

## 2. LBP

### A hybrid approach to treating LBP

J Orthop Sports Phys Ther. 2019 Jun;49(6):453-463. doi: 10.2519/jospt.2019.8774. Epub 2019 Feb 13.

#### **Hybrid Approach to Treatment Tailoring for Low Back Pain: A Proposed Model of Care.**

Hodges PW.

##### Abstract

Various approaches have been used to guide the treatment of low back pain. These approaches have been considered in isolation and often tested against each other. An alternative view is that a model of care that involves a hybrid approach may benefit patients with low back pain.

This commentary considers the potential benefits of a sequentially applied hybrid approach for treatment tailoring to optimize resource allocation to those most likely to require comprehensive care, and then decision making toward treatment paths with the greatest potential for success. In a first step, a prognosis-based approach, such as the Subgroups for Targeted Treatment Back Screening Tool (STarT Back), identifies individuals likely to require greater resource allocation. Although a clear path is indicated toward simple and psychologically informed care for the low- and high-risk groups, respectively, there is limited guidance for the large medium-risk group.

For that group, the hybrid model provides a stepwise path of additional methods to guide treatment selection. This includes subgrouping based on pain mechanism to guide priority domains for the next phase, which includes tailoring of psychological and movement-based approaches.

Motor control approaches to exercise would be indicated for individuals with medium risk and a nociceptive pain mechanism, with treatment guided by detailed assessment via one of several paradigms.

Psychologically informed treatments are tailored to those with medium risk and a predominantly central pain mechanism, guided by detailed assessment of psychosocial features.

A hybrid approach to a model of care could simplify treatment selection and take advantage of the benefits of each method in a time- and cost-efficient manner. *J Orthop Sports Phys Ther* 2019;49(6):453-463. Epub 13 Feb 2019. doi:10.2519/jospt.2019.8774.

### Can biomechanical research benefit LBP

J Orthop Sports Phys Ther. 2019 Jun;49(6):425-436. doi: 10.2519/jospt.2019.8825. Epub 2019 May 15.

### **Can Biomechanics Research Lead to More Effective Treatment of Low Back Pain? A Point-Counterpoint Debate.**

Cholewicki J, Breen A, Popovich JM Jr, Reeves NP, Sahrman SA, van Dillen LR, Vleeming A, Hodges PW.

Although biomechanics plays a role in the development and perhaps the persistent or recurrent nature of low back pain (LBP), whether biomechanics alone can provide the basis for intervention is debated.

Biomechanics, which refers to the mechanics of the body, including its neuromuscular control, has been studied extensively in LBP. But, can gains be made in understanding LBP by research focused on this component of biology in the multifactorial biopsychosocial problem of LBP?

This commentary considers whether biomechanics research has the potential to advance treatment of LBP, and how likely it is that this research will lead to better treatment strategies. A point-counterpoint format is taken to present both sides of the argument.

First, the challenges faced by an approach that considers biomechanics in isolation are presented.

Next, we describe 3 models that place substantial emphasis on biomechanical factors.

Finally, reactions to each point are presented as a foundation for further research and clinical practice to progress understanding of the place for biomechanics in guiding treatment of LBP.

*J Orthop Sports Phys Ther 2019;49(6):425-436. Epub 15 May 2019. doi:10.2519/jospt.2019.8825.*

**Neuroplasticity in LBP****Neuroplasticity of Sensorimotor Control in Low Back Pain**

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**Synopsis**

Low back pain (LBP) is an important medical and socioeconomic problem. Impaired sensorimotor control has been suggested to be a likely mechanism underlying development and/or maintenance of pain.

Although early work focused on the structural and functional abnormalities within the musculoskeletal system, in the past 20 years there has been an increasing realization that patients with LBP might also have extensive neuroplastic changes within the central nervous system. These include changes related to both the structure (eg, gray matter changes) and function (eg, organization of the sensory and motor cortices) of the nervous system as related to processing of pain and nociception and to motor and somatosensory systems. Moreover, clinical interventions increasingly aim to drive neuroplasticity with treatments to improve pain and sensorimotor function.

This commentary provides a contemporary overview of neuroplasticity of the pain/nociceptive and sensorimotor systems in LBP. This paper addresses (1) defining neuroplasticity in relation to control of the spine and LBP, (2) structural and functional nervous system changes as they relate to nonspecific LBP and sensorimotor function, and (3) related clinical implications. Individuals with recurrent and persistent LBP differ from those without LBP in several markers of the nervous system's function and structure. Neuroplastic changes may be addressed by top-down cognitive-based interventions and bottom-up physical interventions. An integrated clinical approach that combines contemporary pain neuroscience education, cognition-targeted sensorimotor control, and physical or function-based treatments may lead to better outcomes in patients with recurrent and persistent LBP.

This approach will need to consider variation among individuals, as no single finding/mechanism is present in all individuals, and no single treatment that targets neuroplastic changes in the sensorimotor system is likely to be effective for all patients with LBP. *J Orthop Sports Phys Ther* 2019;49(6):402–414. doi:10.2519/jospt.2019.8489

### Biological plasticity in LBP

#### **Diverse Role of Biological Plasticity in Low Back Pain and Its Impact on Sensorimotor Control of the Spine**

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2019 **Volume:**49 **Issue:**6 **Pages:**389–401 **DOI:**10.2519/jospt.2019.8716

#### **Synopsis**

Pain is complex. It is no longer acceptable to consider pain solely as a peripheral phenomenon involving activation of nociceptive neurons.

The contemporary understanding of pain involves consideration of different underlying pain mechanisms and an increasing awareness of plasticity in all of the biological systems. Of note, recent advances in technology and understanding have highlighted the critical importance of neuroimmune interactions, both in the peripheral and central nervous systems, and the interaction between the nervous system and body tissues in the development and maintenance of pain, including low back pain (LBP).

Further, the biology of many tissues changes when challenged by pain and injury, as reported in a growing body of literature on the biology of muscle, fat, and connective tissue. These advances in understanding of the complexity of LBP have implications for our understanding of pain and its interaction with the motor system, and may change how we consider motor control in the rehabilitation of LBP.

This commentary provides a state-of-the-art overview of plasticity of biology in LBP. The paper is divided into 4 parts that address (1) biology of pain mechanisms, (2) neuroimmune interaction in the central nervous system, (3) neuroimmune interaction in the periphery, and (4) brain and peripheral tissue interaction. Each section considers the implications for clinical management of LBP. *J Orthop Sports Phys Ther* 2019;49(6):389–401. doi:10.2519/jospt.2019.8716

**Prevalence among material workers**

BMC Musculoskelet Disord. 2019 May 22;20(1):243. doi: 10.1186/s12891-019-2594-0.

**Prevalence of low back pain, seeking medical care, and lost time due to low back pain among manual material handling workers in the United States.**

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**BACKGROUND:**

Low back pain (LBP) is a common and costly problem throughout the United States. To achieve a greater understanding of the occupational risk factors, the National Institute for Occupational Safety and Health (NIOSH) funded a low back health effects consortium, which performed several surveillance studies throughout the United States. This study combines data from the consortium research groups resulting in a data set with nearly 2000 workers in various regions of the country. The purpose of this paper is to examine prevalence and personal risk factors of low back health effects among these workers.

**METHODS:**

There were three common questions regarding history of low back health effects in the past 12 months including 1) have you had LBP lasting 7 days, 2) have you sought medical care for LBP, and 3) have you taken time off work due to LBP. The questionnaire included demographic questions. There were five data collection institutions or sites including NIOSH, Ohio State University, University of Wisconsin-Milwaukee, Texas A&M University, and University of Utah.

**RESULTS:**

The 12-month period prevalence of low back pain lasting 7 days, seeking medical care, and lost time due to LBP were 25, 14 and 10%, respectively. There were no statistically significant differences in gender, age or weight between cases and non-cases for any prevalence measure. The height of workers was significantly greater in the cases compared to non-cases for all three prevalence definitions. There were significant differences among the sites on the prevalence of seeking medical care for LBP and lost time due to LBP. The Ohio State University had significantly higher prevalence rates for seeking medical care and lost time due to LBP than University of Wisconsin, University of Utah, or Texas A&M University.

**CONCLUSION:**

LBP, the least severe low back health effect studied, had the highest prevalence (25%) and lost time due to LBP, the most severe low back health effect studied, had the lowest prevalence (10%) among nearly 2000 US manual material handling workers. There was a significant site or regional influence in prevalence rates for seeking medical care and lost time due to LBP.

## 7. PELVIC ORGANS/WOMAN'S HEALTH

### Role of testosterone in female hypertension

Clin Interv Aging. 2019 Apr 29;14:743-752. doi: 10.2147/CIA.S195498. eCollection 2019.

#### **The potential role of testosterone in hypertension and target organ damage in hypertensive postmenopausal women.**

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**Objective:** The aim of this study was to confirm the potential role of testosterone in hypertension and target organ damage (TOD) in hypertensive postmenopausal women.

**Methods:** A matched group study was conducted. One hundred sixty-one hypertensive postmenopausal women between 45 and 65 years of age were enrolled as group 1. Another 161 age-matched hypertensive men were enrolled as group 2. Ambulatory blood pressure monitoring, echocardiographic imaging, vascular function, sex hormones and clinical characteristics were evaluated. Quantitative data were analyzed using independent Student's *t*-test and multiple regression analysis.

**Results:** The mean and load level of blood pressure were lower in women than in men ( $P < 0.05$ ), except for the mean level and load of the nocturnal systolic blood pressure (SBP) ( $123.77 \pm 15.72$  mmHg vs  $126.35 \pm 15.64$  mmHg, and  $50.43 \pm 30.31\%$  vs  $55.35 \pm 28.51\%$ ,  $P > 0.05$ ). However, the carotid-femoral pulse wave velocity (cf-PWV) in women was higher than that in men ( $9.68 \pm 2.23$  m/s vs  $8.03 \pm 2.82$  m/s,  $P < 0.05$ ). The ratio of the early diastolic mitral peak flow velocity to early diastolic mitral annular velocity (E/Em) was obviously impaired ( $13.06 \pm 3.53$  vs  $12.05 \pm 3.68$ ,  $P < 0.05$ ) in women. Furthermore, in women, a positive correlation was found between testosterone and cf-PWV ( $\gamma = 0.157$ ,  $P = 0.046$ ), and Cf-PWV was positively related to the mean level of nighttime SBP ( $\gamma = 0.210$ ,  $P = 0.008$ ). Moreover, nocturnal SBP was a risk factor for E/Em ( $\gamma = 0.156$ ,  $P = 0.048$ ,  $P < 0.05$ ).

**Conclusion:** Testosterone may play a role in the correlation between hypertension and TOD in hypertensive postmenopausal women. **Clinical Trial number:** This research study was registered under the ClinicalTrials.gov PRS Website (NCT03451747).

**High blood pressure impacts conception****Preconception blood pressure and time to pregnancy among couples attempting to conceive their first pregnancy**

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DOI: <https://doi.org/10.1016/j.ajog.2019.05.038>

**Background**

The association of abnormal blood pressure levels (including hypertension and prehypertension) with reduced fecundability among young childbearing-age couples is not yet completely elucidated.

**Objective**

To investigate the association between abnormal preconception blood pressure level and time to pregnancy among couples attempting to conceive their first pregnancy.

**Study Design**

A total of 2,234,350 eligible couples (with no prior gravidity and whose female partners were aged between 20 and 49 years) participated in the National Free Pre-conception Check-up Projects from January 1, 2015 to December 31, 2016. Couples' preconception blood pressure levels were measured, and time to pregnancy was recorded. Cox models for discrete survival time were used to estimate fecundability odds ratios and their corresponding 95% confidence intervals after adjusting for age, ethnicity, educational level, occupation, household registration, region, tobacco exposure, alcohol intake, body mass index, and duration of marriage of the couples, and fasting plasma glucose levels of the female partner.

**Results**

Compared with normotensive females, those with hypertension (systolic blood pressure  $\geq 140$  mmHg or diastolic blood pressure  $\geq 90$  mmHg) had a 21% lower pregnancy rate (fecundability odds ratio = 0.79, 95% confidence interval: 0.78-0.81). A similar finding was found among males (fecundability odds ratio = 0.89, 95% confidence interval: 0.88-0.90). Prehypertension ( $120$  mmHg  $\leq$  systolic blood pressure  $< 140$  mmHg or  $80$  mmHg  $\leq$  diastolic blood pressure  $< 90$  mmHg) in both male and female partners was slightly associated with reduced fecundability odds ratios. Compared with couples in which both partners were normotensive, the pregnancy rate was reduced by 27% (fecundability odds ratio = 0.73, 95% confidence interval: 0.69-0.77) among couples in which both partners had hypertension.

**Conclusion**

Abnormal preconception blood pressure levels were associated with prolonged time to pregnancy among couples attempting to conceive their first pregnancy, and the mechanism is worth further investigation.

## 14. HEADACHES

### Psychosocial role of HA's

#### The role of psychosocial risk factors in the burden of headache

**Authors** Malmberg-Ceder K, Haanpää M, Korhonen PE, Kautiainen H, Veromaa V, Soinila S  
**DOI** <https://doi.org/10.2147/JPR.S165263>

**Purpose:** Psychosocial risk factors are common in headache patients and affect the impact of headache in multiple ways. The aim of our study was to assess how psychosocial risk factors correlate with the headache impact test-6 (HIT-6). To our knowledge this is the first study to evaluate the impact of several psychosocial factors on the HIT-6 score.

**Patients and methods:** Our study population consisted of 469 Finnish female employees reporting headache during the past year. Psychosocial risk factors were assessed using validated, self-administered questionnaires: the generalized anxiety disorder 7-item scale (GAD-7) for anxiety, the major depression inventory (MDI) for depressive symptoms, the ENRICHD short social support instrument (ESSI) for social isolation, the cynical distrust scale for hostility and the Bergen burnout indicator (BBI-15) for work stress.

**Results:** Exploratory factor analysis of the HIT-6 scores revealed two factors, one describing psychological and quality of life aspects affected by headache and the other describing severity of pain and functional decline. Internal consistency of the HIT-6 was 0.87 (95%CI: 0.85–0.89). Correlations between the total HIT-6 score and all measured psychosocial risk factors except for hostility were weak, but statistically significant.

**Conclusion:** The HIT-6 questionnaire has good construct validity and it describes reliably and independently the impact of headache without interference of psychosocial factors in general working-aged female population.

## 26. CARPAL TUNNEL SYNDROME

[Return to work](#)

### **Return to work after carpal tunnel release surgery: a qualitative interview study**

- Lisa Newington Charlotte Brooks, David Warwick Jo Adams and Karen Walker-Bone

*BMC Musculoskeletal Disorders* 2019 **20**:242

<https://doi.org/10.1186/s12891-019-2638-5>

#### Background

Carpal tunnel syndrome is a common nerve compression disorder which affects hand sensation and function. Carpal tunnel release surgery (CTR) is frequently performed to alleviate these symptoms. For many CTR patients, surgery occurs during their working lifetime, but there is currently no evidence-based guidance to inform clinicians or patients when it might be safe to return to different types of work afterwards. The aim of this qualitative study was to explore the return to work experiences of patients who had recently undergone CTR.

#### Methods

Semi-structured 1:1 interviews were conducted with a subgroup of participants recruited to a multi-centre prospective cohort study. Interviewees were purposely selected to represent a range of demographic, clinical and occupational characteristics. All had recently undergone CTR and had returned to work. Interviews were audio recorded, transcribed verbatim and analysed using the framework method. Participants were recruited until data saturation was achieved.

#### Results

Fourteen participants were interviewed: 11 women (median age 49 years, range 27–61) and 3 men (age range 51–68 years). Three key themes were identified. Theme 1 centred on the level of functional disability experienced immediately after surgery. There was an expectation that CTR would be a ‘minor’ procedure, but this did not match the participants’ experiences. Theme 2 explored the desire for validation for the time away from work, with participants recalling a need to justify their work absence to themselves as well as to their employers. Theme 3 focused on the participants’ reflections of handling their return to work and function, with many reporting uncertainties about what constituted appropriate activity loads and durations. There was a desire for specific information relating to individual work roles.

#### Conclusion

Individual return to work decision-making was largely influenced by the recommendations received. According to the views of participants, clinicians may be able to prepare patients better pre-operatively, especially with respect to function in the immediate post-operative period and by providing return to work guidance that can be tailored for individual work roles.

## 31. KNEE

### Adolescents with knee pain

#### **Five-year prognosis and impact of adolescent knee pain: a prospective population-based cohort study of 504 adolescents in Denmark**

1. Michael Skovdal Rathleff<sup>1,2</sup>, Sinead Holden<sup>1,2</sup>, Christian Lund Straszek<sup>1,3</sup>, Jens Lykkegaard Olesen<sup>1</sup>, Martin Bach Jensen<sup>1</sup>, Ewa M Roos<sup>3</sup>

#### **Abstract**

**Objectives** Investigate the prognosis of adolescent knee pain, and evaluate its impact on health, care-seeking and career choices 5 years later.

**Design** Pre-registered, prospective cohort study.

**Setting** Population-based cohort initiated in school setting.

**Participants** From a cohort of 2200 adolescents aged 15–19 years in 2011, 504 reported knee pain on at least a monthly basis, and were followed prospectively in this cohort study, together with 252 controls who did not have knee pain in 2011.

**Main outcome measures** Outcomes included the Pain and Symptoms subscales from the Knee injury and Osteoarthritis Outcome Score (KOOS), pain intensity measured with a Numeric Rating Scale, pain frequency, knee-related and health-related quality of life, sports participation, physical activity level, KOOS subscales: Function and Sport/recreation, quality of sleep, healthcare consultations, treatments received for their knee pain, the use of painkillers and impact on choice of job or career.

**Results** At follow-up, 358 (71.0%) from the knee pain group and 182 (72.2%) from the control group responded. Of note, 40.5% (95% CI: 35.4% to 45.6%) from the knee pain group reported knee pain 5 years later which was frequent and intense compared with 13.2% (95% CI: 8.2 to 18.1) of the control group. Those from the knee pain group still suffering from knee pain reported poorer physical health (13 points worse on KOOS Function and 30 points worse on KOOS Sport/recreation), stopped or reduced their sports participation because of knee pain (60%), reported worse sleep quality and worse knee-related and general quality of life. In terms of health behaviours, those still with knee pain reported more healthcare consultations. One-third used pain killers regularly, and 15% (95% CI: 12% to 20%) reported that knee pain influenced their choice of job or career.

**Conclusion** Four out of every 10 adolescents with knee pain still experienced frequent and intense knee pain 5 years later, severe enough to impact health, health behaviours and career choices.

**32 A. KNEE/ACL****Kinetic chain linkage**

J Orthop Sports Phys Ther. 2019 May 26;1-45. doi: 10.2519/jospt.2019.8248

**Anterior Cruciate Ligament Injury Mechanisms and the Kinetic Chain Linkage: The Effect of Proximal Joint Stiffness on Distal Knee Control During Bilateral Landings.**

Cannon J<sup>1,2</sup>, Cambridge EDJ<sup>2</sup>, McGill SM<sup>2</sup>.

**STUDY DESIGN:**

Cross-sectional.

**BACKGROUND:**

Neuromuscular deficits at the trunk and hip may contribute to dynamic knee valgus and anterior cruciate ligament (ACL) injury mechanisms. However, comprehensive examination of neuromuscular patterns and their mechanical influence are lacking.

**OBJECTIVE:**

To investigate the influence of lumbar spine joint rotational stiffness (JRS), and gluteal musculature contribution to hip JRS, on dynamic knee valgus.

**METHODS:**

Eighteen university-aged women completed a drop vertical jump while we measured kinematics, kinetics, and twenty-four channels of electromyography spanning the trunk and hip musculature. We classified each limb as high or low valgus based on frontal plane knee displacement magnitude. We used anatomically-detailed EMG-driven biomechanical models to quantify lumbar spine JRS and muscle contributions to hip JRS.

**RESULTS:**

Low valgus limbs generated greater gluteus medius frontal JRS ( $p=0.002$ ,  $ES=1.3$ ) and gluteus maximus transverse JRS ( $p=0.003$ ,  $ES=1.2$ ) compared to high valgus limbs. Participants with bilateral high valgus collapse had substantially reduced lumbar spine sagittal JRS compared to the group with low valgus on both limbs ( $p=0.05$ ,  $ES=5.1$ ). Those who displayed low valgus on both limbs also displayed a peak lumbar spine flexion angle of  $24 \pm 4^\circ$  compared to the bilateral high valgus group's angle of  $38 \pm 10^\circ$  ( $p=0.09$ ,  $ES=1.8$ ).

**CONCLUSION:**

This is the first work of its kind to specifically characterize lumbar spine and hip neuromuscular mechanisms that may be responsible for dynamic valgus in a drop vertical jump, beyond EMG analysis of limited muscles. Participants who avoided high medial knee displacement utilized greater proximal JRS. *J Orthop Sports Phys Ther*, Epub 26 May 2019. doi:10.2519/jospt.2019.8248.

**35. KNEE/TOTAL****Anxiety and depression produce worse outcomes****Depression and Anxiety are Risk Factors for Postoperative Pain-Related Symptoms and Complications in Patients Undergoing Primary Total Knee Arthroplasty in the United States**

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<https://doi.org/10.1016/j.arth.2019.05.035> Get rights and content

Abstract

Background

The study was designed to analyze the underlying relationship between psychiatric comorbidities and postoperative outcomes in patients undergoing primary total knee arthroplasty (TKA).

Methods

We utilized the National Inpatients Sample (NIS) data from 2002 to 2014. On the basis of the International Classification of Disease, 9<sup>th</sup> revision, Clinical Modification, we divided TKA patients into four subgroups: those diagnosed with depression, those diagnosed with anxiety, those concomitantly diagnosed with both depression and anxiety, and those without depression or anxiety. The Chi-squared test and analysis of variance (ANOVA) were performed to measure differences among these 4 subgroups. Multiple logistic regression analysis was used to determine whether psychological comorbidities were independent risk factors for postoperative complications and surgery-related pain.

Results

A total of 7,153,750 patients in the United States were estimated to have undergone TKA between 2002 and 2014. The prevalence of depression, anxiety, or both diagnoses in TKA patients significantly increased over time. Patients with psychiatric disorders showed higher hospital costs but shorter periods of hospitalization, with higher odds ratios (ORs) for most complications and all pain-related symptoms observed in this study.

Conclusion

The prevalence of depression and anxiety in TKA patients is increasing steadily each year. Psychiatric disorders were closely correlated with the outcomes of TKA. The mental health of patients undergoing TKA needs more attention to ensure adequate relief from postoperative pain-related symptoms as well as quality of life.

**37. OSTEOARTHRITIS/KNEE****PRP helps**

J Orthop Surg Res. 2019 May 24;14(1):153. doi: 10.1186/s13018-019-1203-0.

**Efficiency of platelet-rich plasma therapy in knee osteoarthritis does not depend on level of cartilage damage.**

Burchard R<sup>1,2,3</sup>, Huflage H<sup>4</sup>, Soost C<sup>5</sup>, Richter O<sup>6</sup>, Bouillon B<sup>4,7</sup>, Graw JA<sup>8,9</sup>.

**OBJECTIVES:**

Osteoarthritis of the knee is common and often leads to significant physical disability. While classic conservative therapeutic approaches aim for symptoms like pain and inflammation, procedures like the intraarticular application of hyaluronic acids (HA) or platelet-rich plasma (PRP) are thought to stimulate the endogenous HA production, stop catabolism of cartilage tissue, and promote tissue regeneration. To analyse whether the positive effects of PRP injections are associated with the level of cartilage damage, patient satisfaction with the treatment was correlated with the level of knee joint osteoarthritis quantified by MRI.

**METHODS:**

PRP was performed with a low-leukocyte autologous conditioned plasma (ACP) system in 59 patients. A pre-treatment MRI was performed and a Whole-Organ MRI Score (WORMS) was used to score the level of knee osteoarthritis by 14 features: integrity of the cartilage, affection of the bone marrow, subcortical cysts, bone attrition, osteophytes, integrity of the menisci and ligaments, presence of synovitis, loose bodies, and periarticular cysts. A multivariate analysis with ordinary least squares regressions was used.

**RESULTS:**

Although pain symptoms and severity of clinical osteoarthritis symptoms decreased, regression analysis could not detect a correlation between the degree of cartilage damage measured by the WORMS score and a positive response to PRP therapy.

**CONCLUSION:**

This study suggests that intraarticular injection of PRP might improve osteoarthritis symptoms and reduces the pain in patients suffering from osteoarthritis of the knee joint independent from the level of cartilage damages quantified by the whole-organ MRI scoring method WORMS.

**38 A. FOOT AND ANKLE****Decrease in dorsi flexion as season progresses in soccer**

Eur J Sport Sci. 2019 May 9:1-10. doi: 10.1080/17461391.2019.1611930.

**Acute and chronic effects of competition on ankle dorsiflexion ROM in professional football players.**

Moreno-Pérez V<sup>1,2</sup>, Soler A<sup>3</sup>, Ansa A<sup>4</sup>, López-Samanes Á<sup>5</sup>, Madruga-Parera M<sup>6,7</sup>, Beato M<sup>8</sup>, Romero-Rodríguez D<sup>6</sup>.

The aim of this study was to investigate the acute (a football match) and chronic (a whole season) effects of competition on ankle dorsiflexion ROM in professional football players.

Forty football players participated in this study. Ankle dorsiflexion ROM was recorded to examine acute (pre-match, immediately post-match and 48 h post-match) and chronic (pre-season, mid-season and post-season) effects of competitive football. In addition, it was found that players had restricted mobility measures on ankle dorsiflexion as >2 cm change between baseline measures (pre-match and pre-season). The training load of all played matches was estimated using a global positioning system (GPS) and RPE. Pre-season ankle dorsiflexion ROM was greater compared to mid-season (8.1% in the dominant, and 9.6% in the non-dominant leg) and post-season (13.8% in the dominant, and 12.5% in the non-dominant leg). In addition, around 30% of all players showed restricted ankle dorsiflexion ROM values in post-season compared with pre-season.

Related to acute effects, ankle dorsiflexion ROM increased after a match (5.8%) in the dominant ankle, and this value decreased (2.65%) 48 h post-match when post-match measurements in both dominant and non-dominant ankles were compared. The progressive decrease in ankle dorsiflexion ROM throughout a season can be an indicator of increased risk of injury and may be reinforce the need of prevention actions such as stretching exercises and eccentric strength training in professional football players.

In addition, these findings suggest to implement specific recovery strategies aiming at minimizing alteration in ankle dorsiflexion ROM 48 h post-match.

## 42. PLANTAR SURFACE

### Corticosteroids vs. orthotics

J Orthop Sports Phys Ther. 2019 May 26;1-34. doi: 10.2519/jospt.2019.8807.

#### **Effectiveness of Foot Orthoses Versus Corticosteroid Injection for Plantar Heel Pain: The SOOTHE Randomized Clinical Trial.**

Whittaker GA<sup>1,2</sup>, Munteanu SE<sup>1,2</sup>, Menz HB<sup>1,2</sup>, Gerrard JM<sup>1</sup>, Elzarka A<sup>3</sup>, Landorf KB<sup>1,2</sup>.

##### *STUDY DESIGN:*

Randomized clinical trial.

##### *BACKGROUND:*

Plantar heel pain is a common foot complaint that causes significant disability and poorer health-related quality of life. Foot orthoses and corticosteroid injection are effective treatments for plantar heel pain, however it is unclear if one is more effective than the other. Therefore, the aim of this trial was to compare the effectiveness of foot orthoses and corticosteroid injection for plantar heel pain.

##### *METHODS:*

A parallel-group, assessor-blinded randomized trial. Participants received prefabricated, arch-contouring foot orthoses or a single ultrasound-guided corticosteroid injection. The primary outcome measure was the foot pain subscale of the Foot Health Status Questionnaire at 4 and 12 weeks.

##### *RESULTS:*

103 participants aged 21 to 72 years (63 female) with plantar heel pain were recruited from the community and received an intervention. For the primary outcome of foot pain, corticosteroid injection was more effective at week 4 (adjusted mean difference 8.2 points; 95% CI 0.6, 15.8). However, foot orthoses were more effective at week 12 (adjusted mean difference 8.5 points; 95% CI 0.2, 16.8). Although these findings were statistically significant, they did not meet the previously calculated minimal important difference value of 12.5 points.

##### *CONCLUSION:*

Corticosteroid injection is more effective than foot orthoses at week 4, but this effect does not last, and appropriately contoured foot orthoses are more effective than corticosteroid injection at week 12. However, patients may not notice a clinically worthwhile difference between the interventions.

##### *LEVEL OF EVIDENCE:*

Therapy, level 1b. *J Orthop Sports Phys Ther*, Epub 26 May 2019. doi:10.2519/jospt.2019.8807

**45 A. MANUAL THERAPY LUMBAR & GENERAL****Reliability of 6 tests**

S Afr J Physiother. 2019 Apr 24;75(1):469. doi: 10.4102/sajp.v75i1.469. eCollection 2019.

**Intra-rater and inter-rater reliability of six musculoskeletal preparticipatory screening tests.**

Zumana N<sup>1</sup>, Olivier B<sup>1</sup>, Godlwana L<sup>1</sup>, Martin C<sup>1</sup>.

**BACKGROUND:**

High injury prevalence rates call for effective sports injury prevention strategies, which include the development and application of practical and reliable pre-participatory screening tools.

**OBJECTIVES:**

The aim of this study was to investigate the intra-rater and inter-rater reliability of the one-legged hyperextension test (1LHET), the empty can (EC) and full can (FC) tests, the standing stork test (SST), the bridge-hold test (BHT) and the 747 balance test (747BT).

**METHOD:**

Thirty-five healthy, injury-free male athletes (cricket and soccer players), aged 16-24 years, were evaluated by two physiotherapists. For each of the tests, the participants were evaluated twice (on two consecutive days) by each physiotherapist. Both the intra- and inter-rater reliability were determined. Cohen's kappa ( $k$ ) was calculated for the 1LHET, the EC and FC tests and the SST. The intraclass correlation coefficient (ICC) was used for the BHT and the 747BT. A confidence level of 95% ( $p \leq 0.05$ ) was applied as the criterion for determining the statistical significance of the results.

**RESULTS:**

The SST presented with the lowest level of intra-rater agreement (ICC = -0.20 to 0.10). On the other hand, the EC test was the only test where one rater achieved an excellent intersessional agreement ( $k = 0.80$ ; 95% confidence interval [CI] 0.40-1.20). Substantial to excellent results for the inter-rater agreement for both sessions were recorded for the 1LHET ( $k = 0.70-0.90$ ) and the BHT (ICC = 0.70-0.90).

**CONCLUSION:**

Reliability values need to be considered when making clinical decisions based on screening tests. A more refined description of the testing procedures and criteria for interpretation might be necessary before including the six screening tests investigated in this study in formal screening protocols.

**CLINICAL IMPLICATION:**

Confirmed reliability of screening tests would enable sports professionals to make informed decisions when designing preparticipatory musculoskeletal screening tools and when dealing with the management of injury risks in athletes.

**48 A. STM****Myodural bridge**

Spine J. 2018 Jun;18(6):1081-1087. doi: 10.1016/j.spinee.2018.02.006. Epub 2018 Mar 15.

**Orientation and property of fibers of the myodural bridge in humans.**

Zheng N<sup>1</sup>, Chi YY<sup>1</sup>, Yang XH<sup>1</sup>, Wang NX<sup>1</sup>, Li YL<sup>1</sup>, Ge YY<sup>1</sup>, Zhang LX<sup>1</sup>, Liu TY<sup>1</sup>, Yuan XY<sup>1</sup>, Yu SB<sup>1</sup>, Sui HJ<sup>2</sup>.

**BACKGROUND CONTEXT:** Studies over the past 20 years have revealed that there are fibrous connective tissues between the suboccipital muscles, nuchal ligament, and cervical spinal dura mater (SDM). This fibrous connection with the SDM is through the posterior atlanto-occipital or atlantoaxial interspaces and is called the myodural bridge (MDB). Researchers have inferred that the MDB might have important functions. It was speculated that the function of MDB might be related to proprioception transmission, keeping the subarachnoid space and the cerebellomedullary cistern unobstructed, and affecting the dynamic circulation of the cerebrospinal fluid. In addition, clinicians have found that the pathologic change of the MDB might cause cervicogenic or chronic tension-type headache. Previous gross anatomical and histologic studies only confirmed the existence of the MDB but did not reveal the fiber properties of the MDB. This is important to further mechanical and functional research on the MDB.

**PURPOSE:** Multiple histologic staining methods were used in the present study to reveal the various origin and fiber properties of the MDB. Muscles and ligaments participating in forming the MDB at the posterior atlanto-occipital or atlantoaxial interspaces were observed, and the fiber properties of the MDB were confirmed. The present study provides a basis for speculating the tensile force values of the MDB on the SDM and a morphologic foundational work for exploring the physiological functions and clinical significances of the MDB.

**STUDY DESIGN:**

Anatomical and histologic analyses of suboccipital structures that communicate with the SDM at the posterior atlanto-occipital or atlantoaxial interspaces were carried out.

**METHODS:**

Multiple histologic staining methods were used to evaluate the histologic properties and composition of the MDB at the posterior atlanto-occipital or atlantoaxial interspaces in five formalin-fixed head-neck human specimens.

**RESULTS:**

The results show that the MDB traversing the atlanto-occipital interspace originated from the rectus capitis posterior minor (RCPmi). The MDB traversing the atlantoaxial interspace originated mainly from the RCPmi, rectus capitis posterior major, and obliquus capitis inferior. These fibers form the vertebral dural ligament in the atlantoaxial interspace and connect with SDM. The MDB is mainly formed by parallel running type I collagen fibers; thus, suboccipital muscle could pull SDM strongly through the effective force propagated by the MDB during head movement.

**CONCLUSIONS:**

Myodural bridge is mainly formed by parallel running type I collagen fibers; thus, it can transmit the strong pull from the diverse suboccipital muscles or ligaments during head movement. The results of the present study will serve as a basis for further biomechanical and functional MDB research

## 49. STRETCHING

### Hamstring range improves with

Eur J Appl Physiol. 2019 May 10. doi: 10.1007/s00421-019-04159-w.

#### **The effects of 6 weeks of constant-angle muscle stretching training on flexibility and muscle function in men with limited hamstrings' flexibility.**

Brusco CM<sup>1,2</sup>, Blazevich AJ<sup>3</sup>, Pinto RS<sup>4</sup>.

##### *PURPOSE:*

The aim of the present study was to evaluate the effects of 6 weeks of a constant-angle hamstring muscle flexibility training on muscle-tendon stiffness and the range of motion (ROM) in young men with limited hamstring ROM.

##### *METHODS:*

13 participants performed unilateral stretching training (EL), while the contralateral limb acted as control (CL). ROM, relative and peak passive torque, passive stiffness, dynamic knee flexion strength, and active optimum joint angle were assessed before and after the last training session. In addition, participants were tested during the first and last training sessions for first stretch sensation during the stretching procedure only in the EL.

##### *RESULTS:*

Straight-leg raise and isokinetic knee ROM tests (both  $p < 0.0001$ ; from  $59.4 \pm 8.1$  to  $70.3 \pm 9.8$ , from  $28.3 \pm 7.6$  to  $18.5 \pm 5.2$ , respectively) and peak passive torque ( $p = 0.001$ ; from  $53.1 \pm 11.7$  to  $64.9 \pm 12.3$ ) increased only in EL and no changes in relative passive torque, passive stiffness, dynamic knee flexion strength, and active optimum joint angle ( $p > 0.05$ ) were observed. At the point of first stretch sensation, significant increases in passive torque ( $p = 0.004$ ) and angle ( $p < 0.001$ ) were found from pre- to post-training.

##### *CONCLUSION:*

The flexibility training induced significant increases in ROM alongside increases in peak passive torque (stretch tolerance) and the ROM at which stretch was first perceived. However, this occurred without changes in muscle-tendon mechanical properties or transfer to the untrained limb (CL). These results suggest that limb-specific ROM increases were underpinned by neural adaptations.

**50 A. MOTOR CONTROL****Stability vs instability**

J Orthop Sports Phys Ther. 2019 Jun;49(6):415-424. doi: 10.2519/jospt.2019.8144. Epub 2019 Apr 25.

**Are Stability and Instability Relevant Concepts for Back Pain?**

Reeves NP, Cholewicki J, van Dieën JH, Kawchuk G, Hodges PW.

**Abstract**

Individuals with back pain are often diagnosed with spine instability, even though it is unclear whether the spine is susceptible to unstable behavior. The spine is a complex system with many elements that cannot be directly observed, which makes the study of spine function and direct assessment of spine instability difficult. What is known is that trunk muscle activation is adjusted to meet stability demands, which highlights that the central nervous system closely monitors threats to spine stability.

The spine appears to be protected by neural coupling and mechanical coupling that prevent erroneous motor control from producing segmental instability; however, this neural and mechanical coupling could be problematic in an injured spine. Finally, instability traditionally contemplated from a mechanical and control perspective could potentially be applied to study processes involved in pain sensitization, and possibly back pain that is iatrogenic in nature.

This commentary argues for a more contemporary and broadened view of stability that integrates interdisciplinary knowledge in order to capture the complexity of back pain. *J Orthop Sports Phys Ther* 2019;49(6):415-424. Epub 25 Apr 2019. doi:10.2519/jospt.2019.8144.

**Hodges LBP motor control and beyond**

J Orthop Sports Phys Ther. 2019 Jun;49(6):380-388. doi: 10.2519/jospt.2019.7916. Epub 2018 Jun 12.

**Analysis of Motor Control in Patients With Low Back Pain: A Key to Personalized Care?**

van Dieën JH, Reeves NP, Kawchuk G, van Dillen LR, Hodges PW.

## Abstract

Motor control exercise has been shown to be effective in the management of low back pain (LBP). However, the effect sizes for motor control exercise are modest, possibly because studies have used a one-size-fits-all approach, while the literature suggests that patients may differ in presence or type of motor control issues.

In this commentary, we address the question of whether consideration of such variation in motor control issues might contribute to more personalized motor control exercise for patients with LBP. Such an approach is plausible, because motor control changes may play a role in persistence of pain through effects on tissue loading that may cause nociceptive afference, particularly in the case of peripheral sensitization. Subgrouping systems used in clinical practice, which comprise motor control aspects, allow reliable classification that is, in part, aligned with findings in studies on motor control in patients with LBP. Motor control issues may have heuristic value for treatment allocation, as the different presentations observed suggest different targets for motor control exercise, but this remains to be proven.

Finally, clinical assessment of patients with LBP should take into account more aspects than motor control alone, including pain mechanisms, musculoskeletal health, and psychosocial factors, and may need to be embedded in a stratification approach based on prognosis to avoid undue diagnostic procedures. *J Orthop Sports Phys Ther* 2019;49(6):380-388. Epub 12 Jun 2018. doi:10.2519/jospt.2019.7916.

**Hodges LBP and phenotype**

J Orthop Sports Phys Ther. 2019 Jun;49(6):370-379. doi: 10.2519/jospt.2019.7917. Epub 2018 Jun 12.

**Motor Control Changes in Low Back Pain: Divergence in Presentations and Mechanisms.**

van Dieën JH, Reeves NP, Kawchuk G, van Dillen LR, Hodges PW.

**Abstract**

Compared to healthy individuals, patients with low back pain demonstrate differences in all aspects of trunk motor control that are most often studied as differences in muscle activity and kinematics. However, differences in these aspects of motor control are largely inconsistent.

We propose that this may reflect the existence of 2 phenotypes or possibly the ends of a spectrum, with "tight control" over trunk movement at one end and "loose control" at the other. Both may have beneficial effects, with tight control protecting against large tissue strains from uncontrolled movement and loose control protecting against high muscle forces and resulting spinal compression. Both may also have long-term negative consequences. For example, whereas tight control may cause high compressive loading on the spine and sustained muscle activity, loose control may cause excessive tensile strains of tissues. Moreover, both phenotypes could be the result of either an adaptation process aimed at protecting the low back or direct interference of low back pain and related changes with trunk motor control. The existence of such phenotypes would suggest different motor control exercise interventions.

Although some promising data supporting these phenotypes have been reported, it remains to be shown whether these phenotypes are valid, how treatment can be targeted to these phenotypes, and whether this targeting yields superior clinical outcomes. *J Orthop Sports Phys Ther* 2019;49(6):370-379. Epub 12 Jun 2018. doi:10.2519/jospt.2019.7917.

**52. EXERCISE****Comparisons of systems in managing LBP**

J Orthop Sports Phys Ther. 2019 Jun;49(6):437-452. doi: 10.2519/jospt.2019.8451. Epub 2019 May 15.

**Convergence and Divergence of Exercise-Based Approaches That Incorporate Motor Control for the Management of Low Back Pain.**

Hides JA, Donelson R, Lee D, Prather H, Sahrman SA, Hodges PW.

Many approaches for low back pain (LBP) management focus on modifying motor control, which refers to motor, sensory, and central processes for control of posture and movement.

A common assumption across approaches is that the way an individual loads the spine by typical postures, movements, and muscle activation strategies contributes to LBP symptom onset, persistence, and recovery. However, there are also divergent features from one approach to another. This commentary presents key principles of 4 clinical physical therapy approaches, including how each incorporates motor control in LBP management, the convergence and divergence of these approaches, and how they interface with medical LBP management.

The approaches considered are movement system impairment syndromes of the lumbar spine, Mechanical Diagnosis and Therapy, motor control training, and the integrated systems model.

These were selected to represent the diversity of applications, including approaches using motor control as a central or an adjunct feature, and approaches that are evidence based or evidence informed. This identification of areas of convergence and divergence of approaches is designed to clarify the key aspects of each approach and thereby serve as a guide for the clinician and to provide a platform for considering a hybrid approach tailored to the individual patient. *J Orthop Sports Phys Ther* 2019;49(6):437-452. Epub 15 May 2019. doi:10.2519/jospt.2019.8451.

**Number of steps taken per day linked to improved mortality****Association of Step Volume and Intensity With All-Cause Mortality in Older Women I-Min**

Lee, MBBS, ScD; Eric J. Shiroma, ScD; Masamitsu Kamada, PhD; David R. Bassett, PhD; Charles E. Matthews, PhD; Julie E. Buring, ScD  
JAMA Intern Med. doi:10.1001/jamainternmed.2019.0899

**IMPORTANCE** A goal of 10 000 steps/d is commonly believed by the public to be necessary for health, but this number has limited scientific basis. Additionally, it is unknown whether greater stepping intensity is associated with health benefits, independent of steps taken per day.

**OBJECTIVE** To examine associations of number of steps per day and stepping intensity with all-cause mortality.

**DESIGN, SETTING, AND PARTICIPANTS** This prospective cohort study included 18 289 US women from the Women's Health Study who agreed to participate by wearing an accelerometer during waking hours for 7 days between 2011 and 2015. A total of 17 708 women wore and returned their devices; data were downloaded successfully from 17 466 devices. Of these women, 16 741 were compliant wearers (10 h/d of wear on 4 days) and included in the analyses, which took place between 2018 and 2019.

**EXPOSURES** Steps per day and several measures of stepping intensity (ie, peak 1-minute cadence; peak 30-minute cadence; maximum 5-minute cadence; time spent at a stepping rate of 40 steps/min, reflecting purposeful steps). **MAIN OUTCOMES AND MEASURES** All-cause mortality.

**RESULTS** Of the 16 741 women who met inclusion criteria, the mean (SD) age was 72.0 (5.7) years. Mean step count was 5499 per day, with 51.4%, 45.5%, and 3.1% of time spent at 0, 1 to 39 (incidental steps), and 40 steps/min or greater (purposeful steps), respectively. During a mean follow-up of 4.3 years, 504 women died. Median steps per day across low-to-high quartiles of distribution were 2718, 4363, 5905, and 8442, respectively. The corresponding quartile hazard ratios (HRs) associated with mortality and adjusted for potential confounders were 1.00 (reference), 0.59 (95% CI, 0.47-0.75), 0.54 (95% CI, 0.41-0.72), and 0.42 (95% CI, 0.30-0.60), respectively ( $P < .01$ ). In spline analysis, HRs were observed to decline progressively with higher mean steps per day until approximately 7500 steps/d, after which they leveled. For measures of stepping intensity, higher intensities were associated with significantly lower mortality rates; however, after adjusting for steps per day, all associations were attenuated, and most were no longer significant (highest vs lowest quartile for peak 1-minute cadence, HR = 0.87 [95% CI, 0.68-1.11]; peak 30-minute cadence, HR = 0.86 [95% CI, 0.65-1.13]; maximum 5-minute cadence, HR = 0.80 [95% CI, 0.62-1.05]; and time spent at a stepping rate of 40 steps/min, HR = 1.27 [95% CI, 0.96-1.68];  $P > .05$ ).

**CONCLUSIONS AND RELEVANCE** Among older women, as few as approximately 4400 steps/d was significantly related to lower mortality rates compared with approximately 2700 steps/d. With more steps per day, mortality rates progressively decreased before leveling at approximately 7500 steps/d. Stepping intensity was not clearly related to lower mortality rates after accounting for total steps per day.

**6 Minutes of exercise helps elderly**

J Geriatr Phys Ther. 2019 Apr 23. doi: 10.1519/JPT.000000000000233.

**Six Minutes of Physical Activity Improves Mood in Older Adults: A Pilot Study.**

Boolani A<sup>1</sup>, Sur S<sup>2</sup>, Yang D<sup>3</sup>, Avolio A<sup>1</sup>, Goodwin A<sup>2</sup>, Mondal S<sup>4</sup>, Fulk G<sup>5</sup>, Towler C<sup>1</sup>, Lee Smith M<sup>6</sup>.

**BACKGROUND AND PURPOSE:**

The purposes of this study were to examine (1) differences in mood and motivation among older adults after the completion of 6 minutes of self-paced walking (6MW) and (2) the relationship between pace and magnitude of mood change.

**METHODS:**

Eleven participants completed 3 days of testing where energy, fatigue, tension, depression, confusion, mental and physical energy, and motivation to perform mental tasks were measured before and after the 6MW. A repeated-measures analysis of variance was used to examine changes in mood and motivation, and a bivariate Pearson correlation was used to determine relationships between pace and magnitude of changes in mood.

**RESULTS:**

Faster pace was associated with significant improvements ( $P < .05$ ) in fatigue, energy, tension, confusion, total mood disturbance, state mental fatigue, and state physical energy. A significant relationship was noted between pace and changes in energy, fatigue, state mental and physical energy, and fatigue in the expected direction.

**DISCUSSION:**

Results indicate that mood is influenced by pace of the activity. Findings suggest that even 6 minutes of physical activity can improve moods, which may impact how physical therapists approach prescribing exercise to older adults.

**53. CORE****Changes in structure and function of back muscles in LBP****Changes in Structure and Function of the Back Muscles in Low Back Pain: Different Time Points, Observations, and Mechanisms**

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- AUTHORS

Paul W. Hodges, PT, PhD, DSc, MedDr, BPhy (Hons)<sup>1</sup>, Lieven Danneels, PT, PhD<sup>2</sup>

**Published:** *Journal of Orthopaedic & Sports Physical Therapy*,  
2019 **Volume:**49 **Issue:**6 **Pages:**464–476 **DOI:**10.2519/jospt.2019.8827

**Synopsis**

Spinal health depends on optimal back muscle performance, and this is determined by muscle structure and function. There has been substantial research evaluating the differences in structure and function of many back muscles, including the multifidus and erector spinae, but with considerable variation in results. Many studies have shown atrophy, fat infiltration, and connective tissue accumulation in back muscles, particularly deep fibers of the multifidus, but the results are not uniform. In terms of function, results are also somewhat inconsistent, often reporting lower multifidus activation and augmented recruitment of more superficial components of the multifidus and erector spinae, but, again, with variation between studies.

A major recent observation has been the identification of time-dependent differences in features of back muscle adaptation, from acute to subacute/recurrent to chronic states of the condition. Further, these adaptations have been shown to be explained by different time-dependent mechanisms. This has substantial impact on the rationale for rehabilitation approaches.

The aim of this commentary was to review and consolidate the breadth of research investigating adaptation in back muscle structure and function, to consider explanations for some of the variation between studies, and to propose how this model can be used to guide rehabilitation in a manner that is tailored to individual patients and to underlying mechanisms. *J Orthop Sports Phys Ther* 2019;49(6):464–476.  
*doi:*10.2519/jospt.2019.8827

**56. ATHLETICS****Kinesio taping**

Physiotherapy. 2019 Apr 8. pii: S0031-9406(19)30052-5. doi: 10.1016/j.physio.2019.04.001.

**Effects of kinesio taping alone versus sham taping in individuals with musculoskeletal conditions after intervention for at least one week: a systematic review and meta-analysis.**

Ramírez-Vélez R<sup>1</sup>, Hormazábal-Aguayo I<sup>2</sup>, Izquierdo M<sup>3</sup>, González-Ruíz K<sup>4</sup>, Correa-Bautista JE<sup>5</sup>, García-Hermoso A<sup>6</sup>.

**BACKGROUND:**

Kinesiotaping (KT), has emerged as an interesting and relatively novel method for treating musculoskeletal conditions. To date, none of the systematic reviews with meta-analysis have addressed the efficacy of KT alone (without any other intervention) over sham taping (ST).

**OBJECTIVE:**

The present meta-analysis aimed to investigate the effectiveness of KT versus ST in patients with musculoskeletal conditions in interventions lasting at least 1 week on musculoskeletal conditions and functional performance outcomes.

**DATA SOURCE:**

Manual and electronic searches (CENTRAL, EMBASE, MEDLINE and PEDro) were conducted using kinesiotaping, strapping, musculoskeletal pain and musculoskeletal conditions.

**STUDY SELECTION CRITERIA:**

Randomised controlled trials on adults with a diagnosis of musculoskeletal conditions.

**DATA EXTRACTION AND DATA SYNTHESIS:**

Two researchers independently carried out the search and the third author was referred to for arbitration. The methodological quality of the studies using the PEDro scale and GRADE approach.

**RESULTS:**

Six RCTs were identified and included in the meta-analysis. When compared with ST in adults with chronic non-specific low-back pain (LBP), KT resulted in superior effects on pain at follow-up, but the pooled pain in the immediate post-treatment period and disability scores (in the immediate post-treatment period and at follow-up) were not significantly different. Generally, all results were supported by low quality evidence according to GRADE criteria.

**CONCLUSION:**

Our findings indicate inconclusive and low-quality evidence of a beneficial effect of KT alone over ST in LBP and knee osteoarthritis. Systematic review registration number: PROSPERO CRD42018084151.

## 58. RUNNING

## Over ground vs treadmill

Sports Med. 2019 May;49(5):763-782. doi: 10.1007/s40279-019-01087-9.

**A Systematic Review and Meta-Analysis of Crossover Studies Comparing Physiological, Perceptual and Performance Measures Between Treadmill and Overground Running.**

Miller JR<sup>1</sup>, Van Hooren B<sup>2,3</sup>, Bishop C<sup>1,4</sup>, Buckley JD<sup>1</sup>, Willy RW<sup>5</sup>, Fuller JT<sup>6</sup>.

**BACKGROUND:**

Treadmills are routinely used to assess running performance and training parameters related to physiological or perceived effort. These measurements are presumed to replicate overground running but there has been no systematic review comparing performance, physiology and perceived effort between treadmill and overground running.

**OBJECTIVE:**

The objective of this systematic review was to compare physiological, perceptual and performance measures between treadmill and overground running in healthy adults.

**METHODS:**

AMED (Allied and Contemporary Medicine), CINAHL (Cumulative Index to Nursing and Allied Health), EMBASE, MEDLINE, SCOPUS, SPORTDiscus and Web of Science databases were searched from inception until May 2018. Included studies used a crossover study design to compare physiological (oxygen uptake [ $\dot{V}O_2$ ], heart rate [HR], blood lactate concentration [La]), perceptual (rating of perceived exertion [RPE] and preferred speed) or running endurance and sprint performance (i.e. time trial duration or sprint speed) outcomes between treadmill (motorised or non-motorised) and overground running. Physiological outcomes were considered across submaximal, near-maximal and maximal running intensity subgroups. Meta-analyses were used to determine mean difference (MD) or standardised MD (SMD)  $\pm$  95% confidence intervals.

**RESULTS:**

Thirty-four studies were included. Twelve studies used a 1% grade for the treadmill condition and three used grades > 1%. Similar  $\dot{V}O_2$  but lower La occurred during submaximal motorised treadmill running at 0% ( $\dot{V}O_2$  MD:  $-0.55 \pm 0.93$  mL/kg/min; La MD:  $-1.26 \pm 0.71$  mmol/L) and 1% ( $\dot{V}O_2$  MD:  $0.37 \pm 1.12$  mL/kg/min; La MD:  $-0.52 \pm 0.50$  mmol/L) grade than during overground running. HR and RPE during motorised treadmill running were higher at faster submaximal speeds and lower at slower submaximal speeds than during overground running.  $\dot{V}O_2$  (MD:  $-1.25 \pm 2.09$  mL/kg/min) and La (MD:  $-0.54 \pm 0.63$  mmol/L) tended to be lower, but HR (MD:  $0 \pm 1$  bpm), and RPE (MD:  $-0.4 \pm 2.0$  units [6-20 scale]) were similar during near-maximal motorised treadmill running to during overground running. Maximal motorised treadmill running caused similar  $\dot{V}O_2$  (MD:  $0.78 \pm 1.55$  mL/kg/min) and HR (MD:  $-1 \pm 2$  bpm) to overground running. Endurance performance was poorer (SMD:  $-0.50 \pm 0.36$ ) on a motorised treadmill than overground but sprint performance varied considerably and was not significantly different (MD:  $-1.4 \pm 5.8$  km/h).

**CONCLUSIONS:**

Some, but not all, variables differ between treadmill and overground running, and may be dependent on the running speed at which they are assessed.

**59. PAIN****Fear of pain**

J Pain. 2019 May 4. pii: S1526-5900(18)30594-7. doi: 10.1016/j.jpain.2019.04.009.

**PAIN-RELATED FEAR, PAIN INTENSITY AND FUNCTION IN INDIVIDUALS WITH CHRONIC MUSCULOSKELETAL PAIN: A SYSTEMATIC REVIEW AND META-ANALYSIS.**

Martinez-Calderon J<sup>1</sup>, Flores-Cortes M<sup>2</sup>, Morales-Asencio JM<sup>3</sup>, Luque-Suarez A<sup>4</sup>.

Pain-related fear is considered a strong psychological predictor for both chronic pain and disability.

The aims of this study were to systematically review and critically appraise the concurrent association and the predictive value of pain-related fear affecting both pain intensity and disability in individuals with chronic musculoskeletal pain. PubMed, AMED, CINAHL, PsycINFO, PubPsych and grey literature were searched from inception to January 2019. Observational studies reporting cross-sectional and longitudinal associations between pain-related fear and pain intensity and/or disability were included. The GRADE criteria judged whether the overall quality and strength of the evidence was high or low in terms of risk of bias, inconsistency, indirectness, imprecision and publication bias.

Seventy observational studies (97% cross-sectional) were included with a total sample of 15,623 individuals (63.56% females) with chronic musculoskeletal pain. Pain-related fear is comprised of fear of pain, pain-related anxiety and fear-avoidance beliefs. Greater levels of fear of pain, pain-related anxiety and fear-avoidance beliefs were significantly associated with greater pain intensity and disability. However, the quality and strength of the evidence was very low due to the imprecision of results, risk of bias, indirectness and publication bias were common across the included studies.

Despite the aforementioned limitations, the findings highlight the potential role that pain-related fear may play in chronic musculoskeletal pain and disability. The field would benefit from research using higher quality studies and longitudinal designs. Perspective:

This article presents promising results about the concurrent association between pain-related fear and both pain intensity and disability in individuals with chronic musculoskeletal pain.

Nevertheless, the overall quality and strength of the evidence was very low in terms of risk of bias, indirectness, imprecision and publication bias. Thus, the findings should be taken with caution, and further research is needed.

## 61. FIBROMYALGIA

### Bone density

Biol Res Nurs. 2019 May;21(3):272-278. doi: 10.1177/1099800419838625. Epub 2019 Mar 27.

#### **Associations Between Bone Mass in Women With Fibromyalgia and Widespread Pressure Pain Hypersensitivity, Tenderness, Perceived Pain Level, and Disability.**

Correa-Rodríguez M<sup>1</sup>, El Mansouri-Yachou J<sup>2</sup>, Tapia-Haro RM<sup>2</sup>, Molina F<sup>3</sup>, Rueda-Medina B<sup>1</sup>, Aguilar-Ferrandiz ME<sup>4</sup>.

Author information

Abstract

This study aimed to evaluate the impact of fibromyalgia syndrome (FMS) on bone mass assessed by calcaneal quantitative ultrasound (QUS) in pre- and postmenopausal women and determine whether there are associations between bone status and pressure pain thresholds (PPTs), tender point counts (TPCs), self-reported global pain, or disease severity.

Ninety-five women with a diagnosis of FMS and 108 healthy controls matched on menopause status were included in this cross-sectional study. PPT and TPC were measured by algometry pressure. Self-reported global pain and disease severity were evaluated by Visual Analogue Scale and Fibromyalgia Impact Questionnaire, respectively. Bone mass was assessed with calcaneus QUS. Broadband ultrasound attenuation (BUA; dB/MHz) and speed of sound (SOS; m/s) were significantly lower in the FMS patients compared with controls ( $p = .027$  and  $p = .003$ , respectively).

regression analysis revealed that all PPTs were significantly associated with the BUA parameter after adjustments for body mass index (BMI), menopause status, and physical activity in women with FMS ( $p < .05$ ). TPC was also significantly associated with BUA after adjustments for covariables ( $\beta = .241$ , 95% confidence interval [0.333, 3.754],  $p = .020$ ).

No significant differences were found between any QUS measurements and global pain or disease severity. Calcaneal BUA and SOS values were lower in women with FMS compared to healthy controls, and decreased pain thresholds and higher TPCs were associated with lower calcaneal BUA values.

Low pain thresholds might be independent predictors for low bone mass in FMS women.

**65. NEUROLOGICAL CONDITIONS****Stroke**

JAMA. 2019 May 23. doi: 10.1001/jama.2019.6560.

**Association of Stroke Among Adults Aged 18 to 49 Years With Long-term Mortality.**

Ekker MS<sup>1</sup>, Verhoeven JI<sup>1</sup>, Vaartjes I<sup>2</sup>, Jolink WMT<sup>3</sup>, Klijn CJM<sup>1,3</sup>, de Leeuw FE<sup>1</sup>.

**IMPORTANCE:**

Stroke remains the second leading cause of death worldwide. Approximately 10% to 15% of all strokes occur in young adults. Information on prognosis and mortality specifically in young adults is limited.

**OBJECTIVE:**

To determine short- and long-term mortality risk after stroke in young adults, according to age, sex, and stroke subtype; time trends in mortality; and causes of death.

**DESIGN, SETTING, AND PARTICIPANTS:**

Registry- and population-based study in the Netherlands of 15 527 patients aged 18 to 49 years with first stroke between 1998 and 2010, and follow-up until January 1, 2017. Patients and outcomes were identified through linkage of the national Hospital Discharge Registry, national Cause of Death Registry, and the Dutch Population Register.

**EXPOSURES:**

First stroke occurring at age 18 to 49 years, documented using International Classification of Diseases, Ninth Revision, and International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, codes for ischemic stroke, intracerebral hemorrhage, and stroke not otherwise specified.

**MAIN OUTCOMES AND MEASURES:**

Primary outcome was all-cause cumulative mortality in 30-day survivors at end of follow-up, stratified by age, sex, and stroke subtype, and compared with all-cause cumulative mortality in the general population.

**RESULTS:**

The study population included 15 527 patients with stroke (median age, 44 years [interquartile range, 38-47 years]; 53.3% women). At end of follow-up, a total of 3540 cumulative deaths had occurred, including 1776 deaths within 30 days after stroke and 1764 deaths (23.2%) during a median duration of follow-up of 9.3 years (interquartile range, 5.9-13.1 years). The 15-year mortality in 30-day survivors was 17.0% (95% CI, 16.2%-17.9%). The standardized mortality rate compared with the general population was 5.1 (95% CI, 4.7-5.4) for ischemic stroke (observed mortality rate 12.0/1000 person-years [95% CI, 11.2-12.9/1000 person-years]; expected rate, 2.4/1000 person-years; excess rate, 9.6/1000 person-years) and the standardized mortality rate for intracerebral hemorrhage was 8.4 (95% CI, 7.4-9.3; observed rate, 18.7/1000 person-years [95% CI, 16.7-21.0/1000 person-years]; expected rate, 2.2/1000 person-years; excess rate, 16.4/1000 person-years).

**CONCLUSIONS AND RELEVANCE:**

Among young adults aged 18 to 49 years in the Netherlands who were 30-day survivors of first stroke, mortality risk compared with the general population remained elevated up to 15 years later.