

Virtual Poster Session: **MSK Rehab Strategies for Now & the Future - Friday June 12, 2020 3:00-4:15pm EDT**
<https://vimeo.com/showcase/7214828>

13 | Lauren Straatman- Western University; Masters (In progress or completed)

“An Exploration of the Relationship between Subjective and Objective Pain”

Background: Pain is one of the most frequent causes of disability and decreased quality of life. Pain represents a major social, economic and clinical problem that has exercised generations of health care professionals and resources [1]. Measuring pain is a useful way to begin to understand its effects. We will be exploring two different ways to measure pain; subjective measurement through self-reported pain-rating scales and objective measurement via quantitative sensory testing.

Objectives: The primary objective was to establish the relationship between subjective and objective pain, and the secondary objective is to examine men and women's responses regarding sex-specific expectations of pain experiences.

Methodology: A secondary analysis on two previously collected datasets was performed, wherein multiple statistical tests on the combined data and on the individual datasets were used to establish the relationship between subjective and objective pain. Chi-square analyses, linear regressions, Pearson correlations and z-transformations make up the statistical tests used.

Findings: The above analyses indicated that a subjects perceived pain threshold, as measured using the GREP questionnaire, does not reliably predict their quantified pain threshold, as measured using a handheld algometer.

Future Studies: Pain is highly variable between people, so developing a more in-depth metadata analysis would allow us to classify subjects based on subjective parameters that might contribute to their overall pain measure. In addition, introducing imaging techniques as a more objective pain measure to quantify joint contact mechanics and subchondral bone mineral density. This will allow us to understand the biomechanics behind the potential mechanisms underpinning pain.

Reference: [1] Phillips, C. J. (2009) 'The Cost and Burden of Chronic Pain', *Reviews in Pain*, 3(1), pp. 2–5. doi: 10.1177/204946370900300102.

23 | Mélanie Roch- Université de Sherbrooke; Masters (In progress or completed)

“The immediate effect of dry needling on the viscoelasticity of a trigger point”

Background : Trigger points (TP) can cause localized muscle stiffness and alter movement patterns and joint mechanics. Dry needling is widely used to treat TP but its immediate mechanical effects are poorly understood.

Originality: This is the first study that explored the mechanical effects of dry needling on TP.

Purpose: To investigate the immediate effects of a dry needling on the viscoelastic properties (tone, stiffness and elasticity) of a TP located in the infraspinatus muscle of people with chronic shoulder pain.

Methodology: Forty-eight individuals with chronic shoulder pain who presented a TP in the infraspinatus participated in this prospective study. The presence of a TP was confirmed with a palpatory exam performed by a physiotherapist using Travell and Simons criteria. The viscoelastic properties of the TP were measured with the MyotonPro at baseline (T1), after obtaining a twitch with the needle (T2) and 30 minutes later (T3). Repeated measures ANOVA and post-hoc tests were used to assess changes in the viscoelastic properties over time.

Results: Significant decreases in tone and stiffness were found across time after the dry needling. Post-hoc tests with Bonferroni corrections revealed significant differences in stiffness and tone between T0-T1 ($p=0.004$, $p\leq 0.001$) and stiffness between T1-T3 ($p=0.013$).

Significance & Impact: This study brings new insights on the immediate mechanical effect of dry needling. Whether these effects are associated with improvements of muscle and joint function needs to be verified as well as the longterm effects.

35 | Ze Lu- St. Joseph's Hospital London; PhD (In progress or completed)

“The Outcome of Physiotherapy After Total Shoulder Arthroplasty”

Background and rationale: Total shoulder replacement/arthroplasty (TSA) is a useful surgery for patients who have shoulder joint osteoarthritis. It can help patients reduce the pain, increase the shoulder range of motion, and finally do better activities. A successful result is not only depending on the surgical skill, but also on the exercise program after surgery. However, no previous studies clearly support that exercise can help patients live a better life.

Objectives: We searched all relevant scientific papers in the database and summarize the information.

Methodology: We ran a thorough search in 4 scientific databases (MEDLINE, EMBASE, PUBMED, GOOGLE SCHOLAR) until February 2020. We rated the quality of information from those studies as high (>38), moderate (28 - 37), and low-level (<27) according to the guideline. We provide information on study designs, outcomes as pain, shoulder range of motion (ROM) and function scores, and exercise programs.

Results: We identified 1234 papers at the beginning and selected 15 as fit studies left. These 15 papers include 10 to 374 patients and track them in a 5 -years period after surgery. Meanwhile, 8 studies were rated as moderate to a high level of quality which means we can use it with some confidence. Patients who finish the exercise program have an improvement in pain, ROM, and activity performance.

Significance and future studies: This the first research to summarize information on exercise details and effect for TSA. We find improvement after the exercise program. But we don't know whether the effect is due to the surgery or exercise. We need high-quality studies including a compare group. Future studies should test and use patient learning sessions before the surgery.

36 | Christina Ziebart- Western University; PhD (In progress or completed)

“Measurement Properties of Physical Impairments after Distal Radius Fracture”

Background: Individuals with DRF presenting for hand therapy may experience difficulty with gripping an object, painful wrist movements, sensori-motor difficulties, and swelling around wrist and hand.

Rationale: A comprehensive review of the existing evidence concerning the measurement properties of common physical impairment measures can provide a valuable resource to guide hand therapy practice while managing DRF

Objectives: The primary objective was to locate and assess the quality of literature on the measurement properties for the measures of physical impairment used in individuals with DRF

Methodology: Two reviewers searched PubMed, CINAHL, and EMBASE using combination distal radius fractures, measurement properties and physical impairments as keywords, and articles independently assessed, using the COMSIN critical appraisal tool. Primary studies that examined at least one of: reliability, validity, responsiveness, or indices of true and meaningful changes for measures of physical impairment in DRF population were included in this review.

Results: A total of 18 articles were included for this review. The quality of the studies ranged from 46% to 92%, with 13 studies receiving a score of 70% or higher. This review suggest that measures such as grip strength assessment and assessment of supination and pronation ROM using various goniometric devices showed good intra- as well as inter-rater reliability, concurrent validity, and responsiveness in individuals with DRF.

Scientific Impact: Acceptable reliability and responsiveness were reported in grip and wrist ROM assessments for measuring changes in wrist and hand function after DRF. However, wrist ROM assessed using traditional goniometric techniques were less reliable in individuals with DRF.

65 | Clodagh M Toomey- University of Calgary; Early Career Researcher (within 5 years of first appointment)

“Change in symptoms and quality of life following a youth sport knee injury”

Background/Scope: Sustaining a knee injury increases the odds of post-traumatic osteoarthritis in the affected joint by 4- to 6-fold. Previous research has shown that individuals with a knee injury are likely to have prolonged knee symptoms and poorer quality of life (QOL) 3-10 years later. However, the further trajectory of these outcomes is unknown.

Objective: To examine in a preliminary analysis, the association between 3-12 year knee injury history and change in Knee Injury and Osteoarthritis Outcome Score (KOOS; Symptoms and QOL subscales) over a 1-3 year follow-up (FU) period.

Methodology: Participants included individuals with a 3-12 year history of youth sport-related intra-articular knee injury and uninjured controls of similar age (≤ 1 year), sex and sport participation, from the Alberta Youth Prevention of Early Osteoarthritis (PrE-OA) cohort that completed baseline and ≥ 1 annual FU assessment over a 3-year period. Linear regression (clustered by similar age, sex, sport) were used to examine the association between change in each of symptoms and QOL (baseline to furthest FU) with injury history; time since injury/exposure ($<$ or ≥ 10 years) and time between baseline and follow-up (1 or 2 years) were covariates.

Results: Data from 120 participants (59 clusters; 14-26 years, 52% male) were included. Median time since injury was 8 (5-12) years and 55% had 1 year between baseline and FU. We did not find a significant association between injury history and the longitudinal change in symptoms ($\beta = -1.8$, 95% CI -5.8, 2.2) or QOL ($\beta = 0.9$, 95% CI -1.9, 2.1) over the 1-3 year period.

Significance and future studies: In youth with a 3-12 year knee injury history, symptoms and QOL did not appear to significantly decline within a short-term 1-3 year period. The trajectory of decline that is linked with risk of post-traumatic osteoarthritis may be more complex and over a longer period of time. Future analyses will consider multiple time-points in this longitudinal cohort.

76 | Matteo Ponzano- University of Waterloo; PhD (In progress or completed)

“A Meta-Analysis of Multi-Component Progressive Resistance Training Interventions in People at Risk of Fracture”

Objectives: To assess the effects of progressive resistance training (PRT) on health-related outcomes in people at risk of fracture.

Design: Systematic review and meta-analysis.

Participants: Men and women ≥ 50 years with low bone mineral density (BMD) or fracture history.

Intervention: PRT

Outcomes: mortality, fracture-related mortality, hip-fractures, fragility fractures, falls, physical functioning and disability, health-related quality of life, adverse events, pain, BMD.

Results: 3973 records were identified, 465 were assessed, and 53 were included. PRT may increase the number of people experiencing falls (relative risk [RR] 1.23 95% confidence interval [CI] (1.00 to 1.51), 5 studies) but not the total number of falls (incidence rate ratio [IRR] 1.05 (0.91 to 1.21), 7 studies). PRT improved performance on the Timed Up and Go test (mean difference [MD] -0.89 seconds (-1.01 to -0.78), 13 studies) and health-related quality of life (standardized mean difference [SMD] 0.32 (0.22 to 0.42), 20 studies). PRT may increase total hip (MD 0.00 g/cm² (0.00 to 0.01), 3 studies) but not femoral neck (MD 0.02 g/cm² (0.00 to 0.03), 4 studies) or lumbar spine BMD (MD 0.02 g/cm² (-0.01 to 0.05), 4 studies). PRT reduced pain (SMD -0.28 (-0.39 to -0.17), 16 studies).

Conclusion: PRT may improve health-related quality of life and physical functioning and reduced pain in people at risk of fracture.

Registration: PROSPERO CRD42019120158

84 | Karim Bayanzay- Jersey Shore University; Early Career Researcher (within 5 years of first appointment)

“Restoration of Shoulder and Hip Tilt with Vibroacoustic Waves”

Background: Several studies have demonstrated that focused vibroacoustic stimulation to the C1 segment of the vertebrae can alleviate pain and restore function in chronic back pain patients [1]. Follow up investigations to determine its mechanism have measured biomechanical changes, such as mean axis of rotation (MAR) and improvement in disc health on the cellular level.

Rationale: The process for determining the MAR involves complex geometrical analysis of X-ray images, which are impractical in the clinical setting [4]. Therefore, KKT Orthopedic Spine Centers use specialized calipers to measure the degree of hip and shoulder tilt, as a surrogate marker for spinal alignment.

Purpose: To determine changes in spinal alignment, as measured by shoulder and hip tilt, before and after application of vibroacoustic waves with the KKT Device.

Methodology: This is a retrospective chart review study of a single KKT Orthopedic Spine Center. All patients received at least 12 vibroacoustic interventions for back or neck pain over 6 months. Outcome measures include shoulder and pelvic tilt measured with calipers, as measured by a trained physician. These measures were collected at baseline, after the 6th treatment, and after the 12th treatment.

Results: After reviewing 78 charts, 89.5% and 87.8% of patients experienced improvement in shoulder and hip tilt, respectively. Of those patients, 44.0% and 39.2% returned to a value of 0 degrees (neutral) in shoulder and hip tilt, respectively. Baseline shoulder tilt was 2.3 degrees (SD = 1.3) which was reduced by an average of 1.7 degrees. Baseline pelvic tilt was 2.5 degrees (SD = 1.4), which was reduced by an average of 1.9 degrees after treatment application.

Significance, Impact and Future Studies: We found significant improvements in hip and shoulder tilt after the application of focused vibroacoustic stimulation. However, for further validation, a large multi-center randomized control trial is required and currently underway.

86 | Mahdis Aziderouei- Lakehead University; Masters (In progress or completed)

“Scoping Review of Knowledge Translation Theories in Ergonomic Research”

Context: Identifying Musculoskeletal (MSK) injury risks in industrial settings with physically demanding tasks is a primary focus of Ergonomic Research (ER)¹. Using principles of Knowledge Translation (KT) can be an effective way to integrate stakeholders in the research process to ensure appropriateness of tools and strategies for MSK injury risks². KT theories have been widely utilized to inform research in health contexts however, their application in ergonomics and work health are less clear³. A primary challenge in ER is developing methodologies to disseminate evidence-based solutions for effective use of knowledge by “end-user”⁴. To effectively address research-practice gap, understanding the application of intervention and transferring new knowledge to decision-makers are an important first step².

Objective: To provide a synthesis and appraisal of the application of KT theories applied in ER identifying key tenets of those theories that might inform effective strategies including evaluation of impact. Application of theories in industry and health care system researches has been challenging; thus, the use of applicable KT theories appropriate to the context of the task, job, and environment would facilitate the gap¹.

Method: A scoping review (SR) of KT theories used in ER will be conducted. The literature search will be conducted on KT theory in Ergonomics/Occupational health research between 2000-2019. Literature will be evaluated and critically appraised by researchers for key features of the KT theories such as tenets, limitations, gender, and context.

Implication: It can be difficult to choose a single theory for a dynamic work environment such as mining; some of the theories are informed or modified/tailored for a specific organizational need⁵. The resulting review will help researchers to operationalize theory in developing KT tools to enhance accessibility of knowledge and educate the end-users including workers, union and management⁶.

“The Role of Pain, Musculoskeletal Injuries & Social Behavior on Depression”

Approximately one fifth of Canadian university students suffer from depression or anxiety. Despite this increased in prevalence, there is lack of quality research regarding the causes and role of musculoskeletal injuries on depression among university students.

The purpose of this study was to identify factors (e.g. pain and musculoskeletal injuries) associated with depression, stress and anxiety in Canadian university students. This study was a secondary cross-sectional analysis of baseline (N=298) and one-year follow-up data (N=171) of a 5-year longitudinal cohort study of university students aged 17 years or older. A total score for the Depression, Anxiety, and Stress Scale-14 (DASS-14) was used, where a higher score indicated presence of depression, anxiety, and stress. A multiple regression analysis was conducted to investigate the association between independent variables (e.g. demographics, pain, etc.) with DASS-14 scores, as well as assess prognostic factors that may predict future onset of depression.

There were no significant differences between DASS-14 scores at baseline and at follow-up. At baseline, sex (female), age, difficulty sleeping, pain intensity, peer pressure, and attitudes towards study program were significant predictors of depression, stress and anxiety. Similar predictor variables were found at follow-up. There were no significant prognostic factors for DASS-14 scores at one year. Significant sex differences were found in factors that predicted DASS-14. Importantly, pain intensity was a significant predictor in females, while musculoskeletal injury was significant in males.

Mental health prevention and interventions strategies for university students should consider the role of sex, changes in sleep patterns, attitudes towards study, peer pressure and pain intensity. Future studies should aim to understand the relationship between musculoskeletal injuries/pain and the manifestation of clinical depression.

“Vertebral endplate structural defects: nomenclature and measurement methods”

Background: Evidence suggests a role for vertebral endplate defects in the pathogenesis of back pain. However, a recent study highlighted a lack of agreement among expert researchers and clinicians in the terms used for endplate structural defects.

Originality, Rationale, and Scope: The magnitude and pervasiveness of this problem, hindering accurate communication and synthesis of endplate research, is unknown.

Objective: To summarize the scope of varied nomenclature and measurement methods used to document endplate structural defects in the health sciences literature.

Methodology: A scoping review was conducted according to the York Framework and reported according to PRISMA-ScR. PubMed, Scopus, Embase and CINAHL databases were searched. All screening was conducted by two reviewers independently using the review management software, Covidence. A standardized, pilot-tested form was used to extract data, which were analysed descriptively.

Results: A total of 211 studies were identified that met inclusion criteria, originating from 29 countries with the United States (18.8%) and China (12.26%) as leading contributors. The review uncovered a total of 34 different terms for endplate structural defects, reported in 54 different combinations. Of the 34 terms, some appeared to represent the same phenomenon. Schmorl's nodes were most commonly investigated (n=99 studies) and defined similarly across studies, with the main difference in definition relating to whether the indentation (node) was required to have a sclerotic margin. However, there was great variability in the definitions of other terms commonly representing structural defects. Most of the terms for structural endplate defects were never defined in any study.

Significance: This review provides a foundation and impetus for standardizing terminology and core measures of endplate structural defect phenotypes needed to improve communication and synthesis of the growing body of endplate research to advance the field.
