we defined RTW as no sickness compensation benefit disbursement for four consecutive weeks within the first year after the intervention. At the first interview in the clinic, it was ensured that sick leave was primarily due to low back problems. Questionnaires were used to obtain data on health, disability, demographic and workplace-related factors. Cox hazard regression analyses were used with RTW as outcome measure and hazard rate ratios ($HRR = HR_{\text{multidisciplinary}} / HR_{\text{brief}}$) were adjusted for demographic and health-related variables. An interaction term consisting of a baseline variable*intervention group was added to the multivariable regression model to analyse whether the effects of the interventions were moderated by the baseline factor. Subsequently, a new study was performed that included 120 patients who followed the same protocol. This group was analyzed in the same way to verify the findings from the original study group.

Results

The multidisciplinary intervention group ensured a quicker RTW than the brief intervention group in a subgroup with low job satisfaction, notably when claimants were excluded. The opposite effect was seen in the subgroup with high job satisfaction. When claimants were excluded, the effect was also in favour of the multidisciplinary intervention in subgroups characterised by no influence on work planning and groups at risk of losing their job. Inversely, the effect was in favour of the brief intervention in the subgroups who were able to influence the planning of their work and who had no risk of losing their job due to current sick leave. Interaction analysis of the data in the new study displayed similar or even more pronounced differences between subgroups in relation to intervention type.

Conclusions

Multidisciplinary intervention seemed more effective than brief intervention in subgroups of patients with low job satisfaction, no influence on work planning and feeling at risk of losing their jobs due to their sick leave as compared with subgroups not fulfilling these criteria.

Clustering patients on the basis of their individual course of low back pain over a six month period

Iben Axen ✉, Lennart Bodin ✉, Gunnar Bergstrom ✉, Laszlo Halasz ✉, Fredrik Lange ✉, Peter W Lovgren ✉, Annika Rosenbaum ✉, Charlotte Leboeuf-Yde ✉ and Irene Jensen ✉

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Background

Several researchers have searched for subgroups in the heterogeneous population of patients with non-specific low back pain (LBP). To date, subgroups have been identified based on psychological profiles and the variation of pain.

Methods

This multicentre prospective observational study explored the 6- month clinical course with measurements of bothersomeness that were collected from weekly text messages that were sent by 176 patients with LBP. A hierarchical cluster analysis, Ward's method, was used to cluster patients according to the development of their pain.

Results

Four clusters with distinctly different clinical courses were described and further validated against clinical baseline variables and outcomes. Cluster 1, a "stable" cluster, where the course was relatively unchanged over time, contained young patients with good self- rated health. Cluster 2, a group of "fast improvers" who were very bothered initially but rapidly improved, consisted of patients who rated their health as relatively poor but experienced the fewest number of days with bothersome pain of all the clusters. Cluster 3 was the "typical patient" group, with medium bothersomeness at baseline and an average improvement over the first 4-5 weeks. Finally, cluster 4 contained the "slow improvers", a group of patients who improved over 12 weeks. This group contained older individuals who had more LBP the previous year and who also experienced most days with bothersome pain of all the clusters.

Conclusions

It is possible to define clinically meaningful clusters of patients based on their individual course of LBP over time. Future research should aim to reproduce these clusters in different populations, add further clinical variables to distinguish the clusters and test different treatment strategies for them.

Utilization of Modified NFL Combine Testing to Identify Functional Deficits in Athletes Following ACL Reconstruction

Gregory D. Myer, Laura C. Schmitt, Jensen L. Brent, Kevin R. Ford, Kim D. Barber Foss, Bradley J. Scherer, Robert S. Heidt Jr., Jon G. Divine, Timothy E. Hewett

DOI: 10.2519/jospt.2011.3547

STUDY DESIGN: Case control. **OBJECTIVES:** To use modified NFL Combine testing methodology to test for functional deficits in athletes following anterior cruciate ligament (ACL) reconstruction following return to sport. **BACKGROUND:** There is a need to develop objective, performance-based, on-field assessment methods designed to identify potential lower extremity performance deficits and related impairments in this population. **METHODS:** Eighteen patients (mean \pm SD age, 16.9 \pm 2.1 years; height, 170.0 \pm 8.7 cm; body mass, 71.9 \pm 21.8 kg) who returned to their sport within a year following ACL reconstruction (95% CI: 7.8 to 11.9 months from surgery) participated (ACLR group). These individuals were asked to bring 1 or 2 teammates to serve as control participants, who were matched for sex, sport, and age (n = 20; mean \pm SD age, 16.9 \pm 1.1 years; height, 169.7 \pm 8.4 cm; body mass, 70.1 \pm 20.7 kg). Functional performance was tested using the broad jump, vertical jump, modified long shuttle, modified pro shuttle, modified agility T-test, timed hop, triple hop, single hop, and crossover hop tests. A 1-way multivariate analysis of variance (MANOVA) was used to evaluate group differences for dependent performance variables. **RESULTS:** The functional performance measurements of skills requiring bilateral involvement of both lower extremities showed no group differences between the ACLR and control groups ($P > .05$). An overall group difference ($P = .006$) was observed for the combined limb symmetry index (LSI) measures. However, the modified double-limb performance tasks (long shuttle, modified agility T-test, and pro shuttle) were not, independently, sufficiently sensitive to detect limb deficits in individuals with ACL reconstruction. Conversely, the LSI on the distance measures of the single-limb performance tasks all provided moderate to large effect sizes to differentiate between the ACLR and control groups, as the individuals who had ACL reconstruction demonstrated involved limb deficits on all measures ($P < .05$). Finally, the LSI for the timed hop test was not different between groups ($P > .05$). **CONCLUSIONS:** These findings indicate that, while unilateral deficits are present in individuals following ACL reconstruction, they may not be evident during bipedal performance or during modified versions of double-limb performance activities. Isolation of the involved limb with unilateral hopping tasks should be used to identify deficits in performance.

J Orthop Sports Phys Ther 2011;41(6):377-387, Epub 2 February 2011. doi:10.2519/jospt.2011.3547

Computer Simulation of Pectoralis Major Muscle Strain to Guide Exercise Protocols for Patients After Breast Cancer Surgery

Caroline W. Stegink-Jansen, William L. Buford Jr., Rita M. Patterson, Lisa J. Gould

DOI: 10.2519/jospt.2011.3358

STUDY DESIGN: Descriptive study. **OBJECTIVES:** To quantify and rank the order of strain (length change in proportion to the resting length) of 3 portions of the pectoralis major (PM) muscle during various exercises. **BACKGROUND:** A biomechanical foundation on which to base exercise prescriptions for patients after breast cancer surgery is lacking. **METHODS:** An interactive, 3-D, computer graphic simulation system, developed to study biomechanical properties of the musculoskeletal system, was used to simulate movements of the glenohumeral, scapulothoracic, and scapuloacromioclavicular joints of the shoulder, and to estimate strain in 3 portions of the pectoralis major (PM) muscle throughout the motions. The computed tomography scans of 2 male cadavers and literature review formed the basis for the estimations used in the model. Strains in the clavicular, midsternum, and abdominal regions of the PM were expressed as percent strain: $[(\text{change in muscle length}/\text{resting length}) \times 100]$. Exercise motions were based on PM muscle anatomy and published breast cancer rehabilitation protocols. **RESULTS:** Strains of the PM regions ranged from -21% shortening of the clavicular region during flexion to 55% lengthening of the abdominal region during the overhead stretch. Strain between adjacent regions was most uniform for the movement of abduction with external rotation, and least uniform with flexion. **CONCLUSION:** PM muscle lengthening estimates were not linearly proportioned to shoulder joint motions, and varied for 3 portions of the PM. This information may help clinicians and researchers to estimate lengthening of PM portions throughout measurable shoulder motions.

J Orthop Sports Phys Ther 2011;41(6):417-426. doi:10.2519/jospt.2011.3358

KEY WORDS: exercises, modeling, neoplasms, shoulder, x-ray computed tomography

VIDEO

Conflicting Dermatome Maps: Educational and Clinical Implications

Mary Beth Downs, Cindy LaPorte

DOI: 10.2519/jospt.2011.3506

SYNOPSIS: Sensory testing is a common noninvasive method of evaluating nerve function that relies on the knowledge of skin dermatomes and sensory fields of cutaneous nerves. Research to determine the extent of the dermatomes was conducted in Europe during the late nineteenth and early twentieth centuries. Experiments performed on cadavers, monkeys, and human patients prior to 1948 resulted in the creation of similar but somewhat different dermatome maps. A radically different map with long, swirling dermatomes was produced by Keegan and Garrett in 1948. This map was derived largely by examining compression of dorsal nerve roots by vertebral disc herniation. The maps appearing in textbooks are inconsistent. Some books show a version of the early maps, some show the Keegan and Garrett map, and others show maps that are not consistent with either. The purpose of this paper is to discuss the history of dermatome maps, including the experimental procedures by which each was obtained, and to relate the early maps to those found in textbooks commonly used in healthcare education programs. The paper discusses the significance of these maps as used for clinical diagnosis and the need for further research.

J Orthop Sports Phys Ther 2011;41(6):427-434. doi:10.2519/jospt.2011.3506

KEY WORDS: anatomy, neck, nerves, sensation, skin, spine

The purpose of this paper is to discuss the history of dermatome maps, including the experimental procedures by which each was obtained, and to relate the early maps to those found in textbooks commonly used in healthcare education programs. The paper discusses the significance of these maps as used for clinical diagnosis and the need for further research.

Asymmetrical Lower Extremity Loading After ACL Reconstruction: More Than Meets the Eye

Terese L. Chmielewski

DOI: 10.2519/jospt.2011.0104

Sports fans know that movement patterns are important for athletic performance. Similarly, clinicians know that addressing abnormal movement patterns after an anterior cruciate ligament (ACL) reconstruction is important for a successful return to sport. The kinematic (motion) component of movement patterns is more easily observed than the kinetic (forces) component, thus more commonly addressed in ACL reconstruction rehabilitation. Ignoring the kinetic component, though, could impede a successful return to sport. Asymmetrical lower extremity loading has been reported in a variety of activities following ACL reconstruction, and may contribute to both short- and long-term consequences. It is important that clinicians become aware of the potential for asymmetrical lower extremity loading to affect patient outcomes and for researchers to enlarge the body of knowledge.

J Orthop Sports Phys Ther 2011;41(6):374-376. doi:10.2519/jospt.2011.0104

KEY WORDS: anterior cruciate ligament, knee, knee osteoarthritis, return to sport

It is important that clinicians become aware of the potential for asymmetrical lower extremity loading after anterior cruciate ligament (ACL) reconstruction to affect patient outcomes and for researchers to enlarge the body of knowledge.

Return to Sport: When Should an Athlete Return to Sport After an ACL Surgery?

DOI: 10.2519/jospt.2011.0504

J Orthop Sports Phys Ther 2011;41(6):388. doi:10.2519/jospt.2011.0504

A TORN ANTERIOR CRUCIATE LIGAMENT (ACL), FOLLOWED BY RECONSTRUCTION SURGERY, CAN BE DEVASTATING FOR AN ATHLETE. It leads to many questions: When can I return to competition? Will I lose my scholarship? How do I prevent reinjury? Advances in physical therapy now help athletes improve rapidly during the early period after surgery. However, guidelines on how to determine if it is safe to return to sport are more general and vary widely, based on whether the input is from athletes, parents, coaches, or the sports medicine community. Athletes and the people who care about and for them need reliable and valid methods to determine when they are ready to return to sport. A study published in the June 2011 issue of *JOSPT* provides new insight and evidence-based tools to help answer this question.

NEW INSIGHTS

The researchers tested 18 athletes who returned to sport after ACL surgery and 20 healthy athletes who played the same sports and were similar in age and gender. All athletes were tested using performance-based tests similar to those used in the National Football League Combine. The researchers discovered tests that could identify functional limitations on the side repaired surgically in athletes who had already returned to sport. Specifically, the researchers found that athletes' performance was still limited on 3 hopping tests (see illustrations left). When asked to hop on a single leg as far as possible, the athlete jumping off the repaired leg covered only 92% of the distance achieved when jumping off the uninjured leg. Similarly, the athlete could go only 91% to 92% of the distance of the uninjured leg when asked to perform single-leg hopping in a straight line 3 times or hopping over a thick line on the ground.

Association Between Changes in Abdominal and Lumbar Multifidus Muscle Thickness and Clinical Improvement After Spinal Manipulation

Shane L. Koppenhaver, Julie M. Fritz, Jeffrey J. Hebert, Greg N. Kawchuk, Maj John D. Childs, Eric C. Parent, Norman W. Gill, Deydre S. Teyhen

DOI: 10.2519/jospt.2011.3632

STUDY DESIGN: Prospective case series. **OBJECTIVE:** To examine the relation between improved disability and changes in abdominal and lumbar multifidus (LM) thickness using ultrasound imaging following spinal manipulative therapy (SMT) in patients with low back pain (LBP). **BACKGROUND:** Although there is a growing body of literature demonstrating physiologic effects following the application of SMT, few studies have attempted to correlate these changes with clinically relevant outcomes. **METHODS:** Eighty-one participants with LBP underwent 2 thrust SMT treatments and 3 assessment sessions within 1 week. Transversus abdominis (TrA), internal oblique (IO), and LM muscle thickness was assessed during each session, using ultrasound imaging of the muscles at rest and during submaximal contractions. The Modified Oswestry Disability Index was used to quantify participants' improvement in LBP-related disability. Stepwise hierarchical multiple linear regression and repeated-measures analysis of variance were performed to examine the multivariate relationship between change in muscle thickness and clinical improvement over time. **RESULTS:** After controlling for the effects of age, sex, and body mass index, change in contracted LM muscle thickness was predictive of improved disability at 1 week ($P = .02$). As expected, larger increases in contracted LM muscle thickness at 1 week were associated with larger improvements in LBP-related disability. Contrary to our hypothesis, significant decreases in both contracted TrA and IO muscle thickness were observed immediately following SMT; but these changes were transient and unrelated to whether participants experienced clinical improvements. **CONCLUSION:** These findings provide evidence that clinical improvement following SMT is associated with increased thickening of the LM muscle during a submaximal task. **LEVEL OF EVIDENCE:** Prognosis, level 4.

J Orthop Sports Phys Ther 2011;41(6):389-399, Epub 6 April 2011. doi:10.2519/jospt.2011.3632

KEY WORDS: low back pain, muscle contraction, transversus abdominis, ultrasound

The authors examine the relation between improved disability and changes in abdominal and lumbar multifidus (LM) thickness using ultrasound imaging following spinal manipulative therapy (SMT) in patients with low back pain (LBP).

The Immediate Effects of Muscle Energy Technique on Posterior Shoulder Tightness: A Randomized Controlled Trial

Stephanie D. Moore, Kevin G. Laudner, Todd A. McLoda, Michael A. Shaffer

DOI: 10.2519/jospt.2011.3292

STUDY DESIGN: Randomized controlled trial. **OBJECTIVES:** To compare a muscle energy technique (MET) for the glenohumeral joint (GHJ) horizontal abductors and an MET for the GHJ external rotators to improve GHJ range of motion (ROM) in baseball players. **BACKGROUND:** Overhead athletes often exhibit loss of GHJ ROM in internal rotation, which has been associated with shoulder pathology. Current stretching protocols aimed at improving flexibility of the posterior shoulder have resulted in inconsistent outcomes. Although utilization of MET has been hypothesized to lengthen tissue, there are limited empirical data describing the effectiveness of such stretches for treating posterior shoulder tightness. **METHODS:** Sixty-one Division I baseball players were randomly assigned to 1 of 3 groups: MET for the GHJ horizontal abductors ($n = 19$), MET for the GHJ external rotators ($n = 22$), and control ($n = 20$). We measured preintervention and postintervention GHJ horizontal adduction and internal rotation ROM, and conducted analyses of covariance, followed by Tukey honestly significant difference post hoc analysis for significant group-by-time interactions ($P < .05$). **RESULTS:** The group treated with the MET for the horizontal abductors had a significantly greater increase in GHJ horizontal adduction ROM postintervention (mean \pm SD, $6.8^\circ \pm 10.5^\circ$) compared to the control group ($-1.1^\circ \pm 6.8^\circ$) ($P = .011$) and a greater increase in internal rotation ROM postintervention ($4.2^\circ \pm 5.3^\circ$) compared to the group treated with the MET for the external rotators ($0.2^\circ \pm 6.3^\circ$) ($P = .020$) and the control group ($-0.2^\circ \pm 4.0^\circ$) ($P = .029$). No significant differences among groups were found for any other variables ($P > .05$). **CONCLUSION:** A single application of an MET for the GHJ horizontal abductors provides immediate improvements in both GHJ horizontal adduction and internal rotation ROM in asymptomatic collegiate baseball players. Application of MET for the horizontal abductors may be useful to gain ROM in overhead athletes. **LEVEL OF EVIDENCE:** Therapy, level 2b-.

J Orthop Sports Phys Ther 2011;41(6):400-407, Epub 6 April 2011. doi:10.2519/jospt.2011.3292

KEY WORDS: baseball, manual therapy, pitching, rehabilitation, stretching

The authors compare a muscle energy technique (MET) for the glenohumeral joint (GHJ) horizontal abductors and an MET for the GHJ external rotators to improve GHJ range of motion (ROM) in baseball players.

Diagnostic Accuracy of Clinical Tests and Signs of Temporomandibular Joint Disorders: A Systematic Review of the Literature

Jennifer Reneker, Jaime Paz, Christopher Petrosino, Chad E. Cook

DOI: 10.2519/jospt.2011.3644

STUDY DESIGN: Systematic review. **OBJECTIVE:** To summarize the research on accuracy of individual clinical diagnostic signs and tests for the presence of temporomandibular disorder (TMD), and for the subclassifications affiliated with TMD. **BACKGROUND:** Diagnosis of TMD through clinical diagnostic measures has been reported in many studies; however, few of these studies have identified individual clinical tests or signs that can aid in the diagnosis of TMD or differentiate between the subclassifications of TMD. **METHODS:** Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed for this review. Computerized and hand searches were completed to locate articles on the diagnostic accuracy of clinical tests and signs. To be considered for review, the study required (1) an assessment of individual clinical measures of TMD, (2) a report of the diagnostic accuracy of these measures, and (3) an acceptable reference standard for comparison. Quality assessment of studies of diagnostic accuracy (QUADAS) scores were completed on each selected article. Sensitivity and specificity and negative and positive likelihood ratios were calculated for each diagnostic test described. **RESULTS:** The search strategy identified 131 potential articles, which were narrowed down to 7 that met the criteria for this review. After assessment using the QUADAS score, 3 of the 7 articles were of high quality. All 7 studies used tests to differentiate subclassifications of TMD. The 7 studies included (1) diagnostic tests/signs of joint sounds, (2) joint movements, or (3) clinically oriented pain measures. There were no studies that investigated TMD versus a competing, non-TMD condition. **CONCLUSION:** Only 3 studies presented in this literature review were of high quality. Because all of the included studies assessed diagnostic accuracy among subclassifications of individuals suspected of having TMD, the ability of any of these tests to distinguish between patients with TMD versus patients without TMD remains unknown. Because of the lack of clear findings indicating compelling evidence for clinical diagnosis of TMD, and because of the low quality of most of these studies, the data are insufficient to support or reject these tests. **LEVEL OF EVIDENCE:** Diagnosis, level 2a–.

J Orthop Sports Phys Ther 2011;41(6):408-416, Epub 18 February 2011. doi:10.2519/jospt.2011.3644

KEY WORDS: head, jaw, TMJ

The authors summarize the research on accuracy of individual clinical diagnostic signs and tests for the presence of temporomandibular disorder (TMD), and for the subclassifications affiliated with TMD.

Occult Hypermobility of the Craniocervical Junction: A Case Report and Review

K. Sean Mathers, Michael Schneider, Michael Timko

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STUDY DESIGN: Resident's case problem. **BACKGROUND:** Patients often present to physical therapists with chief complaints of neck pain, occipital headache, and dizziness associated with a past history of cervical spine injury. These symptoms may be associated with various cervical spine conditions, including craniocervical junction (CCJ) hypermobility. **DIAGNOSIS:** This report reviews the history, physical exam, and diagnostic imaging findings of a patient with the above symptoms. This patient, who had a history of multiple cervical spine injuries, was examined with 2 manual therapy provocative tests: the Sharp-Purser test, which is intended to stress the transverse ligament and odontoid, and the modified lateral shear test, which is intended to stress the alar ligaments. The lateral shear test was perceived as demonstrating excessive mobility and a soft end feel, with a "shift" of C1 on C2. Stress cervical radiographs, obtained using open-mouth projections in neutral, left, and right cervical lateral flexion, revealed a 3-mm lateral offset of the right lateral mass of C1 on C2. MRI evaluation of the lower cervical spine did not reveal any significant disc derangement; however, images of the soft tissues of the craniocervical junction were not obtained. Based on the examination and imaging studies, the patient was determined to have a previously undiagnosed hypermobility of the atlantoaxial joint. **DISCUSSION:** The patient was advised to avoid rotational manipulation and end range lateral flexion stretching exercises. Axial traction manipulation techniques, midrange stabilization exercises, and postural advice appeared to provide good relief of symptoms. Physical therapists should consider the possibility of CCJ hypermobility in the frontal plane when examining the cervical spine in patients with chronic neck pain, headache, and a past history of trauma. The lateral shear test and stress radiography may provide simple screening tests for occult CCJ hypermobility; however, the reliability and validity of these tests is lacking. Further research on diagnosis and management of CCJ hypermobility is warranted. **LEVEL OF EVIDENCE:** Differential diagnosis, level 4.

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KEY WORDS: alar ligament, cervical spine, manual therapy, transverse ligament

Patients often present to physical therapists with chief complaints of neck pain, occipital headache, and dizziness associated with a past history of cervical spine injury. This report reviews the history, physical exam, and diagnostic imaging findings of a patient

The Relationships Between Inter-recti Distance Measured by Ultrasound Imaging and Abdominal Muscle Function in Postpartum Women: A 6-month Follow-up Study

Lih-Jiun Liaw, Miao-Ju Hsu, Chien-Fen Liao, Mei-Fang Liu, Ar-Tyan Hsu

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STUDY DESIGN: A prospective longitudinal study. **BACKGROUND:** Diastasis recti abdominis (DRA) is defined as an increase in the inter-recti distance (IRD), or width of the linea alba. It is a common occurrence in women postpartum. Little information exists on the short- and long-term recovery of IRD and the relationship between changes in IRD and the functional performance of the abdominal muscles. **OBJECTIVES:** To investigate the natural recovery of IRD and abdominal muscle strength and endurance in women between 7 weeks and 6 months postpartum, and to examine the relationship between IRD and abdominal muscle function. **METHODS:** Forty postpartum (25-37 years of age) and 20 age-matched, nulliparous females participated. IRD was measured at 4 locations (upper and lower margin of the umbilical ring, and 2.5 cm above and below the umbilical ring) with a 7.5-MHz linear ultrasound transducer. Trunk flexion and rotation strength and endurance were measured with manual muscle testing and curl-ups. Evaluation was conducted at 4 to 8 weeks and 6 to 8 months after childbirth in postpartum women, and only once for the nulliparous female controls. **RESULTS:** During follow-up, the IRD at 2.5 cm above the umbilical ring and at the upper margin of the umbilical ring decreased ($P = .013$ and $P = .002$, respectively). The strength and static endurance of the abdominal muscles improved over time ($P < .05$). A negative correlation between IRD and abdominal muscle function at 7 weeks and 6 months postpartum was found ($r = 0.34$ to 0.51 ; $P < .05$, except for trunk flexion strength at 6 months postpartum [$P = .064$]). In addition, IRD changes between 7 weeks and 6 months postpartum were correlated with improvement in trunk flexion strength (Spearman $\rho = 0.38$, $P = .040$). At 6 months after childbirth, postpartum women had greater mean \pm SD IRDs at all 4 locations (from cranial to caudal: 1.80 ± 0.72 , 2.13 ± 0.65 , 1.81 ± 0.62 , and 1.16 ± 0.58 cm) than those of nulliparous females (0.85 ± 0.26 , 0.99 ± 0.31 , 0.65 ± 0.23 , and 0.43 ± 0.17 cm) (all $P < .001$). All abdominal strength and endurance measurements were less than those of nulliparous females (all $P < .001$). **CONCLUSIONS:** The IRD and abdominal muscle function of postpartum women improved but had not returned to normal values at 6 months after childbirth. Future research is essential to explore the need for intervention and, if needed, the effectiveness of specific intervention to reduce the size of IRD in postpartum women.

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KEY WORDS: abdomen, linea alba, pregnancy, rectus abdominis, strength

The authors investigate the natural recovery of IRD and abdominal muscle strength and endurance in women between 7 weeks and 6 months postpartum, and to examine the relationship between IRD and abdominal muscle function.

Surgery with disc prosthesis versus rehabilitation in patients with low back pain and degenerative disc: two year follow-up of randomised study

Abstract

Objective To compare the efficacy of surgery with disc prosthesis versus non-surgical treatment for patients with chronic low back pain.

Design A prospective randomised multicentre study.

Setting Five university hospitals in Norway.

Participants 173 patients with a history of low back pain for at least one year, Oswestry disability index of at least 30 points, and degenerative changes in one or two lower lumbar spine levels (86 patients randomised to surgery).

Patients were treated from April 2004 to September 2007. **Interventions** Surgery with disc prosthesis or outpatient multidisciplinary rehabilitation for 12-15 days.

Main outcome measures The primary outcome measure was the score on the Oswestry disability index after two years. Secondary outcome measures were low back pain, satisfaction with life (SF-36 and EuroQol EQ-5D), Hopkins symptom check list (HSCL-25), fear avoidance beliefs (FABQ), self efficacy beliefs for pain, work status, and patients' satisfaction and drug use. A blinded independent observer evaluated scores on the back performance scale and Prolo scale at two year follow-up. **Results** The study was powered to detect a difference of 10 points on the Oswestry disability index between the groups at two years. At two years there was a mean difference of -8.4 points (95% confidence interval -13.2 to -3.6) in favour of surgery. In the analysis of prespecified secondary outcomes, there were significant differences in favour of surgery for low back pain (mean difference -12.2, -21.3 to -3.1), patients' satisfaction (63% (n=46) v 39% (n=26)), SF-36 physical component score (mean difference 5.8, 2.5 to 9.1), self efficacy for pain (mean difference 1.0, 0.2 to 1.9), and the Prolo scale (mean difference 0.9, 0.1 to 1.6). There were no significant differences in return to work, SF-36 mental component score, EQ-5D, fear avoidance beliefs, Hopkins symptom check list, drug use, and the back performance scale. One serious complication of leg amputation occurred during surgical revision of a polyethylene dislodgement. The drop-out rate was 20% (34) and the crossover rate was 6% (5). **Conclusions** Surgical intervention with disc prosthesis for chronic low back pain resulted in a significantly greater improvement in the Oswestry score compared with rehabilitation, but this improvement did not clearly exceed the prespecified minimally important clinical difference between groups of 10 points, and the data are consistent with a wide range of differences between the groups, including values well below 10 points. The potential risks of surgery and the substantial amount of improvement experienced by a sizeable proportion of the rehabilitation group also have to be incorporated into overall decision making.

Manual Therapy

The validity and accuracy of clinical diagnostic tests used to detect labral pathology of the hip: A systematic review

[Roanna M. Burgess](#), [Alison Rushton](#)^b, [Chris Wright](#)^b, [Cathryn Daborna](#)

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Abstract

Acetabular labral tears are an area of increasing interest to clinicians involved in the diagnosis of musculoskeletal complaints of the hip. This review systematically evaluated the evidence for the diagnostic accuracy and validity of reported symptoms, physical examination and imaging in this complex population. Studies published in English prior to May 2010 were included. One reviewer searched information sources to identify relevant articles. Two reviewers independently assessed studies for inclusion, extracted data and evaluated quality using the Quality Assessment of Diagnostic Studies Tool.

Twenty one studies were included. Meta-analysis was limited owing to heterogeneity between studies. Results showed Magnetic Resonance Arthrography to consistently outperform Magnetic Resonance Imaging. Computerised Tomography also showed high accuracy levels for the few studies identified. Studies investigating physical tests were of poor quality demonstrating a need for further research in this area. Symptoms likely to be present in patients presenting with acetabular labral tears were found to be anterior groin pain and mechanical hip symptoms; however, additional good quality studies are needed to consolidate findings.

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Lumbar spinal stenosis-diagnosis and management of the aging spine

[Karen Maloney Backstrom](#), [Julie M. Whitman](#)^b, [Timothy W. Flynn](#)^c

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Abstract

Low back pain and lumbar spinal stenosis (LSS) is an extensive problem in the elderly presenting with pain, disability, fall risk and depression. The incidence of LSS is projected to continue to grow as the population ages. In light of the risks, costs and lack of long-term results associated with surgery, and the positive outcomes in studies utilizing physical therapy interventions for the LSS patient, a non-invasive approach is recommended as a first line of intervention. This Masterclass presents an overview of LSS in terms of clinical examination, diagnosis, and intervention. A focused management approach to the patient with LSS is put forward that emphasizes a defined four-fold approach of patient education, manual physical therapy, mobility and strengthening exercises, and aerobic conditioning.