2020 AAOMPT Annual Conference

Research Report Abstracts: RR 01 – RR 33

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RR 01 [ID: 6]

EVALUATION OF THE EFFECTIVENESS OF A PAIN NEUROSCIENCE EDUCATION CURRICULUM FOR PATIENTS WHO ARE OPIOID ADDICTED WITH CONCURRENT CHRONIC MUSCULOSKELETAL PAIN

Nicole Windsor, Robert English, Judith Daniels, Anne Harrison
Primary Contact: Nicole Windsor, University of Kentucky, nwindsor0415@gmail.com

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Background/Purpose: Chronic musculoskeletal pain (CMP) is estimated to effect over 100 million adults annually and is targeted as an instigator of opioid dependence. Opioid medications are often the first response for patients suffering with CMP, but over 10 million people annually admit to misusing opioids. Further, more than 130 people in the U.S. die every day after overdosing on opioids. With the opioid epidemic, the U.S. now has a population of patients who experience chronic musculoskeletal pain with concurrent opioid dependence. This persistent problem creates a "perfect storm" of fear of movement, low self-efficacy, and dysfunction. A critical component to chronic pain management is understanding how patients view their pain experience; i.e. what a person believes about their pain experience may be far more important than the pain itself. Traditional education utilizes anatomical models that focus on tissue damage, causing patients to become solely-focused on sensation inducing unnecessary fear. Researchers have explored educating people about pain via Pain Neuroscience Education (PNE), a cognitive-based intervention that facilitates understanding of the biological processes underpinning the pain state. While the use of PNE is successful with patients experiencing CMP, it has not been researched in patients who are opioid dependent with concurrent CMP. Therefore, the purpose of this study was to evaluate the feasibility of conducting a PNE curriculum with patients who suffer with CMP and concurrent opioid dependence.
Methods: A retrospective chart review characterized 35 subjects who participate in a local opioid-management program. A feasibility study was performed to determine the best approach for delivery of the PNE curriculum, with two representative subjects who completed pre- and post-intervention questionnaires. A final large study involved 33 subjects; seventeen in the experimental group (PNE) and sixteen in the control group (general health education). Both groups received intervention in four, 15-minute sessions, one-on-one with the PI.
Results: The chart review revealed demographics, functional ability and participation with physical therapy. The kinesiophobia and self-efficacy scores for the pilot subjects showed positive change, as did their knowledge of the PNE concepts. The large study is currently in process.
Discussion/Conclusion: The chart review revealed a lack of participation in physical exercise and physical therapy. Results from the pilot study indicate a PNE curriculum is beneficial in assisting subjects in reframing beliefs regarding their pain experience. The scores on objective measures indicate positive change regarding kinesiophobia and self-efficacy. Further, subjects subjectively voiced results indicating the PNE intervention was "very informative", "easy to understand", and provided "another perspective" regarding the pain experience. We anticipate the results of the large study will mirror the findings from the feasibility study and provide support for the implementation of a PNE curriculum for patients with CMP and concurrent opioid dependence.

RR 02 [ID: 8]

SURVEY OF DRY NEEDLING EDUCATION AND PHYSICAL THERAPIST ASSISTANT'S CURRICULA IN THE SOUTHEAST UNITED STATES: A PILOT STUDY

Amber Karren, Gretchen Seif, Kathryn Hayne, Mary Kathleen Koschnitzki, Emily Harrison, Joseph Donnelly
Primary Contact: Amber Karren, Medical University of South Carolina, karren@musc.edu

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Background/Purpose: Dry Needling (DN) has become a popular intervention for a physical therapist (PT) treatment of trigger points for patients with musculoskeletal pain. Clinical reasoning skills are necessary for implementation of DN, a PT skill, however physical therapist assistants (PTAs) may benefit from baseline knowledge to recognize the need for DN and optimizing patient care. The "Clinical Handbook" for PTAs suggests PTAs should be able to determine when a patient should be evaluated by the PT for DN and if the PT may need to re-examine a patient who has received DN. The purpose of this pilot study was to determine the current level of DN in PTA education in the Southeastern United States.
Methods: PTA schools (n=46) in the Southeastern US (Florida, Georgia, South Carolina, North Carolina, Tennessee, and Virginia) listed on the APTA website were surveyed with a RedCap survey with 8 questions with a list of choices (check all that apply) and comment boxes were used. The Medical University of South Carolina IRB deemed this a quality improvement project and IRB approval was not necessary.
Results: Data was analyzed by percentages of responses. A survey of PTA programs in the Southeast US with a response rate of 52% (n=24), 92% (n=22) accredited, and 8% (n=2) candidates for accreditation. Only 25% (n=6) include DN in the curriculum, 4% (n=1) have 5 contact hours, 13% (n=3) with 2 contact hours, and 8% (n=2) with < 1 contact hour. DN models taught are 21% (n=5) trigger point/intramuscular, 8% (n=2) intramuscular stimulation, 4% (n=2) radiculopathy, 8% (n=2) functional trigger points, and 13% (n=3) superficial trigger points. DN techniques taught are 21% (n=5) pistoning, 8% (n=2) multiple needles, 13% (n=3) multiple needles with electrical stimulation, and 8% (n=2) superficial techniques. DN course activities are 8% (n=2) guest presentation and demonstration, 17% (n=4) education on the theories only, and 25% (n=6) inform on the western biomechanical DN models. Reasons for not including DN in the PTA curriculum: 17% (n=4) lack of qualified faculty, 4% (n=1) lack of finances to hire faculty, 50% (n=12) DN not considered high priority, 67% (n=16) DN not considered an appropriate modality for PTA practice, 21% (n=5) not enough time to include DN education, and 4% (n=1) lack of scientific evidence.
Discussion/Conclusion: Results suggest that there is a lack of education on DN in PTA curricula in the Southeastern US with variability in the exposure and methods taught. Although DN is not considered a PTA intervention, the patient would benefit from the PTA's ability to determine if the PT should evaluate a patient for DN. Additionally, there is a lack of research on the appropriate amount and content of DN education in PTA curricula. Future research should include the PTA schools nationwide.

RR 03 [ID: 9]
SURVEY OF DRY NEEDLING EDUCATION IN PHYSICAL THERAPIST CURRICULA IN THE SOUTHEASTERN UNITED STATES

Kathryn Hayne, Gretchen Seif, Mary Kathleen Koschnitzki, Amber Karren, Emily Harrison, Joseph Donnelly
Primary Contact: Kathryn Hayne, Medical University of South Carolina, hayneka@musc.edu

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Background/Purpose: There is currently no standard for dry needling (DN) education in entry-level curricula. In a 2018 AAOMPT presentation the investigators reported on the level of DN education provided in entry-level physical therapy (PT) programs in the United States (US), including methodology, contact hours, and educator qualifications, but did not report on how these programs included 16 safety skills that were not included in current entry-level practice standards. The objectives: 1. Determine the current level of DN education in entry-level PT programs in Southeastern US; 2. Determine if programs incorporated the 16 identified safety skills into their DN courses; and, 3. If the faculty support their students performing DN on clinical practicums.
Methods: PT program directors (n=38) in the Southeastern US (Florida, Georgia, South Carolina, North Carolina, Tennessee, and Virginia) listed on the American Physical Therapy Association website were surveyed with a RedCap survey with nine questions with a list of choices (check all that apply) and comment boxes. The Medical University of South Carolina's IRB deemed this as a quality improvement project and IRB approval was not necessary.
Results: Data were analyzed by percentages of responses. A survey was sent to PT program directors (n=38) in Southeast US with a response rate of 44.7% (17/38). A majority, 64.7% (n=11), of the programs introduce the theory with hands-on skills, 17.6% (n=3) introduce theory without hands-on skills, and 17.6% (n=3) do not include it. Course objectives were developed from state's requirements (29.4% (n=5)), the Federation of State Boards of Physical Therapy (FSBPT) competencies (41.2% (n=7)), and from a continuing education (CE) course (52.9% (n=9)). The 16 safety criteria were included in the DN course work for 35.3% (n=6) of the programs and 11.8% (n=2) through completion of CE. Five programs, 29.4%, reported their coursework is sufficient to allow students to perform DN while on clinical practicums and 58.8% (n=10) of programs do not support DPT students performing DN while on clinical practicums. Three programs plan to include DN in the future through inclusion of hands-on skills, an extra DN elective, or a full DN course. Two do not plan to add DN courses due to belief that DN is considered a post-professional skill.
Discussion/Conclusion: Dry needling education in Southeastern US entry-level DPT programs varies greatly, particularly in inclusion of the 16 safety skills identified by the FSBPT into the DN courses. These identified skills are important for programs to address consumer safety and to prevent adverse events. Future research should include a survey of all programs to determine the current state of DN education and identify safety considerations in DPT entry-level education.

RR 04 [ID: 10]
SHOULD TRIGGER POINT DRY NEEDLING BE INCLUDED IN ENTRY-LEVEL DPT CURRICULUM?

Emily Harrison, Gretchen Seif, Amber Karren, MaryKathleen Koschnitzki, Kathryn Hayne, Jospeh Donnelly
Primary Contact: Emily Harrison, Medical University of South Carolina, harrisem@musc.edu

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Background/Purpose: Dry needling (DN) has been shown to improve pain thresholds, range of motion, and reduce spasticity. The American Physical Therapy Association and American Academy of Orthopedic Manual Physical Therapists support DN as a skilled intervention for physical therapists, but DN is not currently included in entry-level accreditation standards. However, anecdotally students at The Medical University of South Carolina (MUSC) report performing DN throughout clinical rotations. In a 2018 AAOMPT presentation the investigators reported on the level of DN education provided in entry-level physical therapy (PT) programs in the United States (US), including methodology, contact hours, and educator qualifications. However, they did not report if these programs included the 16 safety skills that were identified by the Federation of State Boards of Physical Therapy (FSBPT) as a part of DN standards. The MUSC PT program includes a two-hour DN lab that includes safety considerations prior to their first clinical practicum and offers an elective prior to their final clinical practicums. Objectives: 1. Identify 2nd year students' exposure (observation and/or performing) to DN on their first clinical practicum; 2. Determine their confidence and knowledge of skills necessary to safely perform the technique after a 2-hour exposure lab.
Methods: Current second year DPT students (class of 2021) at MUSC (n=62) were surveyed with a RedCap survey with a response rate of 93% (n=58). This survey was modeled on previous surveys from the literature related to perceptions of the introduction of thrust joint manipulation to entry-level PT programs. The MUSC IRB deemed this as a quality improvement project and IRB approval was not necessary.
Results: Only 24% (n=14) of students were not exposed to DN on their first clinical rotation. Over 50% (n=34) said that they somewhat disagreed or disagreed in their confidence and ability to perform all the components of DN on patients. The students showed confidence in identifying an appropriate patient 77% (n=47), identifying trigger points 74% (n=43), and recognizing the precautions and contraindications to the technique 86% (n=50).
Discussion/Conclusion: Data were analyzed by percentages of responses. While DN is not currently considered an entry-level skill, results of this survey demonstrate that a majority of MUSC students (76%) are exposed to DN while on their first clinical practicum. While a 2-hour lab is not sufficient to instruct students in all aspects of DN, there is a need to expose students to the safety considerations of the technique prior to clinical practicums. If clinicians are expecting students to perform DN while on clinical practicums, the entry-level DPT programs need to instruct students in the safety considerations of DN identified by the FSBPT. We recommend that CAPTE align with consumer safety standards of the FSBPT if student physical therapists are performing DN on patients during clinical experiences.

RR 05 [ID: 13]

RELIABILITY AND ACCURACY OF AN EXPERT PHYSICAL THERAPIST AS A REFERENCE STANDARD FOR A MANUAL THERAPY JOINT MOBILIZATION TRIAL

Evan Petersen, Stephanie Thurmond, Catherine Shaw, Kelly Miller, Tommy Lee, Jonathan Koborsi
Primary Contact: Evan Petersen, University of the Incarnate Word, evan.j.petersen@gmail.com

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Background/Purpose: Traditional teaching methods for learning manual therapy skills have consisted of an expert instructor demonstrating techniques followed by student practice sessions. This method places expert instructors in a de facto role as a reference standard in the classroom without providing evidence that their skills are either accurate or reliable. Previous studies on joint mobilization have used expert practitioners as the reference standard as there is no current evidence on what ideal forces would be for effective mobilizations. However, none of these trials have documented the reliability or accuracy of the reference standard. Therefore, the purpose of this study is to report both the reliability and accuracy of an expert physical therapist (PT) acting as a reference standard for a manual therapy joint mobilization trial.
Methods: A secondary analysis was performed using data from a published randomized, controlled, crossover study. A board-certified, fellowship-trained manual physical therapist with 20 years of experience served as the reference standard for the study. The mobilization technique studied was the central posterior to anterior (PA) joint mobilization of the L3 vertebra. A loadpad force monitoring device was used to record all force production data. Twenty-four mock patients were recruited from faculty, staff, and doctoral students of an accredited physical therapy program. Reliability and accuracy data for the reference standard were collected over four time periods spanning 16 weeks.
Results: Intrarater reliability of the expert PT for R1 and R2 joint forces was excellent (R1 Force $ICC_{3,3}$ 0.95, 95%CI 0.76-0.99 and R2 Force $ICC_{3,3}$ 0.90, 95%CI 0.49-0.99). Additionally, the expert PT was 92.3% accurate (mean % error ± SD, 7.7±5.5) when finding Grade III mean peak mobilization force and 85.1% accurate (mean % error ± SD, 14.9±8.3) when finding Grade IV mean peak mobilization force. Finally, correlations between actual applied forces and computed ideal forces were excellent (Pearson r 0.79 - 0.92, n=24, P < 0 .01 for all correlations).
Discussion/Conclusion: The expert PT in this manual therapy joint mobilization trial showed excellent reliability and accuracy as the reference standard. The study supports the use of implementing quantitative feedback devices into the teaching of joint mobilization when a reliable and accurate reference standard has been identified.

RR 06 [ID: 14]

Patient Expectations of Benefits from Physical Therapy and its Relationship to Self-Reported Outcomes, A Pilot Study

Craig Wassinger, Jeny Pearcy, Michael Bourassa, Dustin Barrett, Chad Cook
Primary Contact: Craig Wassinger, East Tennessee State University, wassinger@mail.etsu.edu

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Background/Purpose: Many psychosocial factors have been described as influencing patient outcomes. The objectives of this study were to correlate patient expectations at baseline and after 2 weeks of physical therapy to the change in self-reported outcomes between evaluation and discharge.
Methods: This prospective cohort study was performed on adult patients with a variety of musculoskeletal disorders. Patients were asked how helpful they thought physical therapy would be for their overall outcome from physical therapy using a 0-10 scale (0: not at all, 10: extremely helpful) at evaluation and after two weeks of treatment. Common regional outcome measures (ODI, NDI, LEFS, QuickDASH) and the Patient-Specific Functional Scale (PSFS) were used to measure self-reported outcomes. Spearman correlations were performed with the two expectation ratings and change in outcome scores from evaluation to discharge.
Results: Seventeen patients with complete follow up data were available for analysis. The proportion of injuries by region was, lower extremity injuries 35%, cervical spine 6%, upper extremity 47% and low back 12%. Individual expectations fluctuated but on average expectations were high for positive outcomes (mean 8.7/10) both at the baseline and two-week time points. Baseline expectations were not significantly correlated to change in regional outcomes ($r=0.443$, $p=0.075$) nor to change in PSFS ($r=0.111$, $p=0.672$) over the course of treatment. Furthermore, expectations at two-weeks were not significantly correlated with change in regional outcomes ($r=0.330$, $p=0.196$) yet were significantly correlated with change in the PSFS ($r=0.490$, $p=0.046$). Small to moderate effects were noted for all correlations.
Discussion/Conclusion: In this study, patients' outcomes appear modestly correlated with self-reported outcomes. This relationship was stronger at two-weeks compared to baseline. Initially, patients may have incompletely formed expectations from physical therapy but over time they develop more fitting expectations. Clinicians might consider periodic measuring of patient expectations as part of the evaluation and treatment process. Further research is warranted to examine the relationship between patient expectations and self-report outcomes.

RR 07 [ID: 16]
BENEFITS OF AN INTERNATIONAL SERVICE-LEARNING COURSE IN HONDURAS FOR DPT STUDENTS: A SINGLE BLIND CASE-CONTROL STUDY

Todd Watson, Jessica Graning, Timothy Eckard
Primary Contact: Todd Watson, Western Carolina University, twatson@wcu.edu

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Background/Purpose: International service-learning (ISL) activities are formalized, structured, collaborative academic experiences that encompass participation in organized service activities, practical experiences, and critical reflection. Clinical reasoning (CR) is defined as a multidimensional process by which clinical data, gathered together with the patient, is assessed to make decisions for diagnosis and treatment planning. Communication is also inherent in the CR process, first to oneself to check for reasoning errors; with colleagues to explain decision logic; and to involve and educate patients in decision-making. The assessment of CR in physical therapy clinical education is primarily achieved through student performance on the physical therapist clinical performance instrument (PT CPI) during clinical education. The PT CPI assesses a student's performance in all subdomains of professional practice and patient management and is completed during each clinical education experience. The purpose of this study was to determine if there were differences in aggregate and subdomain performance on the PT CPI between doctor of physical therapy students enrolled in an elective ISL course and matched controls.
Methods: Twenty-three doctor of physical therapy student who participated in an elective ISL were compared to controls matched on age, gender, cohort and clinical setting utilizing a case-control design. McNemar's tests were used to compare the relative proportions of ISL participants and controls that had each PT CPI subdomain listed as a strength. A Wilcoxon signed ranks test was used to determine if the total number of PT CPI subdomains listed as "strengths" differed significantly between ISL participants and their matched controls.
Results: There were no statistically significant main effects for ISL participation in any subdomain of the PT CPI. A significantly greater proportion of ISL participants than controls had "communication" listed as a strength in the PT CPI comments ($p=0.04$). ISL participants also had significantly more subdomains listed as strengths compared to their matched controls ($p < 0.01$).
Discussion/Conclusion: This study is the first to examine PT CPI performance pre-post ISL experience. A unique feature of this ISL course was the interaction and collaboration among students and supervising PTs for communicating reasoning as well as structured reflection (360°feedback) for self, peer and mentor feedback. In addition to students explaining their own CR for cases at each time-out stage, the supervising PT guided students as they developed hypotheses and plans for case management. The results of this study suggest that participation in an ISL with an emphasis on clinical care may accelerate doctor of physical therapy student gains in communication and overall clinical performance.

RR 08 [ID: 20]
CLINICAL DECISION-MAKING PROGRAM REDUCED RISK OF ADVERSE EVENTS FOLLOWING TOTAL KNEE ARTHROPLASTY OVER 3 YEARS

Seth Peterson
Primary Contact: Seth Peterson, The Motive Physical Therapy Specialists, srpeterson01@atsu.edu

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Background/Purpose: Adverse events occur in approximately 3-9% of patients having total knee arthroplasty (TKA). Fewer adverse events after TKA may reduce hospital readmissions and overall cost of care, which could improve patient management and have implications for developing bundled payment models. The primary purpose of this retrospective cohort study was to examine the impact of a clinical decision-making program on the risk of adverse events in patients with TKA. A secondary purpose was to determine if the program impacted the risk of not reaching standard knee range of motion (ROM) goals, function at discharge, or number of visits used.
Methods: One hundred sixty total patients were included. Ninety-one adults in the 36-month period after program initiation were compared to 69 adults in the 18-month period prior. Subjects were identified who underwent TKA postoperative rehabilitation from 2014-2018 using the electronic health record of one outpatient physical therapy clinic. Adverse events were defined as surgical site infections, deep vein thrombosis (DVT), revision surgeries within 90 days of the procedure, and manipulation under anesthesia. Discharge function was measured by the Lower Extremity Functional Scale (LEFS). Standard knee ROM goals were identified as 0° knee extension and 120° knee flexion at discharge. The program consisted of quarterly meetings and signs posted within the clinic emphasizing strategies to identify high-risk patients, reduce DVT and infection, and emphasize early restoration of knee extension. Absolute risk reduction (ARR), relative risk reduction (RRR), and number needed to treat (NNT) were calculated to determine if a reduction of risk had occurred. Mean discharge LEFS and number of visits used were analyzed.
Results: Adverse events occurred in 13.04% (95% CI, 7.02%-22.97%) of patients before the program and 1.1% (95% CI, 0.19%-5.96%) afterward. The ARR for adverse events was 11.94% (95% CI, 0.42-0.22), the RRR was 8.42% (95% CI, 1.09%-64.93%), and the NNT was 8 (95% CI, 5-24). The proportion of patients not reaching full knee extension was reduced from 26.09% (9% CI, 17.19-37.51) to 7.69% (95% CI, 3.78-15.04%), leading to an ARR of 18.39% (95%CI, 6.85%-30.47%), RRR of 70.51% (95% CI 33.38%-86.95%), and NNT of 5 (95% CI, 3-15). Patients not reaching 120° of knee flexion was 15.94% (95% CI, 9.14%-26.33%) prior and 5.49% (95% CI, 2.37%-12.22%) afterward, leading to an ARR of 10.45% (95% CI, 0.88%-21.30%), RRR of 65.53% (95% CI, 5.39%-87.44%), and an NNT of 10 (95% CI, 5-114). There was no difference in the discharge LEFS score or the number of visits used.
Discussion/Conclusion: The clinical decision-making program reduced the risk of adverse events following TKA. The risk of not reaching ROM goals by discharge was also substantially reduced.

RR 09 [ID: 21]
CAN THE FAB-Q PREDICT FUNCTION AND DISABILITY IN PATIENTS WITH LOW BACK PAIN? A RETROSPECTIVE ANALYSIS

Mathew McClanahan, Sarah Ferrelli
Primary Contact: Mathew McClanahan, Memorial Hermann, mattm033@gmail.com

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Background/Purpose: Low Back Pain (LBP) is the leading cause of disability globally and is multifactorial in nature. The biopsychosocial and fear-avoidance models are used to describe the multifactorial aspects of this population yet current research fails to identify the relationships between fear-avoidance behaviors, physical performance, and self-reported disability. The primary purpose of this study was to identify if the Fear Avoidance Beliefs Questionnaire - Total (FAB-Q) better predicts disability (Modified Oswestry) or physical performance (Functional Lumbar Index) in individuals with LBP. The secondary purpose was to determine the relationship between disability (mODI) and physical performance (FLI).
Methods: This was a retrospective study conducted through the University of Texas Health Science Center and Texas Woman's University in Houston, TX between July 1, 2017 and February 5, 2020. The database consisted of 630 subjects with a primary complaint of cervical or lumbar pain. Inclusion criteria consisted of individuals 18-80 years, primary complaint of LBP with/without leg pain, and the individual receiving a physical therapy evaluation for conservative/pre-operative care. Exclusion criteria consisted of having a neurological condition, decline to participate, or if they were unable to perform physical performance tests (PPT's) due to a reason other than LBP. An orthopedic physical examination was given and mODI, FAB-Q, Front and Side Plank, Sorenson, and FMS overhead squat data were collected. Two separate linear regression analyses were run between the FAB-Q Total and mODI and the FAB-Q and FLI. A Pearson correlation was run between the FLI and the mODI using IBM SPSS 25.
Results: 212 subjects were included in the study. There was a significant correlation/prediction for the FAB-Q predicting the mODI (R=.409, R2 = .167, p=.000). There was a non-significant correlation/prediction for the FAB-Q predicting the FLI (R=.094, R^2 = .009, p=.173). There was a significant correlation between the FLI and mODI(R=.576, p=.000). A post-hoc analysis was performed because the FAB-Q and FLI were highly correlated with the mODI but not with each other. A simple linear regression with multiple independent variables was run with a significant correlation/prediction for the FAB-Q and FLI predicting the mODI (R=.677, R^2 = .459, p=.000).
Discussion/Conclusion: The FAB-Q is a better predictor of the mODI than it is of the FLI, and the mODI has a moderate correlation with the FLI. However, combining physical performance and fear-avoidance beliefs only accounts for 46% of perceived disability. FAB-Q was utilized to measure the psychological aspect of the biopsychosocial model. However, variables such as depression, anxiety and other psychological factors could likely contribute to the unexplained 54% of perceived disability. Additionally, further research should be performed to identify the impact of social factors on perceived disability in the LBP population.

RR 10 [ID: 23]

PREDICTIVE VALIDITY OF A NOVEL FUNCTIONAL SCREEN IN DETERMINING SUCCESS OR FAILURE OF CONSERVATIVE CARE FOR PATIENTS WITH LOW BACK PAIN: A RETROSPECTIVE STUDY

Pedro Migliano
Primary Contact: Pedro Migliano, Memorial Hermann, pedro.migliano@gmail.com

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Background/Purpose : Low back pain (LBP) is a common and costly cause of disability with 80% of the population experiencing some form of LBP during their lifetime, and is estimated to cost up to US$624 billion a year. Given the prevalence of LBP, there has been a push to research predictors of outcome for both conservative and surgical management. There is a dearth of research directly examining function as a predictive tool for patients with LBP. The Functional Lumbar Index (FLI) was developed as a tool to assess the functional capabilities of patients with LBP. The FLI is rated on a 0-11 scale and is scored based on a patient's ability to perform a set of functional tests. The purpose of this study was to examine the predictive validity of the FLI in determining success or failure of conservative care for patients with LBP.
Methods: A retrospective cohort study was performed using data collected from July 1st, 2017 and March 1st, 2020. IRB approval and informed consent were acquired. Participants were classified into either the success (showed ≥ MCID improvement on modified Oswestry in 4-8 weeks) or failure (opted to switch from conservative to surgery) group. Participants were excluded if they had any missing data. A hierarchical logistic regression was run with significant predictors based on previous literature placed in model A (age, BMI, pain intensity, pain duration, fear-avoidance questionnaire, and neuro motor/sensory/reflex screen) and the predictor of interest placed in model B (FLI). A ROC curve was run on the FLI and sensitivity, specificity and likelihood ratios were determined.
Results: 9 participants (age: 65.33 ± 11.38, BMI: 27.23 ± 5.03) in the failed group and 25 participants (age: 55.08 ± 16.99, BMI: 28.27 ± 5.62) in the success group met inclusion/exclusion criteria. The inclusion of the FLI (model B) in the logistic regression significantly improved model A (Model B: R^2 = .46; Model $\chi^2(7)$ =12.92, p=.074; classified 88.2% of cases; Model A: R2 = .21; Model χ^2 (4) =5.32, p=.26; classified 73.0% of cases) and the FLI was the only significant predictor in the model (b = .49, odds ratio = 1.63 [1.02, 2.61]). ROC curve showed a significant area under the curve (.78, p = .01, cut-off: 6.5). FLI showed good psychometric properties (sensitivity: .84, specificity: .78, +LR: 3.78, -LR: .21).
Discussion/Conclusion: The FLI demonstrates good predictive validity in determining patients with LBP who will likely do well with conservative care. The FLI is an inexpensive and quick tool to help determine the best plan of care for LBP patients.

RR 11 [ID: 27]

EXAMINING CORRELATION BETWEEN DEEP NECK FLEXOR ENDURANCE AND THE NECK DISABILITY INDEX

Ruben Fonseca, Caleb West
Primary Contact: Ruben Fonseca, Memorial Hermann, ruben.fonseca@memorialhermann.org

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Background/Purpose: Cervical disorders pose a significant burden in the US, cited as the 4th leading cause of years lost to disability and costing over $87 billion annually to manage. Numerous interventions have been proposed for conservative management of cervical pain, with deep neck flexor (DNF) training amongst the most common. However, current evidence is mixed regarding efficacy of DNF training and who best benefits. Active range of motion (ROM) is a commonly assessed measure and has been correlated to increased pain and disability when limitations exist, but not all peoples with neck pain and disability have ROM limitations. It is possible that ROM may be a key factor in discerning which people with neck pain may best benefit from DNF training. Thus, the purpose of this study is to investigate the correlation between DNF endurance and disability in subjects with and without cervical ROM deficits.
Methods: This is a retrospective cohort study utilizing a subset of data collected between July 2017 and January 2020 at a hospital based physical therapy clinic. Subjects aged 18-80 with neck pain with or without radiation were included. Primary objective measures analyzed were cervical active ROM measured by the Cervical Range of Motion device; perceived disability measured by the Neck Disability Index (NDI); and DNF endurance measured by the DNF Endurance Test. Solely for categorization purposes not used in analysis, subjects were allocated to the "limited ROM" group if they demonstrated greater than 10 degree deficit in total cervical rotation as compared to age matched norms from literature. They were otherwise placed in the "full ROM" group. A Pearson correlation was run between the DNF endurance times and NDI using IBM SPSS v25.
Results: A total of 155 subjects were analyzed, with n=51 in the full ROM group and n=104 in the limited ROM group. A significant correlation was found (p value <.01) between DNF endurance and the NDI in the limited ROM group, but not in the full ROM group, with p values of -.399 and .288, respectively.
Discussion/Conclusion: With statistical significance found only in the limited ROM group, there is potential that ROM has an underlying influence on DNF endurance and disability. However, our results may be a product of poor assessment measures and the study's limitations, thus more research is needed to conclusively determine who may best benefit from DNF training.

RR 12 [ID: 28]

THE SHORT-TERM EFFECTS OF THORACIC TRANSVERSE MOBILIZATION IN PATIENTS WITH SUBACROMIAL SHOULDER PAIN

Robert Boyles, Sarah Taketa, Kyle Morris, Hannah Descoteaux
Primary Contact: Robert Boyles, University of Puget Sound, bboyles@pugetsound.edu

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Background/Purpose: Background: There is evidence that manual physical therapy directed to the thoracic spine is effective for treating patients with subacromial shoulder pain (SSP). However, most of the literature involves cervical and thoracic (CT) manipulation rather than CT mobilization. CT manipulation is not considered safe for all patients, therefore, the therapeutic effects of CT mobilization in patients with shoulder pain needs to be researched further. Purpose: The overall purpose is to measure the effects of a single treatment session of thoracic spine transverse mobilization (TSTM), combined with a single home stretching exercise, in patients with SSP immediately after treatment, and at 48 hours later.
Case Description: This is a one group single treatment pretest/posttest study design, assessing TSTM and exercise effects on shoulder range of motion (ROM), patient perception of treatment effects using the Shoulder Pain and Disability Index (SPADI) and Global Rating of Change Scale (GRCS), and in shoulder pain using the 11 point Numeric Pain Rating Scale (NPRS). Eight patients (five females, three males; mean age 26.75 +8.14) with shoulder pain meeting inclusion criteria, completed a standardized shoulder examination, and received treatment using TSTM and a single home stretching exercise. Outcome measures were taken at baseline, immediately following treatment, and at 48-hour follow-up.
Outcomes: At the 48-hour follow-up session, the SPADI and NPRS scores were statistically significant ($p < 0 .01$). The mean GRCS score = 1.625 was not clinically meaningful, and changes in shoulder ROM measurements were not statistically significant. The overall SPADI score did not reach the minimum clinincally important difference (MCID) with a 6.8% change, however the SPADI Pain subscale did, with a 10.0% change.
Discussion/Conclusion: In conclusion, a single treatment session of non-thrust TSTM and exercise provided a statistically significant decrease in self-reported shoulder pain and disability measures as measured by the SPADI and NPRS in patients at 48-hour follow-up. However, the changes observed did not reach the level of the MCID for the SPADI and NPRS, except for the SPADI Pain subscale. Future studies may be warranted to study the effects of TSTM on long term follow-up, multiple TSTM treatments, and in a comparison with a control group, in patients with subacromial shoulder pain.

RR 13 [ID: 29]
THE EFFECTS OF A THRUST MANIPULATION TO THE ANKLE ON PAIN, STIFFNESS AND/OR GAIT KINEMATICS

Emily Slaven, Nick Alarcio, Chander Fields, Mallory Hayes, Emily Weiss, Nathanial Eckert
Primary Contact: Emily Slaven, University of Indianapolis, slavene@uindy.edu

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Background/Purpose: Ankle sprains are among the most prevalent musculoskeletal injuries within both athletic and general populations; it has been reported that nearly 23,000 individuals in the United States experience an ankle sprain every day. Individuals suffering from chronic pain, instability, and stiffness as a result of ankle sprains may turn to surgery to alleviate symptoms and restore function. There is limited but moderate evidence suggesting manual therapy (MT) as a treatment option for chronic ankle sprains. Research has provided evidence demonstrating improvements in functional outcomes such as pain and range of motion as a result of MT focused at the ankle. No studies to date have quantified the immediate effect of a thrust manipulation to the ankle to determine the mechanism by which symptoms are alleviated. Therefore, the purpose of this study was to determine if, in patients with chronic ankle sprain, a decrease in pain, stiffness, and/or gait kinematics following a thrust manipulation to the affected ankle occurs through biomechanical mechanisms, neurophysiological mechanisms, or a combination of the two.
Methods: Methodology included a first step approach, investigative inquiry that consisted of eleven participants (6 male, 5 female; mean + SD age, 26.09 + 4.25 years) with a previous history of ankle sprain > 3 months with recurring pain and/or stiffness. Participants underwent a series of pre- and post-ankle thrust manipulation testing. To test for biomechanical mechanisms, a three-dimensional motion analysis was used to analyze gait kinematics (ankle DF/PF, ground reaction forces (GRF), velocity, and range). Pre- and post-thrust manipulation measurements of ankle DF, ankle PF, and GRF were compared using a paired t-test. Velocity and range measurements were compared using the Wilcoxon Signed-Ranks test due to the non-parametric data. To test for neurophysiological mechanisms, a combination of static pain measures (pain pressure threshold (PPT) and heat threshold) and dynamic pain measures (conditioned pain modulation and offset analgesia) were used. All mechanical sensation based testing was measured with a pressure algometer (Wagner FPX, Greenwich, CT). All temperature based testing was run using Q Sense CPM System, Medoc (Ramat Yishai, Israel).
Results: There were no significant differences in ankle DF ($p=0.596$), ankle PF ($p=0.680$), GRF ($p=0.524$), velocity ($p=0.625$), and range ($p=0.534$) following thrust manipulation compared to baseline, however pre- and post- data did show differences in pain pressure threshold. There were no significant differences in dynamic pain measurements (Offset Analgesia; $p=0.654$, CPM; $p=0.591$), however, within static pain measurements there were significant differences in pressure pain in response to the ankle thrust ($p=0.046$).
Discussion/Conclusion: The results of this study suggest that the effects of a thrust manipulation to the ankle occur through a neurophysiological mechanism as demonstrated by a change in pressure pain thresholds. One major limitation within this study was the number of subjects; the lack of sample size could play a significant role in finding significant differences in other variables. Also, the onset of the Covid-19 pandemic prevented further data collection for this study.

RR 14 [ID: 30]
TIMING OF INITIATION OF PT INFLUENCE ON OUTCOMES: A RETROSPECTIVE ANALYSIS

Lucia Hamilton, James Camarinos, Lee Marinko, Daniel Sieczkiewicz, Masanao Yajima, Luyin Fu
Primary Contact: Lucia Hamilton, Boston University, lucyham17@gmail.com

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Background/Purpose: Research supports early physical therapy (PT) for neck and low back pain with improved patient outcomes and decreased healthcare utilization. However, the value of early PT across other musculoskeletal disorders is unclear. By examining the influence of early PT on patient-reported outcomes and pain, we can determine if patients benefit from more timely intervention.
Methods: Retrospective cohort analysis of patients enrolled in PT from September 1, 2016 to March 19, 2019 from the Rehabilitation Outcomes Management System (ROMS) database at Boston University. Regression analyses were run to determine whether timing of initiation of PT had an effect on percent change of patient report outcomes and change in pain score for each major body region treated in outpatient PT.
Results: Our study included 2494 non-operative patients (42% male, 58% female, with an average age of 36 years old). Across most body regions, the longer the wait time to initiate PT, the less improvement was seen on respective functional outcome measures and the numerical pain rating scale (NPRS). More specifically, for each 50% delay in initiating treatment (ex: seen at 21 days vs 14 days after injury) there was a statistically significant reduction in improvement for the standardized outcome measures for foot/ankle (2% in LEFS), lumbar spine (1% in ODI), hip (1.5% in LEFS), cervical spine (1% in NDI), and knee (0.5% in KOS). Similarly, for the NPRS each 50% delay was associated with significant increase in pain for foot/ankle (2%), lumbar spine (1.5%), hip (1.5%), and cervical spine (2%) pathologies.
Discussion/Conclusion: In our study, there was a positive clinical impact of early physical therapy leading to better pain and functional outcomes for patients across most bodily regions. This not only supports previous research for the lumbar and cervical spine, but also supports the need for timely intervention for hip, knee and foot/ankle pathologies.

RR 15 [ID: 31]
EARLY CHANGES IN TREATMENT EXPECTATIONS AND PREFERENCES IN PATIENTS WITH LOW BACK PAIN SEEKING PHYSICAL THERAPY

David Shirey, Joel Bialosky
Primary Contact: David Shirey, Brooks Rehabilitation/University of Florida, david.shirey@brooksrehab.org

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Background/Purpose : Expectations and preference for care influence outcomes in patients with low back pain (LBP). Less well studied is whether these change over an episode of care. The purpose of this study was to assess changes in patients with LBP expectations and preferences prior to and following one week of physical therapy (PT).
Methods: Participants with LBP seeking PT completed online questionnaires for demographics, clinical outcomes, and general expectations as well as intervention specific expectations and preferences prior to the initial visit. General expectations for how participants expected to feel upon completion of PT were assessed with a 15-item Likert scale ranging from a very great deal worse to a very great deal better. Treatment specific expectations and preferences were measured using 101 point numeric rating scales anchored with completely disagree to completely agree. Participants indicated whether they believed specific interventions including massage, strengthening exercises would help to improve this episode of LBP (expectation) and whether they preferred to receive the intervention (preferences). Participants completed identical expectation and preference questionnaires within a week following the initial PT session.
Results: Nineteen participants provided informed consent. (11 males, mean duration LBP 89.84 weeks (sd= 154.17)) At baseline, four participants expected to be "a tiny bit worse" to "somewhat worse" following PT. Eight expected to be a "tiny bit better" to "moderately better". Seven expected to be "quite a bit better" to "a very great deal better." Intervention specific expectations were highest for massage mean 59.11 (sd= 18.93); range of motion exercise mean 63.63 (sd= 20.17); and strengthening exercise mean 65.53 (sd= 17.76). Lower expectations were indicated for surgery mean 36.28 (sd= 26.36) and traction mean 36.47 (sd= 30.69). Intervention specific preferences were highest for massage mean 62.06 (sd= 20.82); range of motion exercise mean 63.06 (sd= 24.91); and strengthening exercise mean 65.89 (sd= 26.11). Lower preferences were indicated for medication mean 32.50 (sd= 24.38); rest mean 38.17 (sd= 22.37); surgery mean 15.11 (sd= 25.47); and traction mean 33.28 (sd= 32.39). Following the initial PT session, general expectations improved for 8 participants, worsened for 3, and did not change for 4 participants. Significant ($p< 0.10$) changes in intervention specific expectation were observed following the PT evaluation with worsening expectations for medication and modalities, and improved expectations for range of motion exercise. Trends were observed for worsening of expectations for surgery and improved expectations for strengthening exercise. Small, non-significant changes were observed for all intervention specific preferences.
Discussion/Conclusion: General baseline expectations for PT were high. Patients reported higher expectations and preferred massage and exercise intervention. General expectations and treatment specific expectations showed small change following the initial PT session. Larger changes may require purposefully and systematically assessing and targeting expectations and preferences through educational, collaborative approaches.

RR 16 [ID: 37]

THE INFLUCENCE OF CENTRALIZATION AND DIRECTIONAL PREFERENCE ON SPINAL CONTROL IN PEOPLE WITH NONSPECIFIC NECK PAIN

Ronald Schenk, Ellory Roberts, Andrew Bartz, Seth Goodier, Alex Warthling, Joseph Lorenzetti
Primary Contact: Ronald Schenk, Daemen College, rschenk@daemen.edu

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Background/Purpose: Pain related to disorders of the cervical spine is one of the leading causes of musculoskeletal disability in the United States. Due to the increasing prevalence of neck pain and its associated physical and economic impact, research is necessary in order to examine the most efficacious intervention strategies. Treatment based classification (TBC) approaches have shown promise in managing people with low back pain. Mechanical Diagnosis and Therapy (MDT) is a musculoskeletal classification system that utilizes repeated end range movements in specific directions in order to determine if the patient demonstrates a directional preference (DP) defined as the patient's preferred direction of movement. Painful musculoskeletal conditions have been shown to affect spinal control, and research pertaining to the lumbar spine suggests that patients display improvements in lumbar spinal control as a result of exercising in their DP. The purpose of this study was to investigate the effects of pain on the spinal control of individuals with non-specific neck pain.

Methods: Twenty-six patients presenting with neck pain were recruited from a hospital based outpatient physical therapy clinic in Western New York State. The patients were evaluated by an MDT credentialed clinician. The initial examination consisted of a cervical spine evaluation which included, but was not limited to, a series of repeated end range movements of the cervical spine in various directions while the patient's response was monitored by the clinician. At completion of the repeated end range movement examination, the physical therapist classified the participants into one of three groups: directional preference (DP), directional preference with centralization (Cent), and non-directional preference (Non DP). If patients demonstrated DP in response to the movement tests, they were educated on home exercises in their DP while avoiding aggravating factors. Patients in the Non DP group were instructed to perform general ROM exercises while also avoiding aggravating factors. Immediately following the evaluation, spinal control was assessed with the deep neck flexor test (DNFT), which was administered by another clinician blinded to the patient's MDT classification. The patients attended 3 follow up sessions over the course of 4-weeks. The MDT credentialed clinician reassessed the patient through a mechanical evaluation to determine if a modification or progression of their home exercise was needed. At the 4th physical therapy session, patients were again assessed by the DNFT by the same clinician who performed the initial test.

Results: There was a significant improvement in pain scores from initial to final visit for the group that demonstrated DP ($p < 0 .001$). There was no significant improvement in pain scores from initial to final visit for the group that did not demonstrate directional preference (Non DP) ($p=0.258$). The results also demonstrated a significant difference in mean pain scores between the DP group and the Non DP group ($p=0.013$). Relative to DNFT performance of the groups, there was evidence of significant improvements of DNFT scores (as measured by holding time) over time in the DP group ($p < 0 .001$). There was no significant improvement in DNFT scores in the Non DP group. The final averages of DNFT scores were significantly higher in the DP groups compared the Non DP group ($p=0.009$). Spearman's test for correlation demonstrated that there was a significant correlation between pain scores and DNFT scores ($p=0.049$).

Discussion/Conclusion: In this limited sample, patients who demonstrated DP demonstrated greater reductions in pain than patients who did not demonstrate DP. Patients who demonstrated DP also had longer holding time on the DNFT over time compared to patients who did not demonstrate DP. The data suggests that people who demonstrate DP may demonstrate immediate improvement in spinal control of the cervical spine.

RR 17 [ID: 38]

DOES GLENOHUMERAL MOBILIZATION SYMPTOM RESPONSE AT THE INITIAL EVALUATION PREDICT OUTCOMES IN PATIENTS SUFFERING FROM SUBACROMIAL PAIN SYNDROME? A COHORT STUDY

Sean Riley, Jonathan Harris, Bryan O'Halloran, Chris Showalter, Ken Learman
Primary Contact: Sean Riley, Sacred Heart University, rileys4@sacredheart.edu

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Background/Purpose: A positive response of a ≥ 2-point reduction on the Numeric Pain Rating Scale (NPRS) at the initial evaluation following manual interventions maybe related to ≥ 50% improvement on functional outcomes in patients with low back pain. The purposes of this study was to determine: (1) if there is a difference in outcomes between positive responders (PRs) and negative responders (NRs) to glenohumeral joint (GHJ) mobilizations at the initial evaluation, 2-week, and 4-week follow-up in participants with subacromial pain syndrome (SAPS); (2) if there are statistically significant differences in outcomes within these groups at the time points of interest; and (3) if PRs was predictive of an improvement of ≥ 8 on the QuickDash.
Methods: PRs and NRs were identified at the initial evaluation. Treatment consisted of pragmatically applied physical therapy interventions that included passive shoulder mobilization. Descriptive statistics identified subject characteristic and the proportion of PRs and NRs to GHJ mobilization at the initial evaluation. Between and within group differences between PRs and NRs were determined for the initial evaluation, 2-week follow-up, 4-week follow-up. A multivariate regression analysis was used to determine if PRs at the initial evaluation was predictive of a change of ≥ 8.0 on the QuickDASH at the 4-week follow-up.
Results: The cohort included 121 participants (99 PRs) at the initial evaluation. At the 4-week follow-up there were statistically significant differences between PRs and NRs for shoulder abduction active range of motion (AROM) ($U=619.5$, $p=0.02$, $r=0.22$), the Global Rating of Change Score (GRoC) ($U=605.5$, $p=0.01$, $r=0.23$) and on the QuickDash ($U=636.0$, $p=0.03$, $r=0.20$). These statistically significant differences corresponded with a small effect sizes ($r < 0.30$). The within group differences for these variables were all statistically significant ($p < 0.01$) and corresponded to effect sizes of 0.83, 0.57, 0.83 respectively for the PRs between the initial evaluation and 4-week follow-up. NRs also had statistically significant within group differences between the initial evaluation and 4-week follow-up for shoulder abduction AROM ($p = 0.03$), GRoC ($p= 0.03$), and QuichDash (< 0.001) with effect sizes of 0.50, 0.48, and 0.83 respectively. A multivariate regression revealed that PRs at the initial evaluation was not predictive of a change of ≥ 8.0 on the QuickDASH at the 4-week follow-up.
Discussion/Conclusion: The observed statistically significant differences between PRs and NRs to shoulder mobilization corresponded with small effect sizes. Although PRs was not shown to be predictive of a change of ≥ 8.0 on the QuickDASH, the high prevalence of PRs in the cohort may have influenced the results. Future research should look to determine if PRs to GHJ mobilization perform better when randomly assigned interventions that do and do not include GHJ mobilizations.

RR 18 [ID: 39]

PRAGMATIC APPLICATION OF THRUST VERSUS NON-THRUST MANIPULATION TO THE UPPER SEGMENTS OF THE CERVICAL SPINE PLUS EXERCISE FOR TREATMENT OF CERVICOGENIC HEADACHE: A RANDOMIZED CLINICAL TRIAL

Bryan O'Halloran, Megan Donaldson, Addison Lerner-Lentz, Josh Cleland
Primary Contact: Bryan O'Halloran, Pain Relief and Physical Therapy, bryano@painrelief-pt.com

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Background/Purpose: The effectiveness of non-thrust versus thrust manipulation for the management of spinal conditions, including cervicogenic headache, is conflicting. It appears that study designs using a prescriptive approach to treatment consistently find a significant difference between techniques while those using a pragmatic approach do not. However, a pragmatic approach to non-thrust versus thrust manipulation has not been examined in a patient population with cervicogenic headache. Objectives: To evaluate the effectiveness of non-thrust manipulation compared to thrust manipulation applied in a pragmatic fashion for individuals with cervicogenic headache.

Methods: Methods: Forty-five (26 females) participants with cervicogenic headache (mean age 47.8 ± SD 16.9 years) were randomly assigned to receive either pragmatically selected non-thrust or thrust cervical manipulation. Outcomes were measured at baseline, 48-hours, discharge, and 1-month follow-up and included the Neck Disability Index (NDI), Numeric Pain Rating Scale (NPRS), the Headache Impact Test (HIT-6), the Global Rating of Change (GRC), the Patient Acceptable Symptoms Scale (PASS) and cervical range of motion. The primary aim (effects of treatment on disability and pain was examined with a mixed-model analysis of variance (ANOVA), with treatment group (thrust versus non-thrust manipulation) as the between subjects variable and time (baseline, 48 hours, discharge and follow-up) as the within subjects variable.

Results: Results: The overall group*time interaction for the mixed model ANOVA was not statistically significant for NDI (p= 0.91), NPRS (p=0.81), or HIT-6 (p=0.89). There was no significant difference between groups for the GRC or PASS. Additionally, no significant interaction was found for cervical range of motion flexion (p= 0.84), extension (p= 0.7), side bending right (p=0.65), side bending left (p=0.75), rotation right (p= 0.93) or rotation left (p=0.95).

Discussion/Conclusion: Discussion and Conclusion: The results suggest that non-thrust manipulation has similar effects on disability, pain, global rating of change, and cervical range of motion as thrust manipulation when applied in a pragmatic fashion for individuals with cervicogenic headaches.

RR 19 [ID: 40]
BIOMECHANICS OF THE RIBS DURING RESPIRATION AT THE COSTOTRANSVERSE JOINT:AN IN-VIVO RETROSPECTIVE PILOT STUDY

Michael Maninang
Primary Contact: Michael Maninang, University of Chicago Medicine and Andrews University, micmancebu@aol.com

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Background/Purpose: Rib motion during respiration has been generally described as performing a pump handle motion at the upper ribs and bucket handle motion at the middle to lower ribs. These motions are governed by the orientation of the mechanically linked costovertebral and costotransverse joints as viewed in the transverse plane. The motion of the rib at the costotransverse joint has been described as moving posterolaterally during inhalation and anteromedially during exhalation. The purpose of this study is to measure the motion direction and amount of movement of a rib at the costotransverse joint during quiet respiration using 4-D Computerized Topography (CT) scans.
Methods: This study was a descriptive, in-vivo, retrospective observational study with convenience sample of 4D CT scans of patients, who have received the imaging procedure in preparation for radiation therapy. The scans were registered using the demons deformable registration method. The vector displacement, the relative displacement (difference), the magnitude (3D length) of the displacement and the motion direction with the Lateral (L)- Medial (M), Anterior (A)- Posterior (P), Superior (S)- Inferior(I) schemes were obtained.
Results: The results showed that the average of relative displacement magnitude for all the costotransverse joints investigated in this study is 1.088070621 millimeters from an expiratory point (EP) to inspiratory point (IP). The motion direction in the transverse plane from EP to IP varied at each rib level with 21 joints moving lateral and anterior, 27 joints moving lateral and posterior, 15 joints moving anterior and medial and 19 joints moving posterior and medial. Sixty-three percent of the ribs moved inferiorly, while 37 percent moved superiorly.
Discussion/Conclusion: This study concludes that there is minimal motion occurring at the costotransverse joints during quiet respiration and that the motion direction can occur in a combination of all 3 planes. This study confirms previous clinical observations that the ribs move proximally at the costotransverse joints during quiet respiration. This implies that these joints can be potentially subjected to abnormal stresses, which can lead to biomechanical abnormalities and be a source of nociception. This finding necessitates a biomechanical assessment in the clinic to determine its contribution to the symptomatology of a patient reporting of ribcage pain, which has been deemed to be of musculoskeletal origin. The lack of total concurrence with the previous clinical observation of the ribs' motion direction informs the examiner to assess the rib motion at the costotransverse joint without the bias of previous clinical presumptions. This study provides the basis for the need to biomechanically assess the costotransverse joint in the clinic, but does not inform us of the optimal method to perform the assessment.

RR 20 [ID: 44]

ADHERENCE TO CLINICAL PRACTICE GUIDELINES FOR THE MANAGEMENT OF NECK PAIN: A SURVEY OF ORTHOPAEDIC PHYSICAL THERAPY RESIDENTS

Michael Bourassa, Matthew Randolph, Adam Stevens, Adam Church, Sarah Bradley, Sammie Dunlay, Courtney Hall, Jeny Pearcy, Russell Smith
Primary Contact: Michael Bourassa, East Tennessee State University, bourassa@etsu.edu

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Background/Purpose: The Academy of Orthopaedics in conjunction with the Journal of Orthopedic & Sports Physical Therapy (JOSPT) have published guidelines for the management of musculoskeletal conditions and established strategies to improve outcomes and provide consistency across physical therapy practice. The purpose of this study was to assess current orthopaedic physical therapy residents' adherence and knowledge of these clinical practice guidelines (CPGs) through the dissemination of an electronic case-based survey. The resident's responses were assessed for adherence to currently established guidelines.
Methods: A survey invitation was sent to one hundred and six orthopaedic physical therapy residency programs. Participants chose treatment interventions for six different case scenarios: (1) neck pain with mobility deficit, (2) neck pain with movement coordination impairment, (3) neck pain with headache, (4) neck pain with radiating pain, and (5-6) two case scenarios involving physical therapy red flags for cervical myelopathy and cervical spine fracture. For each case, participants were able to choose up to five interventions for initial treatment. Adherence was determined by selection of all recommended interventions identified within the cervical CPG of each category. Kruskal-Wallis test was used to analyze resident's adherence across geographical regions and Spearman's rho was performed to test for correlation between adherence and residents' demographics.
Results: Sixty-three orthopaedic residency participants from thirty-seven programs initiated the survey and consented, forty-nine completed all clinical scenarios. Data collection showed that 87.76% were adherent to the management of cervical myelopathy, and 83.67% were adherent to the management of a cervical spine fracture, 31.58% were adherent in the management of a mobility deficit, 9.26% were adherent in the management of a movement coordination impairments, 29.41% were adherent in the management of neck pain with headaches, 2.04% were adherent in the management of radiating pain. Subsequent analysis of non-adherent responses revealed minor variations resulting in non-adherence.
Discussion/Conclusion: Current orthopaedic residents were found to have a strong understanding of managing cervical spine red flags as compared to treating musculoskeletal conditions associated with the cervical spine. The adherence variation found was comparable to previous studies of adherence to CPGs within the lumbar spine. This study demonstrates a potential need for programs to assess their implementation of practice guidelines during residency curriculum to assist in reduced physical therapy practice variability.

RR 21 [ID: 45]

ADHERENCE TO CLINICAL PRACTICE GUIDELINES FOR THE MANAGEMENT OF LOW BACK PAIN: A SURVEY OF THIRD YEAR PHYSICAL THERAPY STUDENTS

Michael Bourassa, Courtney Hall, Madison Burris, Kyle Hershberger, Justin Yakel, Matthew Stanton, Jeny Pearcy, Grant Disney
Primary Contact: Michael Bourassa, East Tennessee State University, bourassa@etsu.edu

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Background/Purpose: Low back pain (LBP) is a prevalent and consistent reason to seek physical therapy care within the United States. The demand for physical therapists to provide a low-cost, first-line treatment alternative for LBP management is growing. The Academy of Orthopaedics within the American Physical Therapy Association, in conjunction with the Journal of Orthopedic & Sports Physical Therapy (JOSPT) have published Clinical Practice Guidelines (CPG) for the treatment and management of LBP. While previous studies have evaluated physical therapists' adherence to these CPGs, adherence among physical therapy students has yet to be assessed. The purpose of this study was to examine low back pain CPG adherence among third year Doctor of Physical Therapy (DPT) students.
Methods: Third year DPT students were recruited from 46 accredited physical therapy doctoral programs across the United States. Students chose treatment interventions for six different case scenarios: (1) low back pain with mobility deficit, (2) low back pain with movement coordination impairment, (3) low back pain with referred leg pain, (4) low back pain from red flag condition and (5-6) two case scenarios involving depression and fear avoidance behaviors (i.e., yellow flags). For each case, participants were able to choose up to five interventions from a designated list for initial treatment. Adherence was determined by the selection of all recommended interventions identified within the low back pain CPG of each category. Spearman's rho was performed to test for correlations between adherence and students' demographic information.
Results: A total of 66 third year DPT students completed all sections of the survey. Exposure to CPG's was reported to be 63% among students surveyed. Adherence to red flag pathology was significantly higher (85.2%) than adherence to fear avoidance behaviors (42.2%) and depression (25.4%). Adherence in lumbar musculoskeletal conditions was highest for LBP associated with movement coordination impairments (44%), followed by LBP with mobility deficit (37.2%), then LBP with referred leg pain (28.4%). There was a weak significant correlation (-.251) between low back pain with movement coordination impairment and timing of the last musculoskeletal course on the lumbar spine. The data also suggested that students were inconsistent with CPG recommendations for education in home exercise program and education in symptom alleviating postures and movement.
Discussion/Conclusion: Third year DPT students demonstrated a strong understanding of red flag conditions compared to yellow flag conditions. Adherence to musculoskeletal causes of low back pain were similar to previous studies surveying licensed therapists. This study illustrates a potential need for physical therapy programs to evaluate the implementation of low back pain CPG's within their program's curriculum. Future research is needed to further investigate this topic and provide guidance related to the implementation of CPG's within DPT programs.

RR 22 [ID: 59]

THE IMPACT OF A THRUST MANIPULATION TO THE HIP JOINT: A BIOMECHANICAL OR NEUROPHYSIOLOGICAL RESPONSE, OR BOTH? A PILOT STUDY

Emily Slaven, Nathanial Eckert
Primary Contact: Emily Slaven, University of Indianapolis, slavene@uindy.edu

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Background/Purpose: Thrust manipulation can rapidly reduce pain and increase perceived motion in the hip joint. The exact mechanism by which these changes in pain and increased motion of the hip occur remains unclear. The purpose of this study is to better understand whether an immediate biomechanical, neurophysiological, or a combination occurs as a result of a thrust manipulation to the hip joint.
Methods: Ten participants (34 ±11yrs) with self-reported history of hip pain for at least 3 months completed the study. Prior to a thrust manipulation participants underwent instrumented gait analysis to assess kinematic and kinetic variables. Neurophysiological testing including static (i.e. pressure pain (PPTs) and heat thresholds) and dynamic (i.e. conditioned pain modulation (CPM) and pain offset) measures of pain perception. All tests were repeated following a thrust manipulation to the hip.
Results: No statistically significant differences in hip range or peak hip extension occurred as a result of the thrust manipulation; however the loading response in the vertical ground reaction force did significantly increase following the thrust ($p=0.027$, $d = 1.75$). No statistically significant differences were found in the static or dynamic pain measures. However, the dynamic pain scores of the conditioning stimulus for CPM approached significance ($p=0.53$, $d = 0.35$) pre-post hip thrust.
Discussion / Conclusion: Loading of the painful limb changed following thrust, and neurophysiological mechanisms may have played a role in effecting this change. A larger sample size is needed to confirm these preliminary results.

RR 23 [ID: 63]

THORACIC SPINE THRUST MANIPULATION FOR INDIVIDUALS WITH CERVICOGENIC HEADACHES: A CROSSOVER RANDOMIZED CLINICAL TRIAL

Amy McDevitt, Paul Mintken, Josh Cleland, Dan Rhon, Rebecca Altic, Drew Courtney, Paul Glynn
Primary Contact: Amy McDevitt, The University of Colorado, amy.mcdevitt@cuanschutz.edu

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Background/Purpose: Headache disorders are an extremely common complaint, often resulting in disability and a reduction in quality of life. The worldwide prevalence of headache disorders is reported to be 96%, with the percentage of adults with an active headache disorder estimated at 46%. Studies have shown that manipulative therapy reduces pain and disability in individuals with cervicogenic headache (CeH). However, no studies have examined the effects of thoracic spine manipulation (TSM) for the treatment of individuals with CeH. The purpose of this study was to determine if TSM leads to a greater reduction in headache disability and neck related pain and disability compared to no treatment in individuals with CeH.
Methods: Consecutive participants presenting with CeH were randomized to 6 sessions of TSM or Hold. After 4-weeks, groups crossed over to the other intervention. Outcomes to 12 weeks included: headache disability inventory (HDI), neck disability index (NDI), numeric pain rating scale (NPRS), and the global rating of change (GRC). Outcomes were analyzed using a linear mixed-effects model with Bonferroni correction. Odds of achieving the minimal clinically important difference (MCID) on the GRC of +4 or greater were also calculated.
Results: Forty-eight participants; mean age 34.4; average symptom duration > 3 years enrolled in the study. Comparing hold to active treatment, there was no significant between-group difference on the HDI (mean difference=7.39, 95CI: -4.39 to 19.18; P = 0.214), but the difference between groups on the NDI was significant (mean difference=6.90, 95CI: 0.05 to 13.75; P=0.048). Odds of achieving the +4 MCID on the GRC (OR=38.0, 95CI: 6.6 to 220.0; P < 0 .001) favored TSM.
Discussion/Conclusion: TSM had no effect on headache-related disability as measured by the HDI but resulted in significant improvements in neck-related pain and disability and participant reported perceived improvement. The addition of TSM in the management of individuals with CeH may be beneficial in reducing neck disability. Future studies are needed to examine the long-term impact of TSM in this population.

RR 24 [ID: 65]
RELIABILITY AND VALIDITY OF A NOVEL TOOL FOR THE CLINICAL MEASUREMENT OF PRESSURE PAIN THRESHOLD IN HEALTHY SUBJECTS

Bre Reynolds, Joseph Kelly , Nina Orr, Tess Marcordes, Jordan Cook, Rachel Zwilling, Cal Vrchota, Kelly Mordini
Primary Contact: Bre Reynolds, South College, breynolds@south.edu

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Background/Purpose: Pressure pain threshold (PPT) is a quantifiable palpatory assessment of tenderness defined as the minimum amount of pressure needed to cause a sensation of pain. Reduced thresholds have been reported locally in the region of primary pain as well as in distant or remote locations. PPT has been used to quantify pain in common musculoskeletal conditions as well as complex conditions such as central sensitization. Digital algometers are used in research to measure PPT, however, they are expensive and use in clinical practice is limited. The purpose of the study was to evaluate the intrarater reliability and criterion validity of a modified inexpensive tool that could be used in the clinical measurement of PPT.
Methods: In this cross-section design, PPT was measured in 100 healthy participants at 5 different anatomical locations: temporalis, masseter, C6 spinous process, lateral epicondyle, and 1st dorsal interossei. PPT was measured with both a standard digital algometer (kg/cm2) and a novel modified tool (mL) for 3 trials in each location. For the novel tool, a rubber seal was glued to the end of a plunger flange and became the point of pressure during measurement. Data was collected using the mL scale on the barrel of the syringe (precision 0.2mL; range 0-12mL). Intraclass correlation coefficients (ICC 3,1) were used to measure intrarater reliability and Spearman correlation coefficients were used to describe validity as it related to the criterion standard digital algometer.
Results: One hundred healthy participants (45% male, mean age 29) with no known musculoskeletal pain volunteered for this study. Moderate to excellent intrarater reliability was found at all anatomical sites with the use of the novel tool and algometer. ICC values with the novel tool ranged from 0.766 to 0.895 at each location tested; algometer values ranged from 0.714 to 0.920. A strong to very strong statistically significant correlation was noted between the algometer and modified tool at all anatomical sites tested (range -0.753 to -0.812). A negative correlation was expected because increasing pressures on the modified tool result in lower (mL) readings while increasing pressures on an algometer (kg/cm2) result in higher readings.
Discussion/Conclusion: This study is the first to examine intrarater reliability and criterion validity of a modified novel tool to measure PPT. Results suggest good to excellent interrater reliability and strong correlations to the standard digital algometer. Given that this novel tool is inexpensive and easily replicable, it may be useful to clinical practice for objectively tracking changes in pain. Future research is necessary to test additional anatomical sites and replicate results in various populations including those seeking physical therapy for pain or other musculoskeletal dysfunction.

RR 25 [ID: 68]
MEDICAL IMAGING: WHAT IS IT TELLING US?

John Waggoner, Cameron MacDonald
Primary Contact: John Waggoner, Regis University, john.waggoner22@gmail.com

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Background/Purpose: Imaging studies are frequently relied on as a go-to standard for "diagnosis" in healthcare within the United States. Recent research has shown that the U.S. specifically has spent twice as much as other high-income countries on medical care with lessened outcomes. One reason is the higher use of Magnetic Resonance Imaging (MRI) and Computed Tomography (CT) scans vs other countries. Chronic neck and low back pain are the most common areas where these imaging studies occur, however recent studies suggest that one-third of people over 45 years old have changes in the spine without pain. Hip, shoulder, and ankle imaging has also shown high rates of pain-free patients with "findings" on MRI and CT scans. This relates to the field of physical therapy in that there are daily interactions with patients and with healthcare providers on the relevancy of imaging and patient presentation. Being more familiar with the role of patient symptoms and imaging will be beneficial in helping guide patient treatment and in providing education on imaging to the relevant medical community.
Methods: The search included databases PubMed, Google Scholar, and EBSCO Host through the Regis University Library access. The search was conducted during the months of 07/2019-08/2019. Search terms included: "Asymptomatic Findings", "Imaging", "Abnormal Findings", "Prevalence", "MRI" and "CT scan". Articles were utilized that were after the year 2001; no articles were included in findings prior to the year 2001.
Results: Numerous studies and articles were found that demonstrated high prevalence of abnormal findings in spinal and joint imaging studies despite lack of symptoms. Nakashima et al investigated MRIs that were analyzed in 1211 healthy pain-free people, aged 20 to 70 years. Most people presented with disc bulging (87.6%), which significantly increased with age in terms of frequency, severity, and number of levels. Even most people in their 20s had bulging discs, 73% of males and 78% of females. Wasserman et al in 2018 showed that high number of the world's premier athletes from the 2016 Rio de Janeiro Summer Olympics demonstrated moderate to severe spine disease on MRI, including moderate/severe degenerative disc changes with varying degrees of disc bulges and herniations. Abnormal findings and asymptomatic individuals were also linked to peripheral joint imaging findings. Culvenor et al in 2018 showed that 5397 pain-free uninjured knees were found to show cartilage defects (11% in under 40 year-olds, 43% in over 40 year-olds), meniscal tears (4% in under 40 year-olds, 19% in over 40 year-olds), and osteophytes (18%), with prevalence increasing with age. Frank et al in 2015 found the prevalence of pain-free hips with impingement cam deformity was 37% (55% in athletes versus 23% in the general population) and the prevalence of pain-free hips with pincer deformity was 67%. Labral injury was found on MRI in 68% of pain-free hips.
Discussion/Conclusion: Regardless of the body region imaged by MRI or CT, there are a large amount of pain-free or asymptomatic patients found to have positive findings. Many of these degenerative or abnormal "findings" are common age-related changes and not reflective of functional status or pain as demonstrated with research and literature reviews. Physical therapists help reduce imaging costs by providing evidence-based examination techniques and treatments toward specific goals based on functional status. The prevalence of positive findings in pain-free individuals should be communicated effectively by providers to patients within the healthcare community while also bearing in mind the relevance of patients with positive findings and

presenting with symptoms. Better understanding the role of imaging and symptoms will better assist physical therapists in providing musculoskeletal evaluation and intervention.

RR 26 [ID: 71]
LOCAL AND WIDESPREAD HYPOALGESIC EFFECTS OF UPPER EXTREMITY NEURODYNAMICS

Daniel Maddox, Barrett Stanley, Poonam Hurley, Fredy Solis
Primary Contact: Daniel Maddox, Upstream Rehab Institute, cmaddox182@gmail.com

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Background/Purpose: The purpose of this study was to assess and contrast the immediate effects of 2 different neurodynamic mobilization (NDM) techniques and a sham technique on local and widespread hypoalgesia in asymptomatic subjects. Hypotheses are: (1) Subjects receiving NDM will exhibit greater changes in local and widespread quantitative sensory testing (QST) measures than those receiving sham NDM, and (2) Subjects receiving slider NDM will exhibit greater changes in local and widespread QST measures than those receiving tensioner NDM.
Methods: Brenau University IRB approval (1208684-5) was obtained, and registration was completed with ClinicalTrials.gov (NCT03674489) for this double-blind randomized controlled trial. 60 asymptomatic subjects aged 18-65 were randomly allocated to three groups – slider, tensioner, and sham NDM. The slider and tensioner techniques targeted mobilization of the median nerve. The outcomes of interest were changes in local and widespread QST measures of pain pressure threshold (PPT), thermal pain threshold (TPT), and thermal pain tolerance (TPTol). Baseline QST was conducted at 6 standardized anatomic locations - over bilateral thenar eminences, bilateral dorsal aspects of the 1st carpo-metacarpal joints, and bilateral tibialis anterior muscle bellies. Following baseline testing, subjects received intervention by a 2nd examiner per randomized group allocation. Following intervention, the 1st examiner completed follow-up testing, which mirrored baseline testing. The 1st examiner was blinded to group allocation, and the 2nd examiner was blinded to testing results. For analysis purposes, "local" QST variables simply reflect the measures taken from the L thenar eminence (median nerve field), while "widespread" QST variables reflect the average of the measures taken at the remaining 5 testing sites. Following assessment of normality via Shapiro-Wilk tests, within-group change for each dependent variable was assessed using paired t-tests or Wilcoxon Signed Rank tests; and between-group difference in change for each dependent variable was assessed using Kruskal-Wallis H-tests.
Results: While several significant within-group pre-to-post changes were observed, no significant between-group differences were found, with p-values as follows: Local PPT: p=.67 Widespread PPT: p=.30 Local TPT: p=.11 Widespread TPT: p=.88 Local TPTol: p=.51 Widespread TPTol: p=.34
Discussion / Conclusion: Although statistically significant within-group differences were observed for multiple QST variables in multiple groups, there was no significant interaction between groups. These findings suggest that in asymptomatic subjects, NDM may be no more effective than sham NDM in producing a hypoalgesic effect. Limitations include a relatively small sample size and the potential for a lack of true placebo in the sham NDM technique utilized. While the sham NDM technique has been utilized elsewhere in published literature, to the authors' knowledge it has not been validated. Future studies should seek to validate the sham NDM (or explore alternate methods of sham NDM) and should assess for hypoalgesic effects of NDM in various symptomatic populations – such as those with local, regional, and widespread pain syndromes.

RR 27 [ID: 79]
CHANGES IN HIP STRENGTH AND MUSCLE ACTIVATION FOLLOWING TIBIOFIBULAR AND ANKLE JOINT MANIPULATION

Brian Swanson, Michael Lawrence, Jamie Raymond
Primary Contact: Brian Swanson, University of Hartford, bswanson@hartford.edu

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Background/Purpose: Ankle sprains are one of the most common musculoskeletal injuries in the United States. Changes in muscular activity have been reported in individuals with a history of ankle sprain, including altered latency of the ankle, knee, and hip musculature during functional tasks, altered proximal function during balance tasks and diminished firing of the hip extensors and ipsilateral weakness of the hip abductors. Previous studies have noted that limitations in one joint complex can lead to changes in muscle activation in another joint complex. Therefore, the purpose of this study was to determine if high velocity low amplitude manipulations of the ankle region could increase force output and muscle activation of hip musculature in individuals with a history of ankle sprain and unilateral hip abductor weakness during muscle testing.
Methods: This investigation utilized a single-arm repeated measures design. Twenty-five participants were tested at three time points (pre-manipulation, immediate post-manipulation, and 48h post-manipulation) for force output and immediately pre-post manipulation for muscle activation of the rectus femoris, gluteus medius, and TFL. Manipulations were applied to the talocrural, subtalar, proximal, and distal tibiofibular joints of the weaker limb. No contralateral manipulations were applied. One-way ANOVAs were utilized to compare maximal and average force production for each limb and paired t-tests were utilized to compare muscle activation pre-post manipulations.
Results: Average force in the involved limb increased from pre-manipulation (65.7 N) to 48h post-manipulation (77.8 N, p=.011), maximal force increased (76.9 N) to 48-hours post-manipulation (87.8 N, p=.026), and maximal and average Gluteus medius activation increased 9.8% and 12.2% respectively immediately post manipulation. Changes in force production were not significant immediately pre-post manipulation, and no significant differences were found in the uninvolved limb.
Discussion/Conclusion: A combination of HLVA manipulations of the ankle joints improved hip abductor strength at 48 hours post intervention, and the results of this study suggest that HVLA ankle region manipulations may improve hip abductor strength in individuals with a history of ankle sprain and unilateral weakness. It is important to consider that the increase in strength and activation in a static testing position may or may not translate to improved function. Further research is required to clarify the effects of joint manipulation on muscle activity, and to determine why increases in force production, which were not immediately apparent, were present at 48 hours post-manipulation.

RR 28 [ID: 83]
AGENDA SETTING AND THERAPEUTIC ALLIANCE IN OUTPATIENT PHYSICAL THERAPY: A DESCRIPTIVE STUDY

George Clevenger, Bryan Pickens, Shawn Stoute, Matthew Helton, Christopher Allen, Jon Umlauf
Primary Contact: George Clevenger, Army-Baylor University, GKClevenger@gmail.com

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Background/Purpose: Effective communication is essential for quality care. A patient's ability to articulate their agenda for seeking care without interruption is fundamental to the clinical encounter. Interruptions communicate to the patient that their perspective is less important and may contribute to medical errors. Beyond data gathering, the interview is critical to establishing the therapeutic alliance with the patient. To date, there are no studies that describe physical therapist agenda setting and interruptions. Furthermore, there are no studies that attempt to explore the relationship between agenda setting and interruptions as they relate to the therapeutic alliance.
Methods: Physical therapists and patients were recruited at one large hospital-based system from two direct access and two referral-based outpatient physical therapy clinics. Providers ranged from entry-level students to fellowship trained physical therapists. Patients were excluded if their complaints directly related to surgical interventions or if they presented with red flags of a potentially serious condition. The interview was audio recorded and an independent physical therapist later reviewed the recording to quantify the agenda elicitation and interruptions. Interruption was defined as simultaneous over talk initiated by the therapist. Immediately following the initial encounter, the patients and physical therapists completed the Work Alliance Index (WAI). Patients also completed the Pain Rehabilitation Expectations Scale (PRES) and an overall satisfaction questionnaire.
Results: Nineteen physical therapists (age = 34.6±7.4; mean years of practice = 6.9±6.1; and 47.4% female) and 83 patients with a variety of musculoskeletal complaints were enrolled in the study (age = 34.0±11.9; NPRS was 3.64±2.3; 47.4% female). In 38 of the 78 (48.7%) encounters in which the physical therapists elicited the patient's agenda the therapist interrupted the patient after a mean of 3:13±2:40 min:sec. There was a mean of 4.0±4.3 interruptions per encounter with 7.4% occurring within the first 60seconds. Physical therapy as direct access providers elicited the patient's agenda 75.9%. There was no correlation with agenda setting or interruptions with patient satisfaction or therapeutic alliance.
Discussion/Conclusion: Physical therapists in this study elicited the patient's agenda in 47.8% of initial encounters. However, patients had an average of 3 minutes to complete their agenda prior to the physical therapist interruption or redirection. This is in stark contrast to previously reported findings in the medical literature where the agenda elicitation ranges from 23-74% and patients are interrupted in as little as 11-23 seconds. Establishing the patient's agenda or frequency of interruption did not adversely impact the patient perspective of therapeutic alliance or satisfaction. Physical therapist operating as direct access provider are as effective if not more than other primary care providers at eliciting the patient's agenda.

RR 29 [ID: 84]
BARRIERS TO PHYSICAL THERAPY ACCESS IN A PUBLIC HOSPITAL SYSTEM

Allison Butcher, Sarah Worth, Wayne Brewer
Primary Contact: Allison Butcher, Harris Health System, allisonhall2012@gmail.com

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Background/Purpose: Barriers to healthcare can be financial or non-financial in nature; those who struggle with financial barriers are significantly more likely to also face non-financial barriers. Physical therapy often requires patients to attend multiple sessions in a short period of time, placing a larger burden on those without regular or trustworthy transportation. The purpose of this study was to determine how transportation affects physical therapy management in a publicly-funded hospital system for under- and uninsured patients.
Methods: One hundred fifteen subjects over the age of 18 were included after giving informed consent; patients had to be determined appropriate for outpatient orthopedic physical therapy intervention and scheduled for at least one follow-up visit after their initial evaluation. A four-question survey was provided to subjects at their initial evaluation to assess their overall ability to travel to their physical therapy appointments: 1. How difficult is it for you to get to your physical therapy appointments? 2. How reliable do you feel your transportation is? 3. How do you get to your physical therapy appointments? 4. How long does it take you to get to your physical therapy appointments? Patient charts were later utilized to investigate attendance, based on number of appointments attended out of number of appointments scheduled. Demographic information including age, race, sex, and insurance was also collected.
Results: Subjects travelled an average of 40 minutes per visit, and attended 50% of their scheduled appointments overall. 55% of subjects drove themselves to their appointments, 30% came with a family member or friend, and 15% relied on public transportation. Significant correlations were found between self-perceived reliability vs difficulty ($r = .36$, $p < .001$), difficulty vs time ($r = -.25$, $p = .007$), reliability vs time ($r = -.30$, $p = .001$), and mode vs time ($\eta = .53$).
Discussion/Conclusion: Self-perceived reliability and difficulty, travel time to appointments, and mode of transportation were all found to be important factors in physical therapy management. Patients often travel well over an hour round-trip to their appointments, and struggle to attend their scheduled visits. Physical therapy facilities should consider clinic location, hours, and public transportation availability in order to ensure that their patients have access to care, especially when serving under- and uninsured patients. Overall, physical therapists must consider what economic, environmental, and demographic factors are affecting patients outside of their physical therapy sessions, particularly when working with this underserved patient population. Understanding these social determinants of health outside of the medical chart is key to optimizing outcomes and improving quality of life.

RR 30 [ID: 86]

ULTRASOUND DEMONSTRATES EXCELLENT BETWEEN SESSION RELIABILITY TO QUANTIFY POSTERIOR GLENOHUMERAL TRANSLATION

Shawn Stoute, Jon Umlauf, Bryan Pickens, Kathleen Hogan, Christopher Allen
Primary Contact: Shawn Stoute, Army-Baylor University, Stoute64@yahoo.com

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Background/Purpose: Posterior glenohumeral accessory motion is important for normal glenohumeral kinematics. Both passive and active structures contribute to available glenohumeral translation. Diagnostic ultrasound demonstrates good intra-rater reliability in assessing posterior glenohumeral translation; however, it is unknown whether the amount of translation is stable over time under identical loads. This is important in determining an appropriate washout period after interventions that may change glenohumeral mobility. As part of a larger project investigating immediate change in posterior glenohumeral translation after joint mobilization, we assessed the intra-rater and test-retest reliability of a novel procedure to quantify posterior glenohumeral translation.

Methods: Eight asymptomatic individuals between the age of 18 and 50 participated (3 females; age= 32.5± 8.0 years; BMI= 24.5± 3.0). Posterior glenohumeral translation was assessed under four posterior force conditions during two sessions separated by 7-14 days. A two-assessor team used a GE SonoSite ultrasound device for image capture and the Novel Loadpad® device to standardize linear posterior glide force. Three separate images were captured for baseline, 50N, 100N and 150N in sequential order on both shoulders. Following collection, all images were analyzed in Image J software using the vertical measurement between the coracoid and lesser tuberosity to quantify posterior translation. Twenty images were randomly selected from the first five participants and retraced using Image J to examine reliability of the measurement technique. To determine intra-rater reliability within session and test-retest reliability, intraclass correlation coefficients (ICC) with 95% confidence intervals were calculated using SPSS. Furthermore, displacement scores of posterior translation from baseline to the three force conditions were calculated for each session. Two separate two-way repeated measure ANOVAs examined the differences in the displacement scores between sessions for each shoulder.

Results: The reliability of the measurement technique using Image J was excellent, ICC =0.99. The intra-rater reliability ranged from good to excellent (ICC=0.81-0.99). Test-retest reliability for the dominant and non-dominant shoulder at all force conditions ranged from moderate to excellent reliability (ICC= 0.55-0.94; ICC=0.80-0.92) respectively. There was no session by force interaction for the dominant or non-dominant shoulder respectively ($F=1.858$, $p=0.21$, $F=1.81$, $p=0.07$).

Discussion/Conclusion: Diagnostic ultrasound is a reliable tool to assess posterior translation of the glenohumeral joint. These methods demonstrate moderate to excellent test-retest reliability indicating that glenohumeral posterior translation is moderately stable over time. Ultrasound assessment was able to reliably measure motion at the glenohumeral joint under varying posterior forces. Therefore, the novel procedure used in this study can be used to reliability measure changes in glenohumeral translation.

RR 31 [ID: 91]
MUSCULOSKELETAL IMAGING COMPETENCY OF PHYSICAL THERAPISTS

Michael Ross, Troy Burley, Lori Brody, William Boissonnault
Primary Contact: Michael Ross, Daemen College, mross@daemen.edu

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Background/Purpose: The purpose of this study was to evaluate the musculoskeletal imaging competency of physical therapists through completion of an examination titled the Burley Readiness Examination (BRE) for Musculoskeletal Imaging Competency. We hypothesized that examination performance would be related to formal imaging training, board certification, and other imaging-related training beyond entry-level (e.g., continuing education, residency/ fellowship training, years in practice).
Methods: One hundred twenty-three physical therapists from the United States who practiced in various settings volunteered to participate in this study (74 men, 49 women; ages: 25-34 years, n=50; 35-44 years, n=34; 45-54 years, n=22; 55-64 years, n=14; 65-74 years, n=3; number of years of clinical practice: <1 year, n=4; 1-5 years, n=33; 6-10 years, n=27; 11-15 years, n=14; >15 years, n=45). Seventy-six participants had achieved clinical specialist certification through the American Board of Physical Therapy Specialties. The BRE for Musculoskeletal Imaging Competency has been previously shown to be valid and reliable and it is comprised of 151 multiple choice questions. Eighty-five questions were related to radiographs, 49 questions to magnetic resonance imaging, 8 questions to ultrasound imaging, 6 questions to computed tomography scans, and 3 questions to bone scintigraphy. A passing score of 75% to demonstrate basic competency in the area of musculoskeletal imaging was established. Descriptive statistics and frequency counts were used to examine participant characteristics. Independent sample t-tests, one-way analyses of variance, and chi-square tests were used to compare examination scores between groups according to practice and training characteristics. The level of significance was set to $p<0.05$
Results: The mean overall examination score of all physical therapists was 72.8 ± 8.8%. Fifty-one physical therapists (41%) obtained a passing score of ≥75%. Physical therapists reporting formal additional imaging training were the only group to achieve an average passing examination score (76.7%). Significantly higher examination scores ($p<.001$) were also found between physical therapists with additional levels of training and board certification than those with only entry-level training.
Discussion/Conclusion: The BRE for Musculoskeletal Imaging Competency has the potential to standardize levels of baseline competencies that practitioners possess to promote full integration of musculoskeletal imaging into their practice settings. The results of this study demonstrated that physical therapists with additional imaging training had the highest average examination scores and were the only group to achieve the recommended passing score. These results may have important implications for health policy decisions regarding physical therapists referring for diagnostic imaging, as well as imaging training for physical therapists.

RR 32 [ID: 96]
CHRONIC SPINAL PAIN: A PROPOSED PHYSICAL THERAPY MODEL FOR EVALUATION AND MANAGEMENT

Michael Ross, Ronald Schenk, Joseph Lorenzetti
Primary Contact: Michael Ross, Daemen College, mross@daemen.edu

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Background/Purpose: While spinal pain is currently the leading cause of disability worldwide, it also accounts for the greatest amount of health care spending in the United States when compared to other medical conditions. Although chronic spinal pain affects a large number of the population, clinicians are challenged as to understanding why certain patients develop pain related disability. Additionally, despite best efforts, costs associated with the management of patients with spinal pain continue to increase; unfortunately, these increased costs are not associated with improved outcomes. One method proposed to improve the efficacy of the management of patients with chronic spinal pain is to utilize a treatment based classification with the physical therapist being responsible for triage and classification. Therefore, the purpose of this study is to describe the outcomes associated with a proposed algorithm for the evaluation and treatment of chronic spinal pain based on the Mechanical Diagnosis and Therapy (MDT) system of examination and intervention, with further assessment of pain-associated psychological distress and subsequent subclassification in the Pain Mechanism Classification System (PMCS).
Methods: Two physical therapists trained in MDT and PMCS examined and treated 94 consecutive patients who were seen for evaluation and management of chronic low back pain and/or neck pain in a direct access capacity. Patients were assessed and classified according to the MDT and PMCS systems in a model whereby the physical therapist served as the first point of contact, with referral for other medical management being made as needed based on initial examination findings. Primary outcome measures included pain as measured by the numeric pain rating scale (NPRS), disability as measured by Focus on Therapeutic Outcomes (FOTO), and pain-associated psychological distress Yellow Flag Risk Form (YFRF). These measures were assessed at the time of initial examination, the fourth physical therapy visit, and at discharge. Referral to a physician who was trained in MDT and PMCS was also made following the fourth physical therapy visit if improvements in baseline measures were not seen, or if neurological signs found at initial examination were progressing. Minimal clinically important differences for the outcome measures were used to interpret meaningful change in each individual patient case from the time of initial evaluation and discharge.
Results: The mean number of physical therapy visits for the sample was 7.1 and the mean duration of treatment (from initial evaluation to discharge) was 35.9 days. With regard to the NPRS, 91% of patients demonstrated clinically meaningful improvement (mean improvement of 3.6 points for the NPRS). For the FOTO disability measure, 93% of patients demonstrated clinically meaningful improvement (mean improvement of 18.8 points for the FOTO). For the YFRF, 89% of patients demonstrated clinically meaningful improvement (mean improvement of 24.5 points for the YFRF).
Discussion/Conclusion: The vast majority of patients treated in this study demonstrated clinically meaningful improvements in pain, disability, and pain-associated psychological distress in an average of 7 visits, indicating efficacious care. For patients with chronic spinal pain, this treatment-based classification system with subclassifcation of patients for pain associated psychological distress may have important health policy implications for providing

promising direct access opportunities for physical therapists to efficiently manage this patient population. Further research, including randomized controlled trials, is needed to determine effectiveness in a larger population.

RR 33 [ID: 97]
PHYSICAL THERAPIST KNOWLEDGE IN DIAGNOSTIC IMAGING FOR THE KNEE

Michael Ross, Bryan Cheskiewiscz, Tolbert Jefferies, Katelyn Sikora
Primary Contact: Michael Ross, Daemen College, mross@daemen.edu

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Background/Purpose: Acute knee pain is a common presenting complaint in physical therapist practice. Despite the prevalence of acute knee trauma, fractures are only observed in approximately 6% of patients with knee pain. However, knee radiography to detect fractures remains one of the most commonly ordered studies and accounts for approximately one billion dollars in annual healthcare spending. As such, the use of diagnostic imaging must be judicious and evidence based. For example, the Ottawa Knee Rule is a validated clinical decision making tool for determining whether knee radiographs should be obtained to detect a fracture in the setting of acute knee trauma. For physical therapists, a strong understanding of all aspects of diagnostic imaging has previously been advocated. However, few studies have evaluated physical therapist competence related to appropriate patient referral for diagnostic imaging tests and we are unaware of any studies that have assessed physical therapist knowledge and compliance with the Ottawa Knee Rule. Therefore, the purpose of this study is to evaluate physical therapists in terms of their knowledge, attitudes and self-reported practice behaviors for the Ottawa Knee Rule for patients with knee injuries.
Methods: Approximately 16,500 physical therapists, all of whom were members of the Academy of Orthopaedic Physical Therapy of the American Physical Therapy Association, were invited via email to participate in this electronic survey-based study. Three hundred ninety-four physical therapists (208 men, 175 women, 11 did not disclose their gender identity; mean age: 41.5 ± 12.0 years; mean number of years of clinical practice: 15.7 ± 12.4) agreed to participate. Two hundred nine (53%) participants had achieved board certification through the American Board of Physical Therapy Specialties, and 80 (20.3%) participants were either residency or fellowship trained through the American Board of Physical Therapy Residency and Fellowship Education. Participants in this study completed the same examination developed by Beutel et al (2012) that was originally distributed to all attending emergency department physicians (n = 47) working at three affiliated academic emergency departments to assess knowledge, attitudes and self-reported practice behaviors related to the Ottawa Knee Rule. The examination developed by Beutel et al (2012) consisted of eight questions: five questions evaluated knowledge of the Ottawa Knee Rule through case vignettes and guideline inquiries, one examined self-reported adherence to the rule, and two inquired about potential barriers to implementation. All of the questions on the examination were multiple choice. For the five questions that evaluated knowledge of the Ottawa Knee Rule through case vignettes and guideline inquiries, each correct answer was given a score of 20 points, with a maximum overall score on the examination of 100 points with higher scores indicating higher knowledge levels regarding diagnostic imaging for patients with knee injuries. Correct responses were graded in the same manner as Beutel et al (2012). The participants in the Beutel et al (2012) study had a mean score of 73.2% on the examination. Descriptive statistical analyses were used to assess examination performance and examine the characteristics of the participants. Independent t-tests were used to compare examination scores between groups according to practice and training characteristics. A p-value of < 0 .05 was used for all analyses for determining statistically significant differences.

Results: The mean score on the examination assessing knowledge of the Ottawa Knee Rule was 74.8 ± 24.1 (range = 0 to 100). Board certification ($p = 0.005$), residency/fellowship training ($p = 0.03$), and having a special interest in diagnostic imaging ($p = 0.01$) all improved examination performance. When participants were asked how often do they consider the Ottawa Knee Rule when developing a diagnostic plan for their patients with knee trauma, 156 (39.6%) replied "always", 96 (23.4%) replied "most of the time", 82 (20.8%) replied "sometimes", and 60 (15.2%) replied "never". The most common reasons for disregarding the Ottawa Knee Rule (i.e., consider requesting or ordering a knee x-ray without indication according to the Ottawa Knee Rule) were a lack of confidence or ambiguity in physical examination findings, patient expectations (i.e., patient expects an x-ray), and legal concerns.

Discussion/Conclusion: The survey results demonstrated that physical therapist knowledge and consideration of the Ottawa Knee Rule was generally fair and consistent with attending emergency department physicians in the Beutel et al (2012) study. Examination performance was improved in this study if participants were board certified, residency/fellowship trained, or if they had a special interest in diagnostic imaging. Our results also suggest that noncompliance with the Ottawa Knee Rule is attributable to systemic (e.g., "patient expectations" and "legal concerns") and practice concerns (e.g., a lack of physical therapist confidence in their physical examination findings). Addressing these systemic concerns, as well as measures to improve physical therapist confidence in their physical examination findings, is important to maximize adherence to the Ottawa Knee Rule.

CR 01 [ID: 4]

PHYSIOTHERAPEUTIC MANAGEMENT OF PATIENTS PRESENTING WITH SIGNS AND SYMPTOMS OF CERVICAL RADICULOPATHY: A CASE SERIES

Charles Paulus, Cameron MacDonald
Primary Contact: Charles Paulus, Carilion Clinic, cpaulus7@gmail.com

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Background/Purpose: Patients presenting with signs and symptoms of cervical radiculopathy are often excluded from studies involving manual therapy and exercise. This diagnosis is a costly condition and an optimal treatment approach has yet to be established. A pragmatic, impairment-based approach provided to patients with this diagnosis may be one avenue for non-operative management. Purpose: The purpose of this case series is to describe the clinical decision-making and impairment-based approach in the management of three patients presenting with signs and symptoms of cervical radiculopathy and patient outcomes from treatment.
Case Description: Three patients presenting with neck pain and accompanying subjective symptoms of paresthesia or numbness in one upper limb with cervical or periscapular pain. All three patients met the criteria of a diagnostic clinical prediction rule. All three patients were referred by primary care providers, two of the three patients had insidious onset of symptoms while one was secondary to a motor vehicle collision. Imaging was performed on two of the three cases including cervical radiography of one insidious case and computed tomography for the case with traumatic onset. Symptom duration spanned from three to sixteen weeks before treatment, averaging 9 weeks. No red flags were noted. Interventions: Initial management focused on identification of a directional preference for the cervical spine with all three cases favoring active loaded cervical retraction with centralization occurring. Additionally, manual therapy was performed to the lower cervical, cervico-thoracic junction, and upper thoracic spine beginning with early range and progressing to end-range mobilization (non-thrust) and traction based upon symptom provocation. Follow-up visits included a progression of repeated motions to include cervical retraction with clinician overpressure and extension, in addition to progressive strengthening and conditioning to the neck and periscapular region focusing on patient specific functional tasks including pulling, pushing, lifting, and carrying.
Outcomes: Three patients (age 41, 57, 57; 2 females, 1 male) received and completed physiotherapeutic care for an average of 10 sessions (range, 4-16 weeks). Clinically meaningful improvements were observed in numeric pain rating scale from an average of 6/10 initially, to 0/10 at the final visit, alongside self-reported outcome measures consisting of the Neck Disability Index (NDI) and Shoulder Pain and Disability Index (SPADI) with an initial average of 48% disability progressed to 11% at completion of care. Global Rating of Change (GROC) was also utilized with an average of +6 indicating patients' perceived their symptoms were a great deal better.
Discussion/Conclusion: A multimodal impairment-based approach was utilized incorporating identification of a directional preference, manual therapy tailored to the symptomatic regions of the cervical and thoracic spine, in addition to progressive strengthening and conditioning of the surrounding regions resulted in clinically significant reductions in symptom level as well as self-reported changes in functional status.

CR 02 [ID: 11]
SUSTAINED END RANGE MOBILIZATIONS AND EXERCISE FOR A PATIENT WITH REFRACTORY KNEE STIFFNESS FOLLOWING PATELLAR FRACTURE: A CASE REPORT

Griffin Lee
Primary Contact: Griffin Lee, HonorHeath, griffinlee3@gmail.com

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Background/Purpose: Patellar fractures are relatively uncommon, and patients often have persistent functional limitations, restricted knee motion (ROM) and strength deficits following surgery and rehabilitation. The purpose of this case report is to describe the use of manual therapy and exercise to successfully address refractory knee stiffness in a patient following patellar fracture and open-reduction internal fixation (ORIF).
Case Description: A 58-year-old female fell on the left knee resulting in a transverse fracture of the patella. She underwent ORIF with use of tension wire six days later. Patient presented to outpatient physical therapy 8 weeks after injury with restricted ROM of the knee (0-34°) and patellar mobility deficits. Assessment of passive knee flexion ROM revealed a firm, capsular end-feel. She demonstrated strength deficits throughout the lower extremity, most notably with knee extension (3/5 manual muscle test). Patient reported pain at rest (3/10 on the Numeric Pain Rating Scale). Her initial score on the Lower Extremity Functional Scale (LEFS) was 22/80, indicating a percent of maximal function of 27.5%. Over 5 months (55 visits), the patient was treated using manual therapy and exercise. Manual therapy included patellar mobilizations, tibiofemoral joint glides, and tibiofemoral distraction. Initial grades used were II-III due to pain, but as pain reduced and ROM improved, grades III-IV were utilized and the hold time of the mobilizations was also increased to promote further improvement. Exercises were performed immediately following manual therapy to move the joint into newly gained ROM and promote more lasting changes. Principles of total end range time (TERT) were used, which propose the amount of increase in ROM is proportional to the amount of time the joint is held at end range. TERT involves holding the joint at end range under light tension for prolonged periods of time. Strengthening exercises were performed in later stages once pain was better controlled and ROM was not as limited.
Outcomes: ROM progressed slowly and the patient ultimately required a manipulation under anesthesia after 4 weeks of therapy. The manipulation was mildly effective, increasing flexion ROM from 59° to 95°. Therapy continued an additional 14 weeks (40 visits) following the manipulation. ROM was eventually restored (0-140°). Strength was restored to normal levels (5/5 manual muscle test). Pain was reduced to 0/10 at rest, but pain of 2-3/10 did persist with end range knee flexion. The LEFS at discharge was 73/80.
Discussion/Conclusion: The joint mobilizations and exercises utilizing the concept of total end range time may have contributed to the restoration of knee motion and a better than average outcome for this patient. The duration of care was lengthy, however, may have been necessary to achieve a good outcome. Evidence guiding physical therapists in management of patellar fractures is limited, so further research is needed.

CR 03 [ID: 12]

PHYSICAL THERAPY TO IMPROVE MOBILITY FOLLOWING SURGERY FOR DISTAL BICEPS FEMORIS AND LATERAL COLLATERAL LIGAMENT AVULSIONS: A CASE REPORT

Nicholas Weber
Primary Contact: Nicholas Weber, Athletico Physical Therapy, nickweberpt@gmail.com

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Background/Purpose: Hamstring strains account for as much as 16% of all reported injuries in college-age soccer players. Due to increased prevalence, management of injuries to the proximal hamstrings are more commonly reported in the literature. However, avulsions of the distal biceps femoris sustained during sporting activities are uncommon, leading to limited literature on the management and protocols for return to sport. The purpose of this case report is to provide a physical therapist's perspective on managing a patient with a distal hamstring avulsion and the clinical decision-making process to restore knee mobility following surgical reconstruction in a college soccer player.

Case Description: The patient was a 17-year-old male, 2 weeks status post elective right knee open repair of a distal biceps femoris tendon avulsion and lateral collateral ligament avulsion. His post-operative subjective findings were limited right knee range of motion (ROM) with stiffness, dull ache with motion, generalized weakness of his right leg, and inability to walk or run without an assistive device, which prevented him from participating in off-season soccer workouts. Physical therapy management included joint mobilizations, proprioceptive neuromuscular facilitation, manual stretching, and low load long duration stretches in order to improve knee mobility. Isometric and isotonic exercises focused on knee and hip strengthening. Balance and gait training were provided to improve functional mobility. Modalities were also used for palliative care.

Outcomes: The patient demonstrated improvements in knee ROM, strength, flexibility, pain, gait, and Lower Extremity Functional Scale (LEFS) score. At discharge, patient reported no pain. Knee flexion improved from 47 to 138 degrees and knee extension improved from lacking 6 degrees to neutral. LEFS at initial visit was 11/80 and improved to 72/80 upon discharge. Muscle function and movement system function improved to allow him to begin a return to kicking progression at four months, participate in practice at five months, and fully return to competitive soccer seven months following surgery.

Discussion/Conclusion: The patient presented with a complex knee injury following open repair of his distal biceps femoris avulsion and lateral collateral ligament avulsion. This patient case required significant clinical reasoning due to the lack of established protocols. Test/retest following each intervention was used to assess for tissue response in order to progress this patient appropriately. The interventions that resulted in the most gains included proprioceptive neuromuscular facilitation, low load long duration stretching, and isotonic exercises. The physical therapist speculated that these interventions were more beneficial than tibiofemoral, patellofemoral, or proximal tibiofibular joint mobilizations as the patient had undergone surgery addressing a soft tissue injury rather than a joint impairment. Evidence is lacking in the ideal physical therapy management of athletes with distal hamstring repairs, especially in the presence of concurrent injuries. Further research needs to be completed to investigate effectiveness of treatments for distal hamstring repairs when accompanied by concurrent injuries.

CR 04 [ID: 17]

TREATMENT OF CHRONIC UNILATERAL CERVICAL AND THORACIC PAIN WITH A COMBINED MANUAL THERAPY AND MOVEMENT SYSTEMS IMPAIRMENT APPROACH: A CASE REPORT

Kavork Hagopian
Primary Contact: Kavork Hagopian, Rosalind Franklin University,
KavorkHagopian@comcast.net

Background/Purpose: Accessory motion cannot be corrected by muscles alone and requires the use of joint mobilization for restoration of normal joint mechanics. Subsequently, correction of faulty movement patterns is necessary in order to restore normal motion. The purpose of this case report is to describe the management of a patient with chronic unilateral cervical and thoracic pain utilizing manual therapy and Movement Systems Impairment Classification approach.

Case Description: A 24-year-old right handed female with no macrotrauma, reported pain on right side of cervical and mid-thoracic areas making pulling down and reaching overhead difficult and intermittent radiating morning headaches on the right side of the upper neck. Impairments Posture: extension of the upper cervical spine, and rounded shoulders with anterior position of bilateral humeri. In addition, superior angle of the right scapula was inferior to T3 and downwardly rotated. Joint assessment revealed hypomobile right OA, CT junction, C7, T1-T3 and decreased posterior glide right glenohumeral joint. Pectoralis minor and latissimus dorsi were shortened. Strength testing revealed weakness of the longus colli, serratus anterior and upper trapezius. Movement impairments observed included compensatory cervical extension with upper extremity movements; hinge point at C6 on extension; palpable left rotation of C6 with active right shoulder flexion; insufficient curve reversal mid C Spine on flexion; inability of the scapula to come to mid-axillary line during shoulder flexion; and rhomboid dominance. Physical therapy assessment were acute joint dysfunction right OA and CT junction, and underlying cervical extension rotation syndrome with insufficient scapular upward rotation on the right (Sahrmann). Treatment included joint mobilization/manipulation, neuromuscular re-education, therapeutic exercises, and emphasis on home program.

Outcomes: Outcome measures included Neck Disability Index, FABQR, and Numeric Pain Rating Scale. The NDI scores, decreased from 14% to 6% (MCID 7-19%). The FABQR increased from 19 to 20. The NPRS decreased from 9/10 to 3/10 (MCID 2 points). Patient made considerable gains with three treatment sessions. Cervicogenic headaches resolved. Strength improved (longus colli from <3/5 to 4/5; serratus anterior from <3/5 to 4/5). Patient demonstrated the ability to engage these muscle groups properly. Shoulder/neck mechanics were normalized as the scapula moved to the mid axillary line on shoulder flexion, and resolution of compensation of left C6 rotation with active right shoulder flexion. Patient demonstrated proper sitting posture and support techniques. Functionally, she was able to work out overhead without increased pain.

Discussion/Conclusion: This case report highlights the successful management of a patient with cervical extension rotation syndrome with insufficient scapular upward rotation with segmental motion restrictions at the OA and the cervicothoracic junction. The results demonstrate that a treatment approach that combines manual therapy and the movement systems impairment classification approach can be beneficial in reducing symptoms, restoring normal movement patterns, and improving functional outcomes.

CR 05 [ID: 22]
ORTHOPEDIC MANUAL PHYSICAL THERAPY REASONING FOR THE MANAGEMENT OF GROIN AND LATERAL HIP PAIN: A CASE REPORT

Joseph Alexander, Jamie Schwartz
Primary Contact: Joseph Alexander, Mercy Health Orthopaedics and Sports Rehabilitation, jpalexander1018@gmail.com

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Background/Purpose: Intra-articular hip pain is a condition that poses a challenge to diagnose and treat due to overlapping referral patterns, poor correlation with imaging findings, and a lack of consensus with physical examination findings. The surgery rates for hip arthroscopy have risen exponentially despite these diagnostic challenges. Thoracolumbar junction (TLJ) syndrome or Maigne syndrome, is considered an overlooked source of isolated hip pain. The use of hypothetico-deductive reasoning, consideration of all potential sources of local and referred pain, and a test, treat, re-test approach have been described as ways to reduce diagnostic errors. This case report will describe the reasoning process and management strategy for this patient presenting with primary complaints of anterior and lateral hip pain.
Case Description: This patient was a 38-year-old female referred to outpatient physical therapy with a diagnosis of “left hip sprain” and “hip impingement syndrome”. The patient’s primary complaint was left groin and lateral hip pain that was described as “dull” and “burning”. Symptoms were aggravated by prolonged sitting and rising from a chair. They were eased with walking and with anti-inflammatories. Pertinent objective findings included: pain provoked with passive hip flexion and internal rotation, a positive FADIR sign, pain with right lumbar side gliding, and reproduction of familiar hip symptoms with upper lumbar spring testing. A lower extremity functional scale (LEFS) was administered at evaluation and a score of 64/80 was recorded. Radiographs and an MRI without contrast were performed with unremarkable findings. During the first visit, a trial treatment of hip non-thrust techniques was performed with no change in symptoms. At the second visit, a treatment of non-thrust techniques was performed at the upper lumbar spine and the patient’s symptoms were abolished and passive hip range of motion was pain free.
Outcomes: The patient was treated for a total of seven visits over four weeks. Interventions targeted the TLJ and upper lumbar spine. Manual interventions initiated with oscillatory mobilization and progressed to thrust manipulation directed at symptom producing segments. Exercises included spinal range of motion exercises in all planes and progressive resistance training for the spine and lower quarter. The patient reported 90% overall improvement and near full improvement of her subjective complaints. The final LEFS score was 78/80. The total change of 14 points exceeded both the minimal detectable change and the minimal clinically importance difference values.
Discussion/Conclusion: This patient presented with common findings that were consistent with an intra-articular hip lesion but had no positive imaging findings. The recognition that the TLJ was the likely source of symptoms was determined using hypothetico-deductive reasoning and a test, treat, re-test approach. When managing a patient with hip pain complaints, the exclusion of other sources of symptoms should be considered to minimize diagnostic error and improve treatment efficiency.

CR 06 [ID: 24]
A CASE REPORT: ATYPICAL BRACHIAL PLEXOPATHY

Frank Tudini, Holly Mattmuller, Stuart Holden
Primary Contact: Frank Tudini, Campbell University, franktpt617@gmail.com

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Background/Purpose: The purpose of this presentation is to describe an atypical presentation of dominant upper limb brachial plexopathy. Brachial plexopathy is a type of peripheral neuropathy represented by a combination of signs and symptoms including pain, weakness, or sensory abnormalities. Specifically, we will discuss the differential diagnosis and clinical reasoning that led to additional testing and ultimately exploratory surgery.
Case Description: The patient was a 31-year-old right-handed male with a 10-year history of right inferomedial scapular pain and intermittent shooting pain from the right elbow to the 5th digit which began after backpacking. The patient came direct access to a university pro bono clinic after new onset of right-hand weakness and atrophy which was noticed while exercising. The initial differential diagnosis included cervical radiculopathy and thoracic outlet syndrome (TOS). Right-hand atrophy and weakness were evident with a grip strength of 30.4kg on the right compared with 46.7kg on the left. The patient had multi-segmental sensory loss, full cervical rotation, and negative median nerve, Spurling A, and distraction tests which essentially eliminated cervical radiculopathy. Likewise, TOS was ruled-out secondary to negative upper limb tension tests, special tests, and rib, pectoralis minor, and scalene testing. Malignancy or infection was considered with the absence of pain or specific mechanism of injury; however, this was unlikely based on age, excellent self-reported health status, and normal vital signs. These results prompted the primary care physician to order an MRI. Despite negative MRI findings, the physical therapist referred the patient to a neurologist due to significant hand weakness and atrophy in the absence of a clear clinical diagnosis. Subsequent nerve conduction velocity (NCV) and needle electromyography (EMG) testing led to the diagnosis of brachial plexopathy. Immediate exploratory surgery followed, and an anatomical abnormality was found compressing the medial cord of the brachial plexus.
Outcomes: After surgery, scapular pain was abolished despite no discernible anatomic link between the two areas. Two months postoperatively, there was no significant improvement in grip strength or Quick DASH score. Nonetheless, the patient was pleased with the outcome and relieved that functional grip strength was maintained. He had returned to all vocational and recreational activities including CrossFit, without restriction.
Discussion/Conclusion: This case describes a complex clinical case of a patient with brachial plexopathy and illustrates the benefits of NCV and EMG as adjuncts to clinical examination. The physical therapist was instrumental in initiating prompt referrals to the physician and neurologist that ultimately led to surgery and prevented further strength and dexterity loss of the right hand, thus preserving function. Two months after surgery, the patient had not regained hand strength, however, was pleased with the outcome as functional grip strength remained and he had returned to all vocational and recreational activities.

CR 07 [ID: 25]
IMPROVED KNEE EXTENSOR MOTOR CONTROL FOLLOWING LUMBAR MOBILIZATIONS IN A PATIENT WITH ANTEROLATERAL KNEE PAIN

Lance Mabry, Andrew Stephens, Alicia Emerson, Sarah Miller
Primary Contact: Lance Mabry, High Point University, lmabry@highpoint.edu

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Background/Purpose: Aberrant motor control, mediated by both local and central pathways, is commonly observed in patients with knee pain. Regional interdependence supports the hypothesis of biomechanical and neurophysiological proximal influences on distal structures. Particularly during nociplastic presentations, lumbar-mediated imbalances in knee and hip muscle activation may contribute to decreased motor control of the knee, resulting in knee pain. The purpose of this case study is to demonstrate how physical therapy utilizing a regional approach resulted in within-session functional improvements in a patient who failed knee-centric treatment.
Case Description: A 61-year-old male presented to direct access pro bono physical therapy (PT) with 3 months of left anterior knee pain. The patient reported an onset of symptoms after a period of prolonged walking. Aggravating symptoms included prolonged walking and descending stairs. Physical examination revealed positive left-sided Trendelenburg gait, decreased left-sided stance phase during gait, and significant left-sided dynamic valgus with stair descent. Resting pain was reported as 4/10 on the Numeric Pain Rating Scale (NPRS) and 9/10 when navigating stairs. The average rating on the Patient Specific Functional Scale (PSFS) was 6.3/10. The first three PT sessions focused on knee-centric manual therapy and therapeutic exercise. Although his knee pain improved, stair descent remained a challenge due to diminished motor control. Therefore, the patient was reevaluated with a more regional interdependence perspective. Left hip extension was hypomobile and caused low back pain. Lumbar posterior-to-anterior (P/A) passive accessory assessment revealed hypomobility of L1-L3 with localized pain and concordant knee pain. Using test/treat/retest strategy, three bouts of grade IV P/A mobilization of the L1-L3 segments resulted in immediate and profound resolution of the valgus moment during stair descent. The following four PT sessions incorporated grade IV P/A mobilization of L1-L3, bilateral lumbar neutral gap L1-L3 grade V thrust mobilization, and grade III P/A left hip mobilization. Subsequent to manual intervention, therapeutic exercise focused on gluteal activation. A home exercise program focused on self-lumbar rotational mobilization, hip and knee strengthening, and stretching targeting the hip and low back.
Outcomes: After 8 physical therapy sessions over 7 weeks, the patient's self-reported pain decreased to 0/10 on the NPRS. The patient similarly experienced functional gains, with a 9/10 average score on the PSFS.
Discussion/Conclusion: This case report demonstrates the successful management of lumbar-mediated knee pain and decreased dynamic motor control. Future research should explore understanding how central mechanisms related to pain and motor control can be effectively managed in PT.

CR 08 [ID: 26]
THE EFFECT OF REPEATED CERVICAL RETRACTIONS IN QUADRAPED ON ARM AND HAND PAIN AND TINGLING USING ULTT AS AN OBJECTIVE CONCORDANT SIGN

Max O'Malley
Primary Contact: Max O'Malley, St. Ambrose University, max.omalley@slu.edu

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Background/Purpose: There is a preponderance of evidence in the literature for using repeated motions to treat lumbar pain and radicular symptoms. Repeated motions of the cervical spine for UE radiculopathy is also found in the literature, but is not as well supported nor widely used clinically. Further, it is common to use the SLR as an objective measure for changes in adverse neural tension of the LE, but the same is not true for ULTT in the UE. This case report demonstrates the use of repeated cervical retractions in quadraped as an intervention to treat UE pain and tingling quantified by median nerve ULTT as a concordant sign.
Case Description: 49-year-old male forklift operator referred for right cervical radiculopathy; Subjective complaints include gradual 6-month onset of neck pain and bilateral pain and tingling in the arm and hands. States R side is far worse than L. Distribution was along dorsal arm, forearm and into digits 1-4. Describes job demands as mostly seated operating heavy vibrating machinery. Reports no known mechanism of injury but believes his posture at work is a large contributor. States no particular motions aggravate symptoms but notices more pain and tingling towards end of work day. Extending head back can alleviate symptom at times. Objective exam reveals marked upper crossed posture, 70 degrees of L cervical rotation, 50 degrees R cervical rotation, R cervical quadrant testing brings on familiar local neck pain without referral, cervical distraction provides moderate relief to baseline neck and hand symptoms, C4-6 stiff and painful B, ULTT positive in median distribution at 21 degrees of abduction, NDI score 12%.
Outcomes: The patient was seen for 6 visits over 4 weeks; Median nerve ULTT, cervical rotation, pain rating and subjective reports were taken each treatment. ULTT was performed with shoulder in full ER, elbow in supination and wrist/fingers in extension; shoulder abduction was measured with a goniometer to quantify changes and used as a concordant sign. Treatment involved quadraped cervical retractions followed by postural education and exercises to reinforce lower cervical/upper thoracic extension and upper cervical flexion. HEP included twice daily quadraped retractions followed by banded scapular retractions as well as regular postural checks at work. Patient was encouraged to get out of his seated position at work at least hourly. Results were as follows: Median nerve ULTT improved from 21 to 80 degrees of shoulder abduction; Cervical rotation improved from 50 to 70; NRPS improved from 5/10 to 0/10; NDI improved from 12 to 0%; Pt reported improvements included no further symptoms of numbness and tingling in UE with tasks at work.
Discussion/Conclusion: Current evidence supports the use of repeated motions of the cervical spine for centralization of UE radicular symptoms, but it is not as well supported as repeated motions of the lumbar spine. Further, the SLR is commonly used as a concordant sign for LE neural tension, but the same is not true of ULTT for UE neural tension. This case study supports the use of repeated cervical retractions to centralize pain and tingling symptoms in the arm and hand using ULTT to quantify changes.

CR 09 [ID: 34]

POSTERIOR TIBIALIS TENDINOSIS: A CASE REPORT ON THE REHABILITATION OF A 12-YEAR-OLD BALLET DANCER

Alisa Pravdo, Peter Bowman
Primary Contact: Alisa Pravdo, University of Maryland, apravdo@som.umaryland.edu

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Background/Purpose: The posterior tibial tendon is an essential stabilizer of the medial longitudinal arch and the primary inverter of the midfoot and. Posterior tibial tendon dysfunction is a common and debilitating tendinopathy that can occur following an injury or from overuse. It may result in pain, loss of the medial longitudinal arch, abnormal foot alignment, and impaired gait if untreated. Posterior tibialis tendinopathy has been found to occur more commonly in those with a flattened arch, or pes planus. Studies have shown that tendonitis or tendinosis in the foot or ankle is a common injury among young dancers. There is also research to support strengthening and endurance training for relief of symptoms in those with posterior tibialis tendinosis. However, there is a lack of evidence regarding the specific rehabilitation of young dancers with posterior tibial tendinosis.
Case Description: The patient was a 12-year-old female ballet dancer with a diagnosis of posterior tibialis tendinosis following the Kidner procedure for removal of an accessory navicular bone 1 year prior. The patient continued to experience pain in her arch following this surgical procedure and returned to dancing. The patient presented with complaints of pain in her medial right foot that increased with jumping and participating in ballet class. The patient attempted to manage her symptoms with rest and time off from dancing but reported that her symptoms persisted as she tried to return to jumping. The patient displayed bilateral knee valgus, right rearfoot valgus in stance, bilateral pes planus and hypomobility in her right talocrural joint on initial evaluation. She demonstrated limitations in right ankle plantarflexion and dorsiflexion AROM and with weakness in her posterior tibialis and gluteus medius musculature bilaterally.
Outcomes: The patient was seen twice weekly for 8 weeks. Interventions included manual therapy techniques for the talocrural joint, soft tissue mobilization, stretching and strengthening of the gastrocnemius and soleus musculature, strengthening of the posterior tibialis and gluteus medius musculature and ballet specific activities. Outcome measures included manual muscle testing, active range of motion (AROM), numeric pain scale, and the Lower Extremity Functional Scale (LEFS). Findings at discharge revealed resolution of foot and ankle pain with an improved score on the LEFS from 53/80 to 70/80, improved ankle AROM and strength in addition to return to jumping and spinning in ballet class without symptoms.
Discussion/Conclusion: Focus on stretching and strengthening of the gastrocnemius and soleus musculature, strengthening of the posterior tibialis and gluteus medius musculature along with ballet specific activities may be beneficial to returning young ballet dancers back to pain free dancing. Trials involving young ballet dancers with larger sample sizes and a longer-term follow up are needed to further determine the efficacy of this treatment approach for this population.

CR 10 [ID: 36]

COMBINING THORACOLUMBAR JOINT MOBILIZATION WITH LATERAL FEMORAL CUTANEOUS NERVE GLIDES TO TREAT CHRONIC IRRITATION OF THE LATERAL FEMORAL CUTANEOUS NERVE

Jeremy Boyd
Primary Contact: Jeremy Boyd, Trifecta Therapeutics/ Institute for Athlete Regeneration
jboyd@trifectatherapeutics.com

Background/Purpose: Double crush syndrome and Meralgia Paresthetica (MP) continue to be challenging to diagnosis and even more so to treat. Double crush syndrome is defined as compression at two or more locations along the course of a peripheral nerve that can coexist and synergistically increase symptom intensity. MP is labeled as a nerve entrapment which may cause pain, paresthesias, and sensory loss within the distribution of the lateral cutaneous nerve of the thigh. To this date, there is no research of combined joint mobilizations with LFCN techniques to address either of these conditions. This clinical commentary will discuss the efficacy of performing a combined joint mobilization to the TLJ region with LFCN to treat a patient with potential lumbar radiculopathy and concomitant irritation of the LFCN.
Case Description: A 43-year-old female presented via direct access with chronic-persistent L quad pain since 2018. She states onset symptoms began in April 2018 with initial severe LBP. She received PT at the time, however symptoms were never fully eliminated. In January of 2020 symptoms in her L hip and thigh were exacerbated. Patient presented to FiT in a new facility on 1/29/20 with constant pain that was increased with stair ascension and Olympic weightlifting. The evaluation was remarkable for constant pain on Numeric Pain Rating Scale (NPRS) ranging from 2-7/10, self-reported belief it was leg related issue, functional limitations of pain at work and inability to return to normal competitive weightlifting. Primary impairments were as followed; L>R (PA) spring testing was hypomobile from T12-L2, reproduction of primary pain with LFCN tension position, and general left hip/glute weakness.
Outcomes: She was seen for 5 sessions over a 5-week period with interventions consisting of joint mobilizations targeting the TLJ in combination with LFCN glides, self-nerve glides, mobility exercises, strengthening exercises to her LLE and education. Patient was given LEFS and PSFS to determine functional level/limitation at initial evaluation. Overall LEFS score increased from 57/80 to 76/80 and PSFS increased from an average of 2.5/10 to 8.75/10. NPRS decreased from 2-7/10 to 0/10. The client went on to place 3rd in the snatch at the Arnold Classic in Olympic lifting on 3/6/20.
Discussion/Conclusion: Pain, ROM, joint mobility and overall function all improved with previously mentioned interventions. The outcomes of this case study suggest that combining thoracolumbar gapping mobilization with an LFCN glide at the same time may be beneficial for patients with possible irritation of the LFCN as seen with individuals with MP. The case also demonstrates the safe and effective usage of combined joint mobilization with neural techniques in a patient with MP symptoms in the absence of medical referral.

CR 11 [ID: 42]
MANUAL TREATMENT OF THE GLENOHUMERAL JOINT IN A FORMER OVERHEAD ATHLETE WITH RIB PAIN: A FELLOW-IN-TRAINING'S CASE STUDY

Sarah Macaraeg, Michael Vitt
Primary Contact: Sarah Macaraeg, University of Chicago Medicine,
sarah.macrowski@uchospitals.edu

Background/Purpose: The incidence of rib pain is 1-5%, though the mechanism and diagnosis of rib dysfunction is poor. Dysfunction of the cervicothoracic spine and ribs triples the risk for developing shoulder pain. Overhead athletes often present with GIRD (Glenohumeral Internal Rotation Deficit). Biomechanical motion of the thoracic region during shoulder internal rotation includes spinal segmental ipsilateral flexion and rotation, while the upper ribs glide anterior-superior at the costrotransverse joints. Current literature supports manipulation of the thoracic spine and ribs as adjunct treatment of shoulder dysfunction to improve pain and mobility. However, there has not been evidence of treating the shoulder for rib or thoracic dysfunction. The purpose of this case study is to propose biomechanical treatment of limited shoulder range of motion (ROM) in a former overhead athlete to improve their rib pain, which had previously been treated with thoracic and rib manipulation without improvement.
Case Description: The patient was a 30-year-old female, former right hand dominant volleyball player with left sided chronic upper rib pain. She had previously been treated by physical therapy for the rib pain through soft tissue mobilization, high and low velocity manipulation of her thoracic spine and costotransverse joint without long-term improvement. Aggravating factors include prolonged typing, riding a bicycle, and carrying a loaded backpack. Remarkable examination findings include limited but pain free shoulder flexion and internal rotation range of motion on her right shoulder, and tenderness to her left sided 4 and 5 costotransverse joint. Due to the biomechanics of the costotransverse joint in relation to shoulder motion, the rib appeared to be elevated and hypermobile due to continuous traction at the costotransverse joint from compensation at the thoracic spine due to lack of shoulder ROM.
Outcomes: The subject was treated for 5 visits over a 12 week period. She improved shoulder flexion by 10 degrees, shoulder internal rotation by 20 degrees, and Apley's internal rotation symmetrical to the other side. She had 0/10 rib pain on a Numeric Pain Scale with her previously aggravating factors and a Patient Specific Functional Scale score improvement by 20 points.
Discussion/Conclusion: There has been no biomechanical proposition for manually treating shoulder restrictions and strengthening surrounding rib musculature to improve rib pain. Most evidence for treatment of rib dysfunction is for manipulation of the thoracic spine and/or ribs. This case focused on restoring shoulder mobility and rib/scapular stability to decrease rib pain in this former overhead athlete.

CR 12 [ID: 43]
WHEN A LOWER EXTREMITY RADICULOPATHY IS NOT A RADICULOPATHY – OUTCOMES FOLLOWING A COMPREHENSIVE MANUAL THERAPY PLAN OF CARE: A CASE REPORT

Mark Erickson
Primary Contact: Mark Erickson, Florida Gulf Coast University, merickson@fgcu.edu

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Background/Purpose: To realize the AAOMPT vision, orthopedic manual physical therapists must be able to accurately diagnose pain sources and contributing factors to pain syndromes. Medical diagnoses can be inaccurate and/or incomplete. The purpose of this case report is to describe a unique patient presentation that illustrates how a comprehensive orthopedic manual therapy examination resulted in an accurate diagnosis, led to an integrated plan of care and subsequently a favorable outcome.
Case Description: An 86-year-old male presented to PT with a medical diagnosis of lumbar radiculopathy and complaints of right LBP and right lower extremity (LE) pain and paresthesias. Medical management consisted of 4 multi-level radiograph guided steroid injections which provided short term relief lasting 2-3 days. Past medical history was significant for the right total hip arthroplasty 15 years prior, for which he did not receive PT. Primary positive objective examination findings included right lumbar paraspinal hypertonicity with taut bands and trigger points that reproduced LBP, right gluteal trigger points that reproduced LE pain and paresthesias, severe gluteal atrophy and weakness, antalgic gait due to pain and fear of the R LE buckling, a right lateral shift standing posture, and a 12 second timed up and go (TUG). Notable negative findings included normal neuro screen, pain free lumbar joint play assessment, a normal slump test, and lack of LE symptoms during lumbar AROM and PROM. Interventions included 1) soft tissue mobilization/myofascial release, 2) positional inhibition manual therapy, 3) a novel manual neuromuscular re-education technique (MNRT) to correct recruitment imbalances, 4) therapeutic exercise for body awareness, hip strengthening, reciprocal inhibition and stretching of hypertonic regional musculature, and 5) functional training to reduce fear and improve gait.
Outcomes: LBP was eliminated and the right LE pain and paresthesias were reduced by 80%. The patient was able to walk on level and uneven surfaces, and stairs pain free without fear, or LE buckling. Lumbar neuromuscular recruitment was normalized, hip strength increased, the right lateral shift eliminated, and TUG value improved to 7 seconds. The patient attributed improvements to manual therapy, MNRT, body awareness "homework", strengthening and functional training.
Discussion/Conclusion: A patient diagnosed with lumbar radiculopathy underwent a comprehensive orthopedic PT examination and plan of care targeting soft tissue dysfunction in an integrated manner using a manual therapy and neuromuscular re-education focus while addressing common impairments. Outcomes following 12 visits over 8 weeks were quite positive and illustrate the role orthopedic manual PT, with effective clinical reasoning, can play to establish an accurate diagnosis leading to effective interventions. This case report also points out the need to advocate for patients following surgical procedures to prevent subsequent potential pain syndromes.

CR 13 [ID: 47]
TREATMENT OF UPPER CERVICAL SPINE IN A PATIENT WITH COMPLAINT OF UNILATERAL FACIAL NUMBNESS

Laura Moorman, Joseph McEachern
Primary Contact: Laura Moorman, St. Ambrose University, Rock Valley Physical Therapy, moormanlaurak@sau.edu

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Background/Purpose: The initial goal of physical therapy is to determine the patient's appropriateness for therapy. While there are many conditions that result in changes in facial sensation, one to consider is to the distribution area of the trigeminal nerve. The spinal trigeminal nucleus relays sensation from the ipsilateral portion of the face. In the absence of red flags, one must consider contributions from the upper cervical spine. The purpose of this case study is to describe the physical therapy management of a patient who presented with complaint of unilateral facial numbness.
Case Description: The patient was a 26-year-old female who presented to therapy three days after onset of decreased sensation throughout left side of her face. She described insidious onset and reported no mechanism of injury. She had no other red flags, normal cranial nerve testing, normal vitals, and a negative neurological screen. She had no symptoms into her upper extremities. She did have a moderate limitation in left cervical rotation range of motion. Her past medical history included mild neck pain and headaches intermittently over the last few years.
Outcomes: The patient was seen for four visits over one month. Following two sessions, the patient's facial sensation returned to normal. Left cervical rotation range of motion improved by 20 degrees and was equal to contralateral side. She reported her headaches decreased from 4-5 times per week to 1-2 times per week. Neck pain decreased from 4/10 at worst to 1/10 at worst.
Discussion/Conclusion: This case study shows the benefit of treating the upper cervical spine in patients with changes in facial sensation. However, prior to treatment it was important to do a thorough screen to rule out any red flags or more serious conditions. In the absence of red flags, the patient's symptoms were all consistent with the upper cervical spine. Treatment of the upper cervical spine returned her facial sensation to normal and decreased her headache symptoms as well; she benefitted from home exercise program focused on postural exercise for continued relief of symptoms.

CR 14 [ID: 48]

CAREGIVER TRAINING UTILIZING HANDS ON TECHNIQUES IN AN EFFORT TO EASE CAREGIVER BURDEN IN THE FAMILY OF A CHILD DIAGNOSED WITH CEREBRAL PALSY: IMPLEMENTATION OF CLINICAL DECISION MAKING

Evan Liu, Cameron MacDonald, Kelsey Morihara, Bryan Dennison
Primary Contact: Evan Liu, Regis University/Pacific University, evanliu.pdx@gmail.com

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Background/Purpose: Attention to caregivers of children with developmental disabilities is limited in physical therapy practice. The purpose of this report is to describe the integration of clinical decision making (CDM) by an OMPT fellow-in-training (FiT), directed at easing caregiver burden, during their time serving as a clinical supervisor and student mentor at an international camp for children with disabilities. This case report describes the caregiver reported results for a FiT designed intervention program directed at improving the caregiver's quality of life through improved handling strategies.

Case Description: A 13-year-old male patient, suspected to have spastic quadriplegic cerebral palsy, participated in Tykes Camp with his caregiver. He has significant impairments in gait and requires maximum assist with all activities of daily living including but not limited to dressing, bathing, eating and transfers. The caregiver had expressed increased difficulties with managing the child due to his growing size, movement patterns, ongoing challenges with transfers, and fear of potential injuries to both her and the child. Tykes Camp, facilitated through Therapy Abroad, took place at the Rajanagarindra Institute of Child Development in Chiang Mai, Thailand. Tykes Camp was formed to provide group-based therapy to children with development disabilities. Interventions included gross and fine motor games, behavior regulation techniques, in addition to coordination and balance activities. Caregivers were also encouraged to participate with the children.

Outcomes: During the camp, the FiT facilitated a shift in focus to include the well-being of the caregivers, while still providing therapeutic interventions for the camp attendees. The primary caregiver educational focus was transfer strategies and manual techniques around the lumbopelvic complex. The Fit taught manual pelvic compression and pelvic proprioceptive neuromuscular facilitation (PNF) techniques. The caregiver successfully demonstrated the techniques and applied these techniques to improve transfers and facilitate gait patterns to assist with transfers. After education and instruction was provided, the foster mother verbally reported practicing the tasks at home with noted improvements in transfers from the wheelchair to the shower. She noted decreased spastic moments during erect postures and gait with transfers.

Discussion / Conclusion: This experience and reported case suggest a need to raise awareness and teach caregivers safe handling strategies in order to improve the quality of care they provide, and hopefully, their quality of life. Current research encourages residents and FiTs to consider the patient's contextual and life factors during their CDM process. The CDM process should be applied beyond the direct patient care needs, targeting as many variables as possible related to patient care in an effort to improve patient outcomes. This case highlights the necessary awareness needed by FiTs to develop their CDM beyond the direct patient care needs, identifying and intervening on caregiver variables related to patient care.

CR 15 [ID: 49]
RAPID RECOVERY WITH AN INTEGRATIVE ORTHOPAEDIC MANUAL PHYSICAL THERAPY APPROACH FOR MANAGING LATERAL KNEE PAIN IN A YOUNG ATHLETE

Charalampos Fotiou
Primary Contact: Charalampos Fotiou, Regis University, har.fotiou@gmail.com

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Background/Purpose: Management for lateral knee pain may be improved with the use of a regional interdependence approach, including regional muscle retraining and joint interventions and movement retraining to optimize outcomes. This case report describes the utilization of regional interdependence for management of lateral knee pain in an ambiguous presentation.
Case Description: A 19-year-old male ultimate Frisbee player reported injury during a competitive game 13 days prior to evaluation. The mechanism involved planting his left foot and pivoting sharply to the right when landing. By report hip motor retraining and foam rolling for tissue mobility with an athletic trainer did not improve symptoms since injury, based upon a presumption of anterior knee pain with iliotibial impairment, lower extremity motor weakness and tissue restrictions. Symptoms reported during evaluation were lateral knee pain walking downstairs and running. Pain rated at 6/10 when present. Lower extremity functional score was 59/80. No previous injuries to his lower extremities, low back pain or other areas were reported. Primary impairments identified were; left hip abduction, extension and left knee flexion weakness (4+/5), arthrokinematic restriction of 30% tibial internal rotation and talo-crural dorsiflexion limitation of 30%, both on the left side. Of note no ligamentous or meniscal special tests of the left knee were positive. Interventions Based on identified regional impairments, treatment was commenced with mobilization with movement (MWM) to the left knee with re-assessment of stair function noting improvement. This was followed by graded posterior to anterior tibiofibular mobilization proximally and distally and MWM of the talo-crural joint for ankle dorsiflexion. Test–retest identified subsequently 0/10 pain reported during stair descent. Running tolerance improved to 15 minutes with 1/10 pain. Stated overall improvement was 95%. The patient was educated on a home management program to address deficiencies in hip strength as noted and self-applied knee and ankle mobilizations. The patient was instructed in a gradual return to sport, starting with practice participation duration of 50% and increasing 20% every two days, then moving to full participation.
Outcomes: At the second session completed 10 days post the first visit the patient reported 0/10 on the NPRS with training and one practice game, LEFS was 80/80. A review of self-mobilizations, joint mobility and home exercises was performed, and no impairments were noted. No further active treatment was required.
Discussion/Conclusion: Addressing impairments with immediate reassessment led to the resolution of lateral knee pain. The utilization of a test-retest approach after each intervention allowed for informed clinical decision making, which allowed prioritization of home interventions and management to assist recovery and potentially prevent future recurrence. A similar approach in other ambiguous knee injury presentations may benefit future patients and inform future research.

CR 16 [ID: 50]
MANUAL THERAPY ENHANCES RUNNING EFFICIENCY IN A 30-YEAR-OLD ULTRA-MARATHON ATHLETE

Kyle McIntyre
Primary Contact: Kyle McIntyre, Institute of Physical Art, mcintyre.k.d@gmail.com

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Background/Purpose: There is limited literature on the use of manual therapy to enhance athletic performance. In athletic populations, there has been some research to demonstrate the effects of stretching, strength training and manipulation on running performance. A study performed at Virginia Tech showed that pre competition manipulation improved performance and reduced pain. Thajur demonstrated that acute active isolated stretching improved running economy and ROM in the lower extremities. In research on trained athletes, Paavolainen showed an improvement in 5k running performance without having changes in VO2 max, through explosive strength training. Godges found that static stretching or soft tissue mobilization combined with PNF improved hip ROM, but only static stretching had an improvement in gait economy. The purpose of the present study is to present the enhancement in running performance in an ultra-marathon athlete, through Functional Manual Therapy (FMT).
Case Description: A 30-year-old male ultra-marathon runner was selected for our study in June 2019. He has previously completed a 100-mile ultra-marathon along with many 50k races. All of the races have been completed at high altitudes in the Colorado Rockies. In addition, he competed as a long-distance runner at a Division 2 college. At the time of his initial visit, the subject reported that he was in good health and denied any musculoskeletal symptoms. Past medical history included a right ankle sprain, bilateral Grade I hamstring strains and a Grade I right Achilles strain. For this study, the subject underwent 5 one-hour FMT treatments over a thirteen-day time span. Treatments consisted of functional manual therapy, spinal manipulation, visceral manipulation, neural manipulation and proprioceptive neuromuscular facilitation (PNF). He was also instructed on a home exercise program (HEP), focused on gait patterning and the developmental sequence with proprioceptive inputs (use of Therabands on the subject's body to achieve a desired neuromuscular response). Each treatment focused on a different region and followed the FMT Clinical Reasoning Model for Manual Physical Therapy.
Outcomes: The subject completed a 50k, two weeks after the last treatment intervention. He completed it in a personal record time (5 hours and 12 minutes), which was 30-minutes faster than his previous best time (5 hours and forty-two minutes). The previous best time was accomplished one week prior to the beginning of the study. He reported feeling "very strong for the first time in a long time". He also wore a heart rate monitor and recorded a drop of 5 to 10 bpm from the previous 50k. Objectively, it was noted that the athlete had improvements in posture, mobility, neuromuscular control and gait mechanics while running.
Discussion/Conclusion: This study demonstrates that a healthy athlete can experience significant improvement in his performance through the enhancement of posture and movement in five functional manual therapy treatments. Through the improvements in gait efficiency, there may be improvements in cardio-vascular performance. Given the improvements in this study, there should be further investigation done into the effects of manual therapy on running mechanics efficiency and the potential cardiovascular impact.

CR 17 [ID: 51]
CONSERVATIVE MANAGEMENT OF A PATIENT WITH A METASTATIC DISTAL HUMERUS FRACTURE: A CASE REPORT

Jaocb Brennan, Kevin Farrell, Erik Martinez, Janelle Smith , Candi Gardner
Primary Contact: Jaocb Brennan, St Ambrose University, jbrennan3494@gmail.com

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Background/Purpose: Approximately 65% of people with breast cancer will have skeletal metastases. Of those with skeletal metastases, 9-29% of those will develop pathologic fracture, resulting in decreased quality of life (QoL). Of those fractures, 90% will result in surgery with a goal of decreasing pain and improving range of motion (ROM). The purpose of this case is to report the non-operative treatment of a patient with metastatic distal humerus fracture with the addition of manual therapy to improve function and decrease pain.
Case Description: A 62-year-old right-handed male presented to physical therapy with left elbow pain. He had a history of metastatic breast cancer diagnosed 5 years previously. Per patient report, mechanism of injury occurred 7 weeks prior to evaluation when he lifted a heavy object and felt immediate sharp pain in the medial elbow. Radiograph, CT, and MRI showed minimally displaced fracture of the medial humeral condyle. An orthopedic oncologist opted for conservative treatment versus ORIF or joint replacement. Instructions for therapy included sling use, passive ROM (PROM) and active assisted ROM (AAROM). Objective findings showed decreased elbow ROM with sharp pain at end range. Shoulder ROM was limited bilaterally. Patient had minimal ability to contract elbow flexors and extensors or wrist flexors and extensors against resistance due to pain. Patient reported decreased functional activities including typing, cooking, cleaning, and activities of daily living due to left arm pain. Initial 5 visits utilized PROM and AAROM in all planes of the shoulder and elbow with minimal change in overall ROM. Visit 6 to 16 incorporate manual therapy techniques including grade III-IV anterior-posterior and lateral glides of the humeroulnar joint with physiological end ROM. Manual therapy techniques were utilized as fracture healing was progressing and provided immediate improvements on ROM and pain modulation. PROM and AROM were also included in all directions both in session and with HEP. Resisted ROM was added as tolerated. Treatment goals were to improve ROM, function, and decrease pain.
Outcomes: After 16 visits the patient showed improvement in elbow ROM from 40-115 to 24-132, pronation from 50 to 59, supination from 52 to 87. Functional improvement was measured by Quick DASH from 68 to 43. Grip strength improved from 28 to 40 pounds.
Discussion/Conclusion: Pathological fractures due to metastatic bone lesions can be painful and debilitating. This case reported the decision making and use of manual techniques in addition to conservative management for improvement in function. Conservative management, including manual therapy, should be considered as a safe treatment option for patients with minimally/non-displaced pathologic fractures as a result of metastatic cancer to decrease pain, improve ROM, and improve QoL.

CR 18 [ID: 52]
MANAGEMENT OF A PATIENT WITH A MAISONNEUVE FRACTURE UTILIZING NEURAL DESENSITIZATION AND MANUAL THERAPY: A CASE REPORT

Ashlyn Rulis, Kevin Farrell, Candi Gardner, Joseph Haverkamp
Primary Contact: Ashlyn Rulis, St. Ambrose University, rulisashlyna@sau.edu

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Background/Purpose: Approximately 7% of individuals who experience limb fractures and/or surgical procedures are diagnosed with Chronic Regional Pain Syndrome (CRPS). A multi-disciplinary approach is optimal to address this diagnosis alongside the patient's functional deficits. Physical therapy treatment for these conditions may include pain neuroscience education (PNE) and neural desensitization techniques. The purpose of this case study is to describe the use of both neurophysiologic and biomechanical treatment approaches to address a Maisonneuveankle fracture with concurrent central sensitization.
Case Description: A 17 year-old female presented for physical therapy evaluation 4 weeks status-post right tibiofibular and tibial-syndesmotic open reduction internal fixation of a Maisonneuve ankle fracture. After the surgical fixation, the patient had reported frequent bouts of right lower extremity allodynia, including shooting pains that radiated proximally up her thigh as well as increased skin temperature and erythema when the lower extremity was in a dependent position. She demonstrated significant ankle range of motion (ROM) and strength limitations consistent with the surgical fixation, including significant limitations in dorsiflexion. Initial physical therapy management utilized PNE, graded motor imagery, and manual desensitization techniques to decrease symptom irritability and improve the individual's tolerance to active ROM interventions. Six weeks following the initial evaluation, hardware was to be removed. However, due to the COVID-19 pandemic and to reduce the risk of a CRPS flare-up, the procedure was postponed until the fall, following the patient's competitive golf season. Following this decision, mobilization techniques to optimize ankle ROM for return to a normalized gait pattern and competitive golfing were initiated and continued until the conclusion of this episode of care.
Outcomes: The patient was seen for a total of 12 weeks. During the first 6 weeks, treatment focused on neural desensitization with grade 2 tibiofemoral and talocrural joint glides, light touch desensitization, and PNE. During this period, numerical pain rating decreased from 8/10 to 4/10. Right ankle dorsiflexion active ROM improved from lacking 40 degrees to lacking10 degrees. The second 6 weeks emphasized a biomechanical approach for return to function. At the conclusion of treatment, numerical pain rating decreased to 3/10 and dorsiflexion active range of motion was lacking 4 degrees. The individual also reported 0 instances of shooting pain at night and was able to return to competitive golf play at the conclusion of treatment. Lower Extremity Functional Scale score improved from 26/80 to 55/80 over the course of care.
Discussion/Conclusion: The combination of a neural desensitization first, followed by a biomechanical treatment approach was effective in returning a competitive adolescent golfer to sport. While normal ROM was not achieved, functional limitations were minimal considering the presence of a syndesmotic fixation. This use of neural desensitization initially improved symptom irritability during the first half of treatment, allowing for improved patient tolerance of biomechanical manual therapy interventions during the second half of treatment.

CR 19 [ID: 53]

EXAMINATION AND CLINICAL DECISION MAKING OF A PATIENT WITH HEADACHE, RIGHT JAW, AND CLAVICLE PAIN: A CASE STUDY

Bailey Weber, Kevin Farrell, Candi Gardner, Wendy Bloomhuff, Kerri Hurning
Primary Contact: Bailey Weber, St. Ambrose University, weberbaileys@sau.edu

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Background/Purpose: Ensuring a patient is safe and appropriate for physical therapy is vital when initiating physical therapy. Therefore, a thorough evaluation of patient symptoms is necessary, especially in the presence of potential red flags. In the upper quadrant, this may include evaluating symptoms such as jaw pain and headaches to rule out serious pathology. The purpose of this case study was to describe the tests and measures utilized to determine if a patient presenting with multiple red flags was appropriate for physical therapy.

Case Description: A 21-year-old female presented with neck pain and headaches, as well as the presence of: blurry vision, dizziness, nausea, tinnitus, right facial numbness, and trouble concentrating. In September 2019, the patient reported sudden onset of nausea and left suboccipital headache while painting overhead in sustained right cervical rotation. Subsequent right jaw pain, popping, and clavicular pain came on in February 2020. Upon initial PT evaluation headaches had decreased in frequency, but were accompanied by nausea. The patient previously consulted a chiropractor, primary care physician and neurologist without change. Diagnostic testing of head and cervical spine were unremarkable. Objectively, cranial nerve and VBI screens, Hoffman's test and neuro exam were negative. Cervical active ROM was unremarkable. No symptom reproduction noted with differentiation of vestibular vs cervical spine as source of dizziness. Dizziness was reproduced with sustained right cervical passive rotation. Cervical flexion / rotation test was negative for symptom reproduction and ROM was symmetrical. Right 1st rib mobility decreased with scalene stretch, but was asymptomatic. Patient noted reproduction of headache with long-axis distraction and left C5 unilateral PA. Palpation to right sternocleidomastoid brought on jaw and clavicle symptoms. Based upon muscular referral patterns, it was hypothesized that the patient's symptoms were due to SCM and paraspinal muscles. Deemed appropriate for physical therapy, the patient's treatment included left unilateral PA at C2 and C5 in both neutral spine and left cervical rotation to decrease muscular tension. Patient was educated on deep neck flexor activation for HEP for posture retraining.

Outcomes: Symptoms rated 10/10 at worst and 2/10 at baseline with a Numeric Pain Rating Scale. Deep neck flexor endurance was less than 15 seconds before deviation. Following three treatment sessions, patient reported no right jaw pain and presented with increased first rib mobility with scalene stretch. Final outcome measures will be reported.

Discussion/Conclusion: Physical therapist are well prepared to screen and determine appropriateness for care. Through a thorough evaluation, this patient was deemed appropriate for physical therapy despite reporting multiple potential red flags. This case study supports the use of hands on examination techniques to form a differential diagnosis for a patient with cervical pain and headaches.

CR 20 [ID: 54]

USE OF THORACIC MANIPULATION FOR NEUROMECHANICAL SENSITIVITY IN A PATIENT WITH CHRONIC PAIN FROM TIBIAL PLATEAU FRACTURE: A CASE REPORT

Gabrielle Mendoza, Kevin Farrell, Candi Gardner, Audie Veloria, Janelle Smith
Primary Contact: Gabrielle Mendoza, St. Ambrose University, mendozagabriellea@sau.edu

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Background/Purpose: When addressing joint limitations, manual mobilizations and exercise are typically at the core of a therapist's plan of care. However, irritability of neural tissue should be considered as a potential pain-generating structure that may limit motion. The purpose of this case study is to demonstrate thoracic spine intervention to address apparent contributing neural irritability in a patient with leg pain limiting knee range of motion.

Case Description: A 57-year-old female was referred to therapy for nonsurgical tibial plateau fracture that occurred 11 weeks before evaluation. The patient had not followed physician recommendations for progressive weight-bearing by remaining weight-bearing-as-tolerated months after injury. Initial evaluation was performed by another therapist, but case was transferred 14 weeks into plan of care due to protocol during COVID. Initially the patient's active-assisted range of motion (AAROM) was 25° to 50°, at 14 weeks was only 12° to 75°. Patient was also diagnosed with early-stage complex regional pain syndrome (CRPS) and demonstrated palpable change in temperature through the knee, purple and mottled discoloration in distal medial thigh and knee, and decreased hair growth to medial shin. The original intervention had focused on traditional, local biomechanical treatment to the knee via passive range of motion, joint glides, and therapeutic exercise, but patient continued to complain of pain of high severity. On examination, there was discrepancy in straight leg raise (SLR) with left measuring 40° and right 35° and mobility restrictions through the thoracic spine. Following prior literature, a prone thoracic manipulation to mid thoracic spine (T6 with 2 segments above/below) was completed with cavitation. Immediately following, pain decreased from 6/10 to 3/10 during gait. After soft tissue mobilization along the pathway of femoral/saphenous nerves and lateral femoral cutaneous nerve, pain decreased even further to 1/10. AAROM improved to 8° to 82° and SLR improved to 50° bilaterally by the end of that session without any direct treatment to the biomechanical limitations to the knee.

Outcomes: Care is still ongoing. Patient had progressed to wheelchair/walker-bound with moderate assist during gait to quad cane. She is now independent with gait without assistive device, progressed over 5 weeks. Current treatment includes gait training, manual treatment to the knee/foot/ankle and spine when indicated, therapeutic exercise, and pain neuroscience education. Knee ROM as of week 26 measured 4° to 103°. Skin mottling is still present throughout bilateral legs, purple discoloration is no longer present. Skin temperature is palpably symmetrical.

Discussion/Conclusion: This patient was previously receiving traditional manual treatment directly to the local body part (knee) to address limitations in joint mobility and range of motion as well as developing CRPS. Following literature to address neural sensitivity proximally, the patient's subjective complaints of pain decreased and ROM increased within session.
ROM continues to progress between sessions.

CR 21 [ID: 55]

THE USE OF THORACIC MOBILIZATIONS TO IMPROVE POSTURE AND SCAPULAR POSITIONING FOR AN INDIVIDUAL STATUS POST REVERSE TOTAL SHOULDER WITH INSTABILITY COMPLICATIONS: A CASE REPORT

Connor Obert, Kevin Farrell, Candi Gardner, Anna Perry, Laura Moorman
Primary Contact: Connor Obert, St. Ambrose University, connorobert30@gmail.com

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Background/Purpose: The shoulder joint relies on a complex interplay between static soft tissue, dynamic muscular stabilizers, and bony anatomy to lend stability. Posture and scapular position can assist with stability and improve overall function. Mobilization of the thoracic spine may be important for improving posture, functional range of motion (ROM), and overall stability of the glenohumeral joint. This case looks to examine the impact of thoracic spine mobilization on posture and thus scapular position for overall improved stability in a patient status post reverse total shoulder with instability complications.

Case Description: A 64-year-old male suffered a left glenohumeral anterior/inferior dislocation and rotator cuff tear when pulling himself up into a truck at work. He subsequently had a massive rotator cuff repair, subacromial decompression, distal clavicle excision, labral debridement, and biceps tenolysis. However on follow up, X-rays showed that he had again dislocated. The patient underwent a reverse total shoulder replacement, yet suffered a third dislocation. He was reduced and in a sling for two months and then referred to therapy. Upon examination, the patient had upper crossed posture with increased kyphosis at the cervicothoracic junction and poor scapular positioning. Initial treatment focused on education, swelling reduction, and passive ROM in his left upper extremity. Then, thoracic spine mobilizations were added with grade III reverse Mulligan sustained natural apophyseal glides (SNAG's) and grade III posterior to anterior mobilizations (P-A's) throughout the patient's mid-thoracic spine to improve posture and better position the scapula / glenohumeral joint. Thoracic mobilizations were performed in sitting due to the patient's obesity and inability to lay prone. His home program included scapular retraction exercises and stretching supine on a towel roll. The patient then progressed to active assisted and active ROM exercises.

Outcomes: The patient's posture/scapular positioning was assessed by measuring the patient's acromion process to the table in supine. Initially this was 21 cm (left) and 20 cm (right). After the thoracic mobilizations the distance was 16 cm (left) and 17 cm (right). The patient also noted feeling less stiff. Since, his supine posture has plateaued, but the therapist did note an improvement in sitting posture. The patient has progressed through active assisted and active ROM with no complaints of instability.

Discussion / Conclusion: This case report describes a patient with three shoulder dislocations, including after a rotator cuff repair and subsequent reverse total shoulder. Treatment focused on thoracic mobilizations and exercise to improve posture to improve scapular position and glenohumeral stability. Improving thoracic posture and scapular positioning allowed for him to improve overhead mobility with no further episodes of instability.

CR 22 [ID: 56]
DIFFERENTIATION AND USE OF MANUAL THERAPY TO TREAT ADHESIVE CAPSULITIS: A CASE REPORT

Devin Hartman, Daniel Shuda, Kevin Farrell, Candi Gardner, Kirsten Ukleja, Scott Dickman
Primary Contact: Devin Hartman, St. Ambrose University, hartmandevinp@sau.edu

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Background/Purpose: Therapists must utilize clinical reasoning and a thorough examination process, including working with other providers, to assist in the determination of the underlying cause of the patient's symptoms. The purpose of this case is to discuss the role of a manual therapist in aiding in a differential diagnosis of a patient with shoulder pain.
Case Description: A 45-year-old female presented to therapy with left shoulder pain starting two months prior after repetitive lifting of a bucket. The patient had a diagnosis and positive tests consistent with rotator cuff pathology, as well as positive impingement tests. Labrum, biceps, and contribution from the cervical spine were ruled out, but a base ULTT was unable to be performed due to guarding. At future visits, base ULTT was negative. She had limited ROM in all planes due to pain, most notably abduction and internal rotation, with an empty end feel. After 6 visits, the patient presented with limitations in external rotation, internal rotation, abduction, and flexion, and end feels were firm and capsular although occasionally were empty. Although, the patient did not fit a capsular pattern, glenohumeral joint glides were moderately limited as well. The patient plateaued with ROM after 3 weeks, warranting referral to a physician for imaging and/or injection. The therapist contacted physician about diagnostic ultrasound to assess for cuff pathology, as well as for injection to help decrease pain. The patient returned to therapy following a cortisone injection into the subacromial bursa and oral NSAID's being told she had bursitis. Pain was slightly improved, but ROM continued to be limited. Injection into her bursa failed to reduce symptoms and ROM was digressing. At this point, since the patient appeared to have more capsular restriction, she was referred back to the physician for follow up and injection into the glenohumeral joint capsule. The physician agreed with our differential diagnosis and more effectively directed his injection into the capsule itself. Following injection, the patient presented with less pain, improved ROM, and irritability level, particularly with motion. More aggressive mobilizations were tolerated and improvements with ROM were noted.
Outcomes: Patient is still under care and has seen improvements from 90s to the 130s for flexion and abduction with capsular end feels still but no longer painful. The patient was being treated with grade III glenohumeral glides performed in multiple planes within the patient's available ROM. Final ROM and function will be included.
Discussion/Conclusion: This case presented the examination and manual intervention utilized in a patient with an original diagnosis of shoulder pain. The therapist adapted care and communication with other health providers to guide the differential diagnosis and treatment to lead to positive resolution of the patient's symptoms.

CR 23 [ID: 58]
PAIN AS PRIMARY SYMPTOM OF IATROGENIC PNEUMOTHORAX FOLLOWING DRY NEEDLING

Alec Kay
Primary Contact: Alec Kay, The Ola Grimsby Institute, alec@unitedpt.com

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Background/Purpose: Dry needling (DN) is a technique frequently used by physical therapists. Anatomical knowledge, formal education in precautions and safety, and adequate practice are imperative in its safe use with patients. Despite appropriate training, adverse events (AE) may occur and need to be recognized readily, the most potentially serious being pneumothorax. This case describes a pain pattern related to DN that suggests visceral referral potentially related to pleurisy or post COVID-19 syndrome as 43% of patients following acute COVID-19 can have dyspneic symptoms 60 days following infection.
Case Description: A 27-year-old woman attended physical therapy (PT) for her symptoms which started 2 months earlier when she experienced a viral infection that included fever, cough, and chest pain. She was sick at home for 4 weeks with diagnosis of costochondritis or pleurisy. Five weeks after onset, she was tested negative for COVID-19 and her chest X-ray was normal. Primary complaint was left upper thoracic pain, 3/10 that was worsened by slumping, upper limb physical activity and walking. There was slight tingling and numbness in bilateral 4th and 5th digits. Objective findings included left upper thoracic pulling sensation with combined cervical flexion and right side-bending but other range of motion was normal. All neuro testing was normal. There was reproduction of bilateral 4th and 5th digit tingling with Roo's test after 20 seconds and with pec minor thoracic outlet testing. Palpation revealed left muscle guarding in the paraspinal, upper trapezius, levator scapula, and serratus posterior superior. She had decreased rib mobility at the left 5-8th costotransverse joints. She was diagnosed with costotransverse joint irritation and pec minor thoracic outlet syndrome.
Outcomes: The patient received 5 visits of PT for a month. Treatment on the initial encounter included education with focus on thoracic self-mobilization, ergonomic education, and respiratory exercises. On the second visit, she reported her pain had decreased to 2/10 and more tolerance for walking. Treatment for the remaining 4 visits included HVLAT left 4-6th costotransverse joints and DN to left upper trapezius, serratus posterior superior, and T5-6 longissimus. On her 5th visit, she came in with pain 1/10 and reported doing some light circuit strengthening, running 7x1 minute. During DN, there was a particular needling insertion point that was more painful than usual and reproduced her primary original symptom of scapular and left chest pain. The pain was 3/10 when she left but her pain increased to 8/10 in the same locations in that evening. The following day her physical therapist assessed her vital signs and found that her O2 sat was 97%, heart rate 63, blood pressure 117/70 and she had no abnormal breath sounds on auscultation. Her symptoms were not improved the following morning and was referred for medical work up and chest x-ray. She was found to have 1.8" apical pneumothorax. A week later, the pneumothorax had decreased to 1.5" and pain was down to 6/10 and walking was tolerated well One week later x-rays showed 1mm pneumothorax, and patient returned to running.
Discussion/Conclusion: Pneumothorax is an adverse event with DN and recognition is paramount. Her pain level escalated from a 1/10 to 8/10 where it remained for 36 hours following DN raising a red flag. It is likely the needle infiltrated her pleural lining. The pain pattern was similar to her original pain, suggesting a visceral referral. The adverse event also

may be a result of pleural thickening or inflammation leading to an anatomical anomaly from potential diagnosis of COVID-19 or pleurisy from several weeks prior. Acknowledging accidents occur, this case suggests that a recent history of pneumothorax may be a contraindication for DN in the lung field. The level of evidence of this case study does not merit such a conclusion but nevertheless is a reminder to clinicians to always proceed with caution.

CR 24 [ID: 60]

SUCCESSFUL IDENTIFICATION AND TREATMENT THROUGH DIRECT ACCESS PHYSICAL THERAPY OF A PATIENT WITH T4 SYNDROME WHO HAD BEEN MISDIAGNOSED WITH CARPAL TUNNEL SYNDROME – A CASE REPORT

Nora Corbett
Primary Contact: Nora Corbett, Wallace & Nilan, nora.m.corbett@gmail.com

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Background/Purpose: Medical diagnosis and imaging findings can be useful information when assessing a patient, but they never tell the whole story. Careful subjective assessment, observation and physical examination plays an even more important role. The purpose of this case report is to demonstrate how physical therapists can successfully identify and treat an uncommon diagnosis like T4 syndrome with manual therapy, education and specific exercises.
Case Description: A 67-year-old male writer presented to outpatient physical therapy via Direct Access for treatment of a 15-year history of bilateral carpal tunnel syndrome. Patient had an upper extremity EMG done 3 years ago which concluded moderate median neuropathies at both wrists. He had tried a cortisone injection in his left wrist 1.5 years ago without relief. Symptoms were bilateral wrist aching, whole hand tingling, and dropping things for the past couple of years. Objective findings were significant thoracic kyphosis with forward head posture and severe limitations in thoracic mobility, which also increased bilateral hand tingling. Wrist examination and upper extremity neuro-dynamic testing were normal. Palpation to upper thoracic segments was irritable and stiff. The patient was initially treated for 6 visits over the course of 3 weeks. He stopped after 3 weeks to meet an upcoming book deadline, but continued with his home exercises. Treatment consisted of central posterior to anterior mobilizations at T3-4 and bilateral unilateral posterior to anterior mobilizations at T1-4 segments. This consistently helped to improve thoracic mobility and decrease hand tingling. Patient education emphasized improving posture out of kyphotic positioning. Exercises included self-mobilization to thoracic spine, pec stretching, and scapular/rotator cuff strengthening. The patient returned to the clinic 4 months later for follow-up due to flare-up of symptoms. Previous treatments were continued and exercises progressed to include more global back extensor strengthening.
Outcomes: Following the initial course of 6 sessions the patient had a dramatic improvement in symptom relief, thoracic ROM, and Quick Dash score. Subjective whole hand tingling decreased from almost constant to 30% of the day. Thoracic extension range of motion improved from none to 50% range, full thoracic flexion no longer produced hand tingling, and rotation improved from 50% to 75%. Finally, Quick Dash outcome measure improved from 20.5% to 13.6%. When he returned to physical therapy 4 months later, the patient reported that he had continued with his home exercises and had been symptom free for that 4-month period.
Discussion/Conclusion: This case report demonstrates that direct access physical therapists can successfully identify uncommon presentations like T4 syndrome and effectively treat with manual therapy, education and specific exercises.

CR 25 [ID: 62]
THE USE OF PELVIC MANIPULATION TO RESTORE TERMINAL KNEE EXTENSION IN TWO ADOLESCENTS: A CASE SERIES

Clarke Seyler
Primary Contact: Clarke Seyler, University Hospitals, PenguinPT18@gmail.com

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Background/Purpose: Loss of knee extension is a common finding in patients with traumatic and atraumatic knee pain and can be associated with significant functional limitations. The inability to fully extend the knee in weight bearing may be due a central inhibitory mechanism, rather than an internal knee derangement. The purpose of this report is to describe the physical therapy management of knee pain with a loss of knee extension utilizing assessment of thrust manipulation to the pelvis and therapeutic exercise.
Case Description: Case 1 was a 16-year-old female who presented to physical therapy 3 weeks after an onset of knee pain after skiing. Case 2 was a 15-year-old female patient who presented to physical therapy 2 months after a traumatic onset of knee pain while running hurdles. Both patients were treated with a multimodal approach using pelvic thrust manipulation in addition to therapeutic exercise.
Outcomes: Case 1 was seen for 6 sessions of physical therapy over 7 weeks. Lower Extremity Functional Scale (LEFS) scores improved from 27/80 to 74/80, knee extension ROM improved from lacking 28 degrees to 0 degrees and the subject was able to return to all previous activities including jogging and horseback riding. Case 2 was seen for 5 session of physical therapy over 8 weeks. LEFS scores improved from 47/80 to 70/80, knee extension range of motion (ROM) improved from lacking 30 degrees to 0 degrees and the subject was able to return to previous track activities including running the hurdles.
Discussion/Conclusion: Therapeutic exercise can facilitate improved knee ROM, however, in cases where knee ROM limitations are present and do not fully resolve, other interventions should be considered. In these cases, in depth evaluation of the pelvis and hip revealed a central/proximal contributing factor to the patients' impairments. Pelvic thrust manipulation may be a beneficial adjunctive intervention to exercise and knee manual therapy techniques in subjects with knee pain and lack of range of motion.

CR 26 [ID: 66]
DIFFERENTIAL DIAGNOSIS OF A YOUNG FEMALE ATHLETE REFERRED TO PHYSICAL THERAPY WITH NECK PAIN: A CASE REPORT REVEALING ANKYLOSING SPONDYLITIS

Chelsea David, Bryan Dennison
Primary Contact: Chelsea David, Middlesex Health, chels.david33@gmail.com

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Background/Purpose: Neck pain is most commonly hypothesized as arising from nociceptive structures. However, systemic pathology can mimic symptoms of pain usually attributed to nociceptive structures. The purpose of this case study is to describe the clinical reasoning process for a condition that was hypothesized, as non-nociceptive in origin.
Case Description: A 16-year-old female, golf player presented to outpatient physical therapy with a three-month history of progressively worsening neck and upper back pain with marked stiffness. The symptoms were insidious in their onset and she denied any radiating pain or paraesthesias. Cervical and upper thoracic spine stiffness was worse in the morning and evening. However, these symptoms improved with movement or exercise. She also described new symptoms of fatigue. She rated pain/stiffness as 5/10 on the Numeric Pain Rating Scale (NPRS). Her Neck Disability Index (NDI) score was 13/50 (26% disabled). She had previously seen a physical therapist (PT) who had performed aggressive cervical and thoracic manipulations which made her pain/stiffness worse. She had not followed up with a physician since that time. Physical examination revealed limitations in cervical spine rotation range of motion (ROM) to
Outcomes: After consulting a former mentor regarding the examination findings, the treating therapist's non-musculoskeletal hypothesis was supported and the recommendation for additional diagnostic testing was encouraged. The patient and her mother were contacted by the treating PT with recommendations to follow up with her referring physician to request x-rays and blood tests. The treating PT also contacted that physician and recommended a referral to rheumatology. Subsequent diagnostic testing revealed the presence of ankylosing spondylitis in addition to psoriatic arthritis. Upon returning to physical therapy one month later, after initiating medication management for her condition, her cervical spine range of motion had improved to 65° rotation bilaterally, she rated her pain/stiffness as a 1/10 on the NPRS scale and her NDI score was 2/50 (4% disabled).
Discussion/Conclusion: This case study reinforces the need for physical therapists to perform a thorough evaluation of a patient's history and symptoms. Furthermore, this case supports physical therapist's training in musculoskeletal differential diagnosis and highlights their unique position in musculoskeletal healthcare to aid in this process. The accurate identification and prompt referral of patients presenting with suspicious findings to the appropriate healthcare provider may lead to timelier diagnoses and more appropriately directed care.

CR 27 [ID: 67]

MULTIMODAL TREATMENT APPROACH FOR PATIENT WITH PRIMARY COMPLAINT OF LOW BACK PAIN WITH ADVANCED LEFT HIP DEGENERATIVE OSTEOARTHRITIS: A CASE REPORT

Loviejay Arguelles
Primary Contact: Loviejay Arguelles, Regis University, ljarguellesdpt@gmail.com

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Background/Purpose: There is evidence that hip impairments can be a major contributing factor to LBP and treatment targeting the hip joint is effective for patients with a primary complaint of low back pain. This case report describes the clinical decision making, consideration of regional interdependence, and utilization of multimodal pragmatic treatment approach in a patient with low back pain and advanced left hip osteoarthritis.
Case Description: A 77-year-old male referred to physical therapy for evaluation and treatment of left-sided low back pain after picking up an object at work. A retired truck driver now working part-time in a clothing store, with prolonged standing, bending, and walking. A long history of left hip pain with radiographic evidence of advanced degenerative osteoarthritis with a pending total hip replacement. Baseline numeric pain rating scale (NPRS) 8/10), Oswestry Disability Index (ODI) is 48% and patient-specific functional scale (PSFS) 2/10 for walking > 1/4 mile, standing > 30 minutes and picking up items of clothing on the floor. Left hip passive flexion 90 degrees, extension 0 (+ pain), internal rotation 15 (+ pain), external rotation 30 . Active lumbar motion was limited in all directions without pain except for left-sided low back pain with extension. Manual muscle testing was normal except for left gluteus medius, Maximus, and hip flexors at 4/5. No directional preference for lumbar flexion and extension identified and no neural impairments. Lumbar hypomobility was noted. Spinal manual interventions were commenced both thrust and non-thrust with additional impairment-based mobilization of the left hip. Therapeutic exercises included self-hip mobilization and weight-bearing motor retraining with resistive training via band.
Outcomes: After seven sessions, the NPRS score was 2/10. PSFS rating was 7/10 and ODI 18%. Left hip range improved slightly to 95 flexion, 5 degrees extension, 25 IR, and 30 ER. Pain resolved at end range in these motions. The patient elected not to undergo left total hip replacement due to decrease in pain and improvement in functional walking and resumption of social dancing and ability to pick objects off the floor at work.
Discussion/Conclusion: This case demonstrates that a multi-modal and pragmatic treatment approach utilizing manual therapy and specific exercise for the lumbar spine and hip regions can reduce disability and reduce the need for invasive surgical interventions. Further research should continue to explore the benefits of manual therapy for symptomatic hip OA and spinal pain.

CR 28 [ID: 69]
BENEFITS OF HIGH-VELOCITY, LOW-AMPLITUDE THRUST TECHNIQUE (HVLAT) IN PRESENCE OF SUSPECTED MENISCAL INJURY IN YOUNG ACTIVE INDIVIDUALS: THREE CASE REPORTS

Parul Patel
Primary Contact: Parul Patel, Boston University, ppatelpt@bu.edu

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Background/Purpose: Knee pain is a common condition with almost ¼ episodes related to meniscal injuries. Meniscal injuries fall into two categories: traumatic, occurring in a younger, more active population or degenerative occurring in an older population. Identification of meniscal pathology can be made with a level of certainty utilizing diagnostic guidelines: mechanism of injury of twisting knee, history of catching/locking, delayed onset of effusion and > 3 of the Meniscal Composite Pathology score: findings of pain with forced hyperextension, pain with maximum passive knee flexion, joint line tenderness and pain or audible click with McMurray's maneuver. Arthroscopic partial meniscectomy has been the primary treatment however new evidence suggests similar outcomes with non-operative treatment. Evidence on non-operative treatment for younger more active population is limited. The purpose of this case report is to illustrate the influence of HVLAT performed at the knee on improving pain, ROM and reducing disability in three young active individuals with suspected meniscal injuries.
Case Description: Three individuals ages 18, 22, 22 presented to physical therapy with recent (no greater than 3 month) onset of knee pain provoked by activity. Initial outcomes measures included PSFS (5.7/10, 2.7/10, 2.7/10), NPRS (4.3/10), Knee Outcome Survey (74.3, 88.6, 57.1%). Examination revealed painful, limited passive ROM for knee flexion (0-124, 0-60, 0-135), positive McMurray, and medial joint line tenderness in all three. Decision to perform an HVLAT of tibiofemoral joint was based on the following: acuteness of symptoms, patient understanding of technique, consent to and lack of fear around technique, absence of contraindications to manipulation based on subjective and/or objective findings and presence of signs indicating intra articular involvement.
Outcomes: The patients were seen for 9, 26 and 13 visits and HVLAT was performed3, 1 and 1 time, respectively over the course of care. Final outcome measures for PSFS (7.8/10, 6.3/10, 7.7/10), NPRS (1.3/10), Knee Outcome Survey (92.9, 94.3, 84.3%), passive ROM in knee flexion (0-130, 0-118, 0-145 degrees).
Discussion/Conclusion: All patients had reduced pain and improved ROM immediately following application of HVLAT, were better able to tolerate exercise, and return to higher-level activity or continue participating in higher-level activity with improved tolerance. The exact mechanism responsible for this response is unknown but it is likely multifactorial; patient expectations and application of mechanical force that created peripherally and centrally mediated changes which reduced pain. It may be that a subset of patients with knee pain may benefit from this technique in addition to exercise; however, more research is needed.

CR 29 [ID: 70]

PNEUMOTHORAX FOLLOWING DRY NEEDLING OF PERISCAPULAR MUSCLES UTILIZING A RIB BRACKETING TECHNIQUE: A CASE REPORT

Paul Mintken, Amy McDevitt, Blair Denman
Primary Contact: Paul Mintken, University of Colorado, paul.mintken@ucdenver.edu

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Background/Purpose: Dry needling is commonly used by physiotherapists worldwide, but little information exists regarding the adverse event of pneumothorax. The purpose of this case report is to describe the symptoms and clinical course of a patient who developed a pneumothorax following dry needling.
Case Description: The patient was a 24-year-old female being treated in physiotherapy for chronic neck pain. The physiotherapist treated trigger points in the left periscapular muscles with dry needling using a rib bracketing technique. During treatment, the patient complained of an uncharacteristically sharp pain during one needle insertion. She felt fine the rest of the day. Two days later the patient noticed dyspnea and a sharp pain on the anterior and posterior portion of her thorax. She also developed a dry cough and a "flopping/gurgling" sensation in the left side of her chest when bending over. The physiotherapist was contacted, and she was referred for emergency care. A radiograph revealed a left sided pneumothorax, which was successfully reinflated via a chest tube. The patient was kept overnight and released the following day.
Outcomes: Following discharge from the hospital, the patient complained left sided chest pain, reduced aerobic capacity, and dyspnea for 2 weeks. By 1 month, she reported 100% recovery and had returned to hiking and skiing with no limitations.
Discussion/Conclusion: This case report calls into question the safety of the rib bracketing technique for treating trigger points of the thorax. Dry needling carries the risk of pneumothorax, and physiotherapists should be vigilant. Prompt identification and management can lead to a full recovery.

CR 30 [ID: 73]
ADDRESSING PSYCHOLOGICAL RELATED FACTORS OF CHRONIC TMD THROUGH AN INTERDISCIPLINARY APPROACH: A CASE REPORT

Roy Horton, Andrew Post
Primary Contact: Roy Horton, University of Chicago Medicine, roy.horton@uchospitals.edu

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Background/Purpose: Temporomandibular dysfunction (TMD) frequently involves a variety of overlapping impairments of the orofacial and cervical regions. The prevalence of symptomatic TMD is estimated at 35% or more in people of all ages. Due to the high variability in presentation of TMD, a standardized approach to management may not be effective. Recent evidence has demonstrated individualized care in a biopsychosocial approach aids in facilitating optimal outcomes in those with persistent musculoskeletal pain. However, there is a paucity in the literature for psychological interventions in combination with physical therapy (PT) for those with TMD. The purpose of this case report is to describe an interdisciplinary plan of care for an individual presenting with chronic myogenic TMD.
Case Description: The patient was a 33-year-old male university professor with a 4-year history of bilateral TMD. He had previously seen a dentist and PT for his jaw pain with no long-term improvements. Examination findings at his initial evaluation were consistent with TMD of myogenic origin. Pertinent physical findings included an "S-curve" during mouth opening, right-sided masticatory muscle performance deficits, and pain reproduction with palpation of bilateral temporalis and masseter. He also demonstrated hypomobility with PPIVM assessment at C0-C2 and T1-T4 and forward head posture. His primary functional limitation was orofacial discomfort while lecturing for his work. Interestingly, the patient also reported stress at work and home directly impacting his symptom intensity. His Graded Chronic Pain Scale classification was a grade II (low disability-high intensity). PT interventions included soft tissue mobilization and dry needling in the orofacial and cervical regions, grade III-V mobilizations of the upper cervical and thoracic spine, and neuro-reeducation of the temporomandibular joint and cervical spine. PT education addressed parafunctional habits and sleep hygiene. Due to stress as a contributing factor to his symptoms, he completed 4 sessions of CBT with a psychologist over a 7-week period.
Outcomes: The patient was seen for 7 treatment sessions over 4 months. His TMD Disability Index and Neck Disability Index scores improved from 16/40 to 9/40 and 10/50 to 5/50, respectively. He also scored on the Global Rating of Change +5 or "A good deal better" and reported improved ability to lecture for 120 minutes. Patient was discharged at his request due to COVID-19.
Discussion/Conclusion: This case demonstrates the effective use of an interdisciplinary approach for a patient with TMD including PT and psychological interventions. PT's are well equipped to address physical impairments; however, collaboration with a mental health specialist to provide appropriate psychological interventions outside the scope of PT may be warranted to optimize patient outcomes.

CR 31 [ID: 74]
NOVEL NEURODYNAMIC ASSESSMENT AND INTERVENTION IN THE MANAGEMENT OF A HIGHLY MOBILE ATHLETE WITH LUMBAR RADICULOPATHY: A CASE REPORT

Steven Kinney
Primary Contact: Steven Kinney, Regis University, Stevengkinney@gmail.com

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Background/Purpose: Neurodynamic assessment and intervention are valuable components of orthopaedic manual therapist practice. Despite its ability to influence clinical management, neurodynamic testing has limitations. Additionally, a wide variety of neurodynamic interventions needs to be tailored to the individual. This case illustrates the use of novel neurodynamic assessment and interventions in the management of impairments associated with lumbar radiculopathy in a highly mobile athlete.
Case Description: 35-year-old male reported right posterior hip, knee, lower leg, and foot pain of 3 months duration after an 8-hour car ride. He reported numbness in foot that started shortly before this 3-month period. The patient was a student who sat for prolonged periods and a martial arts participant. His chief complaints on the Patient Specific Functional Scale (PSFS) were inability to sit greater than an hour (0/10), stretching his leg straight (8/10) and difficulty driving greater than 30 minutes (3/10). He also noted limitations in bending, twisting, squatting and martial arts activities. Examination noted pain 2/10 at rest, 7/10 worst. Range of motion impairments were minimal limitations in left lumbar sidebend and lumbar extension only. Right knee hyporeflexia and impaired sensation to light touch on the right lateral foot were noted. A split position, which he typically performed in martial arts, significantly provoked symptoms. Slump test mildly provoked familiar symptoms. A cross body upper limb tension test A performed with the slump test significantly provoked familiar symptoms. Other neurodynamic testing was negative. Initial management included repeated lumbar extension, which slightly improved symptoms, and neurodynamic flossing, which significantly improved symptoms. Neurodynamic flossing intervention included ankle plantar flexion and dorsiflexion paired with lumbar sidebending in a split position. Initially this split position was modified to bring the legs slightly anterior into the more natural plane of the hips. This exercise was included in the patient's home program. On follow up, no symptoms with any activities were present except when he performed a crescent kick. The slump test was negative in the session, but a cross body upper limb tension test A performed with the slump test continued to provoke symptoms. Manual then active neurodynamic flossing was continued noting improvement on the cross body upper limb tension test A performed with the slump test. Symptoms resolved with the crescent kick.
Outcomes: Between the second and third sessions, the patient completed an 8-hour car ride with minimal symptoms. At the conclusion of care, the patient reported no symptoms or physical limitations.
Discussion/Conclusion: This case describes the cross body upper limb tension test A performed with the slump test as a neurodynamic assessment. It also illustrates a novel neurodynamic flossing intervention individualized for a highly mobile martial arts athlete to inform future research questions.

CR 32 [ID: 76]

TREATMENT OF RIGHT FOOT DRIVEN LEFT FEMOROACETEBULAR IMPINGEMENT PRESENTATION OF A 16 Y.O. FEMALE CROSS COUNTRY RUNNER USING THE CONNECTTHERAPY™ & THE THORACIC RING APPROACH™ MODEL

Tyrees Marcy
Primary Contact: Tyrees Marcy, The North American Institute of Orthopaedic Manual Therapy, shatzert@yahoo.com

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Background/Purpose: The etiology of femoroacetabular impingement (FAI) has been studied and related to both inherited/genetic and acquired characteristics of symptomatic presentations. Specifically in adolescence, clinical research suggests that patients exposed to 'at-risk' activities such as basketball, football, or hockey during childhood and adolescence may undergo developmental changes in hip architecture. The purpose of this report is to demonstrate the utilization of the ConnectTherapy™ & the Thoracic Ring Approach™ model as a clinical reasoning tool to identify and treat the influence of distal drivers in identifying regional interdependence that may play a role in the development of FAI.

Case Description: The patient was a 16-year-old Caucasian female referred to physical therapy secondary to anterior groin pain that began in the spring of 2019 and worsened in August, 2019 while running cross country. She had a significant past medical history of severe right ankle sprain spring 2019 with 3 concussive events in the last 'several years'. Diagnostics included MRI negative although her orthopaedic specialist reported potential 'tear in left hip cartilage'. Initial care of 8 visits was provided for the left hip initially by another therapist with little change in groin pain. Clinical findings included left coxafemoral joint anteromedial with relative right center of mass over base of support at feet with internal collapse of right lower quarter during the meaningful screening task squat / bilateral arm lift. Regional clinical findings included reduced left hip PROM painful and right ankle dorsiflexion, reduced left hip strength and right calf strength, habitual right knee genu recurvatum, positive right hip scour and FADIR and positive right talar swing test with grade II hypomobile/non-painful right talocrural and subtalar joint mobility. Utilizing the ConnectTherapy™ and the Thoracic Ring Approach™ model, correction of the right foot centered the left coxafemoral joint into the acetabulum from standing to 30% squat/bilateral arm lift before a barrier was met at the talocrural joint for ankle dorsiflexion requiring manual therapy intervention and neuromuscular re-education for optimal movement strategy for both the left hip and right foot. The ConnectTherapy™ & the Thoracic Ring Approach™ model for clinical care included 8 visits over 1.5 months.

Outcomes: Upon completion of care, the patient had full right ankle/foot dorsiflexion with 4+/5 calf strength right with negative genu recurvatum in standing postures, full left hip PROM non-painful, and left hip grossly 4+/5. She was able to perform meaningful screening tasks squat/bilateral arm lift 75% painfree left hip and left step-out / right single arm lift with palpated left hip centering into left acetabulum with stance phase and neutral right foot biomechanics. Self-reported measure of Care Connections score was 44 initially and 92 upon discharge with ability to jog up to 3 miles for return to sport preparation, perform stairs pain free, sit for up to 120 min and sleep through the night.

Discussion/Conclusion: FAI is defined as a "clinical syndrome in which the anatomic abnormalities of the femoral head and/or the acetabulum result in an abnormal contact between the two during hip motion, especially in positions of hip flexion and rotation, leading to cartilage

and labral damage and hip pain. In utilizing the ConnectTherapy™ and the Thoracic Ring Approach™ model as a clinical reasoning tool, a distal right foot was identified as the primary driver and quickly treated concurrently with left hip for strengthening, balance/proprioception and specific return to sport functional training activities. This case report identifies the potential of the ConnectTherapy™ and the Thoracic Ring Approach™ model with use of a meaningful screening task in a movement assessment based on the patient's meaningful activities in order to identify influencing regions of the body that directly impact the patient's movement experience. This is a useful tool in the evaluation and treatment of groin pain that may be directly related to FAI, especially with young athletes with the potential of preventing acquired characteristics of symptomatic presentations.

CR 33 [ID: 78]

THE DIAGNOSIS AND TREATMENT OF A PATIENT WITH CERVICOGENIC HEADACHE, POST-CONCUSSION SYNDROME, AND HYPERLAXITY: A CASE REPORT

Brian Swanson, Vladimir Smolgovskiy
Primary Contact: Brian Swanson, University of Hartford, bswanson@hartford.edu

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Background/Purpose: Cervicogenic Headache (CGH) is a secondary headache caused by a disorder of the cervical spine, usually accompanied by neck pain. Common signs and symptoms of CGH include unilateral, non-continuous headache without side-shift, headache precipitated by neck movements or postures, positive cervical flexion rotation test, upper cervical hypomobility, positive provocation of involved upper cervical segments, and deficits of strength, endurance, and/or coordination in the cervical musculature. These impairments are also frequently observed in post-concussion syndrome, a persistence of concussion symptoms >7-10days following the initial concussion. Research is showing a strong cervicogenic component to concussion with beneficial effects of treatment of upper cervical spine dysfunction due to the relation of upper cervical sensory afferents to the vestibular system and the trigeminocervical nucleus to the referred headache symptoms. While the cervical flexion-rotation test is a commonly used diagnostic test for CGH supported by the literature, it does not take into account hyperlaxity which may be present in patients. This case report describes the use of the side-bend rotation test to rule in the diagnosis of cervicogenic headache in a 40 y/o female with associated post-concussion syndrome and subsequent treatment.

Case Description: A 40-year-old female with complaints of left-sided occipital and ram's horn headache for two months following use of different pillows on vacation, followed by hitting her head on a garage door 1 week later. She reported previous chiropractic care without relief. Primary complaints were limitations in driving/looking over left shoulder, sleeping, and inability to work due to intolerance of noise and computers, NDI 48%. Physical examination demonstrated only mildly limited cervical left rotation to 60 degrees; flexion rotation test was negative to >45 degrees bilaterally. However, her Beighton Index was 5/9, so the SBRT was assessed, and found to be positive at approximately 0° left rotation with pain reproduction. Manual assessment revealed painful, limited left C1-2 joint play, and DNF endurance was 15 seconds. Vertical saccades (5/10 dizziness) and convergence (near point 8cm; 4/10 HA) were symptomatic. Treatment consisted of upper-cervical joint mobilization, scapulothoracic and DNF motor control exercise, and graded aerobic exercise over 9 visits.

Outcomes: The patient demonstrated a significant improvement, returning to ADLs without limitations and her NDI score at discharge was 2%. Left SBRT improved to 30°, L cervical rotation to 80°, DNF endurance to 40 seconds, and saccades and convergence were asymptomatic.

Discussion/Conclusion: In this patient with mild hyperlaxity, the SBRT was beneficial in identifying upper cervical hypomobility in the presence of a negative flexion-rotation test. Subsequent evidence-based treatment, including manual and self C1-2 mobilization, cervical and thoracic manipulation, and cervical and scapulothoracic strength, endurance, coordination, and stretching exercises in combination with aerobic exercise to address the PCS component, were successful for this patient.

CR 34 [ID: 80]

AN IRRITABILITY-BASED MANUAL THERAPY AND EXERCISE APPROACH TO AVOID SCAPULO-THORACIC FUSION POST EDEN LANGE PROCEDURE: A CASE REPORT

Pamela Dibblee
Primary Contact: Pamela Dibblee, Regis University, dibspd@hotmail.com

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Background/Purpose: The Modified Eden Lange procedure attempts to restore the functional aspect of the trapezius, which in this case, was secondary to paralysis was caused by spinal accessory nerve injury at birth. The procedure substitutes the levator scapulae for the superior aspect of the trapezius and rhomboids for the middle and lower portions of the trapezius.
Case Description: A 21-year-old female, eight years post a modified Eden Lange procedure, presented with progressive increase in shoulder pain, decreasing active elevation and worsening functional use of her left upper extremity. The patient has taken a year off school. All lifting and left upper extremity (UE) use was limited due to shoulder pain. Her primary pain location was in the area of the sternoclavicular (SC) joint, with anterior shoulder pain and left upper trapezius/levator scapulae pain. The patient was given the option of physical therapy management or a scapula-thoracic fusion. On initial evaluation, her Disabilities of Arm, Shoulder and Hand (DASH) score was 48%, and pain level was 6/10. Examination findings revealed left shoulder flexion in sitting 85° with pain in left SC joint and extension with rotation at the lumbar spine. Left shoulder supine external rotation (ER) in neutral 45° with SC joint pain: ER at 90° abduction 62° with shoulder pain. Limitation in posterior-anterior (PA) mobility of the mid-thoracic spine and decreased upward rotation and posterior tilt of left scapula were identified. A Trendelenberg drop during single leg stance was observed bilaterally. Interventions provided each visit were graded based on irritability level and included manual therapy to increase thoracic spine and scapular mobility, and dry needling to the levator scapulae for pain relief. Therapeutic exercise interventions included muscle re-education targeting the deep cervical flexors to help minimize overuse of levator scapulae, proprioception and strengthening of the rotator cuff, scapular stabilizers and core/pelvic girdle musculature.
Outcomes: At the seventh visit, 12 weeks into management, DASH score was 28%. Her pain was rated at 2/10 on the NPRS. Left shoulder motion flexion in sitting 141°, ER in neutral 76° without pain, ER at 90 abduction 92° without pain. Trendelenberg drop in single leg stance was not observed with a return to her regular cardiovascular exercise program. The patient also was able to return to playing the piano for 45 min without increased in pain and had returned to school.
Discussion/Conclusion: This case describes a multimodal treatment of a patient eight years post modified Eden Lange procedure. The grading and intensity of interventions was determined utilizing tissue irritability guidelines when delivering manual therapy and exercise interventions targeting deep cervical flexors, core, shoulder and pelvic girdle musculature. A significant functional improvement was achieved, and the patient did not require left scapula-thoracic fusion.

CR 35 [ID: 81]

A PATIENT WITH A FOUR-YEAR HISTORY OF PAIN FOLLOWING CARDIOVASCULAR SURGERY SUCCESSFULLY TREATED WITH A MULTIMODAL MANUAL PHYSICAL THERAPY APPROACH: A CASE REPORT

Paul Lonnemann, Margaret Lonnemann
Primary Contact: Paul Lonnemann, KORT/ Bellarmine University, plonnemann@bellarmine.edu

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Background/Purpose: Development of chronic pain has been described following open heart and other vascular procedures. Few patients receive physical therapy (PT) interventions following these procedures. Purpose: This is a case report of a multimodal PT approach to treating a patient following an aortic dissection repair with a four-year history of thoracic and lumbar pain.

Case Description: The patient was examined using an impairment based clinical decision making approach grounded in orthopaedic manual physical therapy. The patient presented with c/o left anterior lateral flank pain and right shoulder referral, lower thoracic and lumbar pain with painful AROM, positive neurodynamic testing, painful lower ribs with breathing and pain with coughing/sneezing. Interventions were performed in nine visits over two months. Interventions included manual therapy to restricted soft tissues over the lumbar spine, thorax and associated rib articulations, exercise, low frequency home TENS, and patient/family education focused on the self-care strategies.

Outcomes: The patient improved significantly with a self-reported global improvement of 75%, Modified Oswestry Disability Index improved from 36% to 12%, elimination of pain with Straight leg raise and slump tests, and minimal tenderness to palpation with improvement from a 6/10 to a 3/10.

Discussion/Conclusion: Post-operative pain of a four-year duration was treated successfully with a multimodal physical therapy approach. Patients who have undergone thoracic vascular surgeries may benefit from PT intervention to the lumbar spine, thoracic spine and associated rib articulations. Cardiovascular surgeons should be informed of the potential benefits for patients following cardiovascular surgeries to address chronic pain problems.

CR 36 [ID: 82]
CERVICOGENIC HEADACHES AND DIZZINESS AS A POTENTIAL SOURCE OF SYMPTOMS ASSOCIATED WITH POST-CONCUSSION SYNDROME: A CASE REPORT

Katherine Amsden
Primary Contact: Katherine Amsden, Avant Physical Therapy, kate@avantphysicaltherapy.com

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Background/Purpose: Post-concussion syndrome is not defined by strong consensus, but is typically understood as at least three of the following symptoms persisting one month after concussion (mild traumatic brain injury or mTBI): headaches, dizziness, nausea/vomiting, noise sensitivity, light/screen sensitivity, fatigue, sleep disturbance, irritability, double vision, and cognitive/emotional disturbances. Most cases are treated with prescription of analgesics or antidepressants. Treatment is varied, and is focused on education and grading return to activity based on symptom reproduction. Cervicogenic dizziness and headaches are commonly treated by orthopedic physical therapists, though mechanism is poorly understood. They are primarily a diagnosis of exclusion following orthopedic and neurological evaluation, and a thorough understanding of patient history. The purpose of this case report is to explore the benefit of orthopedic rehabilitation of a patient with post-concussion syndrome.
Case Description: The patient arrived to physical therapy with complaints of dizziness, light sensitivity, and headaches commencing seven weeks previously, when he was struck in the head. He reported constant headaches, worsening with screen use, and dizziness with changing positions. Three weeks prior, he sought care from a primary care practitioner, who diagnosed him with post-concussion syndrome and advised limited screen time and increased sleep. The patient has been compliant however he reported no significant change to symptoms. He was evaluated by a physical therapist who regularly treated patients with orthopedic and vestibular conditions. Cranial nerve and vestibular testing was negative, however cervical examination revealed deficits in upper cervical flexion and right lateral flexion mobility, with reproduction of headaches, actively and passively. Additionally, left atlanto-occipital (OA) capsular mobility was found to be restricted into posterior and left glides, without local pain reproduction but with headaches and dizziness.
Outcomes: The patient was initially treated with orthopedic manual and exercise interventions targeted at improving left OA capsule mobility. At the patient's next visit 4 days later, he reported full resolution of headaches and 50% resolution of dizziness, and orthopedic exercise was progressed. 6 days later, the patient reported full resolution of headaches, dizziness, and screen sensitivity. The patient experienced no further symptoms associated with post-concussion syndrome.
Discussion/Conclusion: This case provides one example of a patient whose symptoms were diagnosed as post- concussive syndrome, thought to be originating from brain trauma, however the source appears to have been his upper cervical spine, and he was able to recover more rapidly with orthopedic care than with post-concussion protocols. A small body of research explores the importance of addressing cervical spine involvement in treating post-concussion syndrome, however it is limited and lacks cohesion with the majority of literature focused on neurological treatment. Further research and changes in practice are warranted, as they may lead to mTBI patients recovering more rapidly by being treated with orthopedic and neurological foci.

CR 37 [ID: 85]

CONSERVATIVE MANAGEMENT OF LOW BACK PAIN FOLLOWING MULTIPLE ABDOMINAL SURGERIES: A CASE STUDY

Allison Butcher, Sarah Worth, Wayne Brewer
Primary Contact: Allison Butcher, Harris Health System, allisonhall2012@gmail.com

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Background/Purpose: Chronic low back pain is a prevalent problem in the United States and is associated with increased healthcare utilization. Given the close association between the pelvic floor and core musculature, it is unsurprising that trauma to one area may affect the other. However, there is limited research regarding the prevalence of back pain following multiple abdominal surgeries, particularly when musculoskeletal deficits are not addressed initially following surgery. The purpose of this case study was to examine the diagnosis and management of a patient with chronic low back pain following four abdominal surgeries over the course of twenty years, and to emphasize the importance of recognizing patients at risk for developing chronic pain.

Case Description: A forty-eight year old female was evaluated by physical therapy for low back pain persisting 20 years that was exacerbated one year prior. Her past medical history was significant for diabetes, an open appendectomy in 2002, a total of seven pregnancies including two caesarean sections and five vaginal births, and a laparoscopic ventral hernia repair in 2019. Her demographic history was significant for low socioeconomic status, decreased health literacy, and lacking health insurance. The patient was seen in physical therapy over 4 months for 10 visits. Treatment included manual therapy, scar massage, therapeutic exercise targeting core activation, functional mobility training, and education. The patient was instructed on timed breathing with functional movements, transitional movements, and lifting techniques.

Outcomes: After completing physical therapy, the patient demonstrated improvement in abdominal control, lower extremity strength, and cardiovascular endurance. She improved her thirty second sit to stand test by 3 repetitions (MCID = 2), her six minute walk test by 288 feet (MCID = 201 feet), and Focus on Therapeutic Outcomes, to measure self-perceived function, by 9 points (MCID = 12). The patient met all of her personal goals including decreased back pain, being able to lift her grandchildren, and having intercourse with her husband.

Discussion/Conclusion: Based off patient history, chart review, and physical examination, it appears that her back pain stemmed from the initial appendectomy in 2002. This patient also has many demographic and environmental characteristics predisposing her to chronic low back pain; it is important to recognize these at-risk patients early to optimize outcomes. Despite the prevalence of chronic lumbar pain in patients following abdominal surgery, physical therapy is rarely considered a priority in the post-surgical treatment plan. It is likely that this patient would have benefited from a much earlier referral to physical therapy to avoid decades of back pain. While more research is necessary to further examine the relationship between physical therapy and low back pain following abdominal surgery, physical therapy can play a vital role in optimizing movement and restoring life after musculoskeletal trauma.

CR 38 [ID: 87]
LASER POINTER VISUAL FEEDBACK FOR POSTURAL CORRECTION AS AN ADJUNCT TREATMENT FORr A 36-YEAR-OLD FEMALE WITH A MILD DOWAGER'S HUMP

Christian Witter
Primary Contact: Christian Witter, Upstream Rehabilitation Institute, cgwitterpt@hotmail.com

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Background/Purpose: Physical therapy consisting of education and exercise is commonly prescribed and has been shown to be effective in reducing kyphosis. Sparsely mentioned in the current research literature, but utilized as a preferred means by the author for facilitating neuromuscular activation of the spine into an ideal posture is the use of laser pointer visual feedback attached to the head and anterior sternum to provide the patient motion guidance feedback on the success of their postural movement corrections once established and cued by the therapist. The purpose of this case study is to describe the clinical reasoning and outcomes using laser pointer visual feedback for postural correction as part of the plan of care during treatment of a patient who presented with neck pain with mobility deficits whose primary goal was to mitigate and/or prevent the worsening of a Dowager's hump while concurrently mitigating pain.
Case Description: The patient was a 36-year-old female referred to physical therapy with a diagnosis of cervicalgia with a primary goal to prevent a worsening of a Dowager's hump that she perceived to be a family trait. An x-ray was not performed, so it is uncertain if the patient matched the clinical description for a Dowager's hump. Her symptoms were aggravated by her job duties as an esthetician which required frequent stooping/gazing downward upon her clients and also driving for a duration longer than two hours. A description of the outcomes measures taken, treatment provided and clinical reasoning during each treatment session and a retrospective analysis of the treatment within the context of Alrwaily's movement control approach was provided.
Outcomes: Postural assessment pictures taken at the initial consultation and last visit demonstrate correction of the Dowager's hump and correlate with the patient reporting satisfactory correction of her posture, improved AROM into upper cervical flexion and upper thoracic extension and meaningful outcomes measured via the NPDI, FOTO and NPRS scales.
Discussion/Conclusion: This case report described the clinical reasoning and treatment of a patient presenting with a mild Dowager's hump using laser pointer visual feedback for postural correction as a component of the plan of care. Successful outcomes for pain control and postural correction for hyperkyphosis using mobilizations and exercise by skilled manual clinicians have been described in the literature, but the benefit of this study was that the description of the clinical reasoning and outcomes using pragmatic application of manual techniques and laser dot motion guidance within the concept of the movement control phase can serve as a platform for further discussion or investigation.

CR 39 [ID: 88]
THINKING BEYOND A SUCCESSFUL OUTCOME: THE VALUE OF FELLOWSHIP MENTORING

Paul Lonnemann, Steven Hnat
Primary Contact: Paul Lonnemann, KORT/ Bellarmine University, plonnemann@bellarmine.edu

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Background/Purpose: Patients may present with musculoskeletal signs and symptoms consistent with a musculoskeletal origin, but in fact may have an underlying undiagnosed medical condition. This is especially true when clients are experiencing a satisfactory outcome while working with a physical therapist, as measured by improvements in test re-test measures, pain scores, patient reported outcome measures and function, but historical symptoms point to another more sinister concomitant condition. The purpose is to describe the collaborative clinical decision making between a Fellow in training and Fellow Mentor with a patient case that involves complaints and impairments in shoulder and spinal mobility with a diagnosis of adhesive capsulitis, which upon return referral to a rheumatologist, confirmed the suspicion of spondyloarthropathy.
Case Description: The patient was a 49-year-old female referred from rheumatologist presenting with a diagnosis of left adhesive capsulitis. Past medical history included a previous history of right shoulder adhesive capsulitis 10 years prior with remaining persistent impairments, Thyroid cancer with partial surgical resection and radiation 5 years prior resulting in difficulty turning head. Initial active shoulder range of motion measured left shoulder elevation to 60 degrees, abduction to 50 degrees; right shoulder elevation to 100 degrees, abduction to 80 degrees. PROM was also similarly limited with pain complaints and hard capsular end feels. Active range of motion of cervical spine demonstrated flexion to 30 degrees, extension to 10 degrees with anterior neck pain, left rotation 10 degrees, right rotation 25 degrees. Upper limb tension testing aggravated patient complaints on the ipsilateral arm tested. Initial treatment addressed pain sensitivity about the surgical incision of the surgical scar to the neck and home exercises for shoulder ROM. On the second visit, the patient returned with greater than 40% improvement in left shoulder elevation, and resting pain levels remained constant at 5/10 on the NPRS. The Fellow-in-Training consulted with a Fellow about current findings resulting in a case discussion and collaborative in person treatment. They confirmed that the history and presentation of the patient did not align with the diagnosis. This included the early onset of the first shoulder impairment at age 39, and the severity of mobility loss in multiple spinal joints. Although the patient had a rheumatological consult more than 10 years ago, it was assumed that as the patient had no rheumatologic diagnosis, any disease was ruled out. On further questioning, however, the patient confirmed morning stiffness of greater than 1 hour, slow progressive worsening over time, onset prior to 40 and persistent symptoms of sacroiliac joint and sciatic pain prior to her adhesive capsulitis diagnosis. The fellow in training and mentor discussed the original subjective history and clues that would have led to further questioning and use of the classification for spondyloarthropathy and typical age of onset that matched the patient's original symptom development. The concerns were discussed with the patient and referral made back to her rheumatologist.
Outcomes: Two additional visits ensued with treatment addressing the cervical, thoracic and shoulder impairments consisting of manual therapy to joints determined stiff by passive intervertebral motion testing, exercise for range of motion, stretching, and functional reach activities. Final range of motion testing demonstrated a plateau in improvement in elevation and

abduction similar to the findings on the second visit. The Quick DASH score improved from 27.27 initially to 11.2. Bloodwork and radiographic evidence confirmed a diagnosis of spondyloarthropathy.

Discussion/Conclusion: This case is an example of the importance of continual on going inter and intra session assessment including further patient questioning related to patient original time of onset, behavior, and seemingly unrelated conditions. This is evident even when the patient is both improving and satisfied with their current improvements and signs and symptoms do not completely align with the patient's present condition or diagnosis. Past medical workups by specialty providers may not be satisfactory for assuming another diagnosis is negative despite previous care. Fellow mentoring can have a valuable effect on patient care outcomes and trajectory in the management of complex disorders.

CR 40 [ID: 89]
HIP PAIN AFTER TOTAL HIP REPLACEMENT SECONDARY TO SICKLE CELL DISEASE

Oluwatosin Olowoyeye, Wayne Brewer, Sarah Worth
Primary Contact: Oluwatosin Olowoyeye, Harris Health System, vicolowoyeye@gmail.com

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Background/Purpose: Sickle cell disease affects 100,000 Americans, with 1 in 16,300 being Hispanic. Pain crises are one of the most common complications and the main reason for emergency room visits. Physical therapy can have a vital role in managing the disease with education and treatment to prevent exacerbation. Limited research is available regarding physical therapy management following musculoskeletal surgery for sickle cell complications such as avascular necrosis. The purpose of this case report is to discuss treatment of a patient pain after total hip replacement with concurrent exacerbations of sickle cell disease.
Case Description: A 32-year-old Hispanic female presented to physical therapy with bilateral hip pain. Her past medical history included sickle cell disease and right total hip replacement secondary to avascular necrosis. Two years ago, she underwent physical therapy treatments after her hip replacement but was unable to make considerable changes due to sickle cell crises disrupting management. She presented with limited hip internal rotation and weakness in all lower extremity musculature. Symptoms were exacerbated with walking more than 1 hour, squatting and negotiating stairs. Functional outcome measures included 30 second sit to stand and 6-minute walk test (6MWT), which she performed 13 repetitions and 1,345 feet, respectively. Self-perceived level of function, as assessed by Functional on Therapeutic Outcomes (FOTO), was 39/100. This placed her at a stage 3, limited community ambulator, compared to stage 5, active community ambulator. She was seen for 11 visits over the course of 4 months with treatment sessions consisting of mobility exercises, progressive weightbearing and lower extremity strengthening. During her episode of care, she visited the emergency room seven times and was admitted on three occasions due to fluctuating symptoms secondary to sickle cell crises. She was cleared by physicians following each admission to return to physical therapy and adjustments were made to her plan of care, as necessary.
Outcomes: The patient demonstrated improvements in hip internal rotation by 9 degrees, increased her FOTO score by 3 points (MCID=11), and improved 6MWT distance by 74 feet (MCID=201 ft). These changes were small, as none met minimal clinically important difference for the patient. She did self-report improvements in function when pain crises were controlled.
Discussion/Conclusion: Several research publications exist on how physical therapy can be beneficial for patients with sickle cell disease; however, none discuss what treatments should entail or how to adjust physical therapy plan of care during a sickle cell crisis. Information about symptoms to monitor, precipitating factors for pain crisis along with subjective reports assisted with the overall care and progression between sessions for this patient. Although the patient made some minor improvements, more research is necessary to determine better ways to progress exercises for patients diagnosed with sickle cell disease to make a significant difference in functional outcomes.

CR 41 [ID: 92]

THE USE OF DRY NEEDLING AND THORACIC THRUST-MANIPULATION FOR A PATIENT WITH CHRONIC BILATERAL PECTORAL PAIN: A CASE REPORT

Karl Bergmann
Primary Contact: Karl Bergmann, Messiah University, kbergmann@messiah.edu

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Background/Purpose: Bilateral pectoral pain is an uncommon condition treated in physical therapy. There is a lack of evidence describing effective intervention for patients with bilateral pectoral pain. However, a growing body of evidence exists supporting the use of dry needling to treat musculoskeletal pain and trigger points. Thrust-manipulation has strong evidence in the treatment of postural dysfunction and thoracic hypomobility. The purpose of this case report is to describe the outcomes of dry needling and thrust-manipulation as a primary intervention for non-specific chronic bilateral pectoral pain.
Case Description: The patient was an active 44-year-old female who self-referred for insidious onset of chronic bilateral pectoral pain, which began 3 months ago. Her primary complaint was the inability to sleep and palpable severe tenderness over the right and left distal chest area. A self-treatment program of stretching and massage did not help. Objective findings included a slight forward head posture and rounded shoulders, reproduction of pain upon palpation of the distal 1/3 of the pectoralis major, and moderate thoracic hypomobility. She was treated using dry needling to the left and right distal pectoralis major and with thrust-manipulation to the upper and mid-thoracic spine. The subject was treated twice over a 5 day period of time.
Outcomes: Clinically meaningful improvements were achieved in pain, as measured by the Visual Analog Scale, reducing to 0/10 at discharge from 6/10 at initial evaluation. The QuickDash was utilized as a functional outcome measure and she improved to a score of 0 after her second treatment.
Discussion/Conclusion: The patient was able to sleep through the night without any pain, return to full functional activities without any limitation, and no longer had pain with palpation. This case report demonstrates the effectiveness and efficiency of the use of dry needling and thrust-manipulation in the treatment of chronic non-specific bilateral pectoralis pain.

CR 42 [ID: 93]
NAVIGATING THE MEDICAL SYSTEM ONE VISIT AT A TIME: A NARRATIVE REVIEW ON A PATIENT WHO REFUSED REFERRAL

Helene Strange, Alex Bengtsson
Primary Contact: Helene Strange, Duke Physical Therapy and Occupational Therapy at Hillsborough, strangeh31@gmail.com

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Background/Purpose: The differential diagnosis process is an important component throughout the entire course of care. Sinister pathology is uncommon in the outpatient setting and red flags may often be more useful to determine prognosis, rather than diagnosis. When sinister pathology is suspected, the appropriate level of urgency for a referral must be determined. When watchful waiting is indicated, continued monitoring of symptoms can dictate later referrals, making the physical therapist (PT) the liaison between providers and the patient. The purpose of this case is to describe the PT's role in managing a patient with whom a referral was immediately indicated and repeatedly refused, and where subsequent visits were used to monitor symptoms and impart the importance of further medical testing.
Case Description: The patient was a 52-year-old male referred to PT for bilateral plantar fasciopathy after seeing over 10 providers in the past year. Initial evaluation by another PT listed "diminished sensation of L5-S1, neural screen WNL, and weakness of ankle musculature". The patient was transferred to the primary author for the following visit and additional testing was performed. Though upper motor neuron testing was negative, the patient demonstrated significant foot and ankle weakness across multiple myotomes, bilateral foot drop, ataxia, positive bilateral slump and sympathetic slump tests. Differential diagnoses included cervical myelopathy and space occupying lesion. Consequently, referral to a neurologist was deemed appropriate, yet the patient refused. He was seen for a month to monitor symptoms and guide him towards further testing. Despite decreased pain and paresthesias with PT intervention, motor function remained unchanged. Eventually, the patient sustained a fall and was convinced to see a neurologist.
Outcomes: The patient was thereby diagnosed with a C6 single plasmacytoma and chronic inflammatory demyelinating polyneuropathy.
Discussion / Conclusion: Although patient preference should often be considered, PTs must take responsibility for making appropriate referrals when indicated. This case is an example of the role PTs play within the health care team, as a vital point of contact due to frequency of encounters. The patient expressed disinterest in seeing yet another specialist, after having been referred from one provider to the next over the course of a year. Initially, the patient was more concerned with pain and paresthesias, rather than his declining motor function. While multiple efforts were made to convey the importance of additional medical testing, the PT was able to take charge of this patient's case to ensure he would not get lost in the system, or give up on seeking care. While direct access refers to the path to PT, as a doctoring profession we also have the responsibility to act as a liaison for our patients throughout the course of care to ensure that necessary steps toward appropriate diagnosis and treatment are taken.

CR 43 [ID: 94]

MANAGEMENT OF CHRONIC MUSCULOSKELETAL PAIN SECONDARY TO RHEUMATOID ARTHRITIS USING A MULTIMODAL APPROACH- A CASE STUDY

Derek Charles
Primary Contact: Derek Charles, Tennessee State University, dcharles@tnstate.edu

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Background/Purpose: Rheumatoid arthritis (RA) is a systemic autoimmune disorder characterized by synovial joint inflammation and degradation, usually resulting in mild-to-moderate disability. This case describes successful management of a patient with chronic musculoskeletal pain secondary to rheumatoid arthritis using manual therapy, therapeutic exercise, and patient education.

Case Description: A 61-year-old female presented to an outpatient physical therapy clinic via direct access with complaints of cervical, thoracic, lumbar, and right shoulder pain and stiffness for greater than 6 months. Her medical history was remarkable for hypertension and a 5-year history of rheumatoid arthritis requiring Enbrel 25 mg and Motrin for joint and muscle pain. Her primary goals were to return to occupational duties as an office administrator requiring prolonged sitting and computer use over an 8-hour day. The patient also wanted to resume recreational walking and exercise. Oswestry Disability Index (ODI) was 26%, Neck Disability Index (NDI) was 32%, and Quick Disability of the Shoulder, Arm, and Hand (QuickDASH) was 18%. According to the Numeric Pain Rating Scale (NPRS) the right shoulder was rated at 6/10, the lumbar spine was 4/10, the cervical spine was 7/10, while the thoracic spine was reported to be “achy and stiff”. Spine active range of motion was within functional limits for all planes but with complaints of stiffness at end range. Right shoulder and cervical spine symptoms were reproduced with a shoulder flexion resisted isometrics but symptoms were most closely reproduced with overpressure into cervical extension or right rotation; lumbar extension; right shoulder flexion and internal rotation; and grade III posterior-anterior (PA) accessory motion joint glides from C5-T3.

Outcomes: After 4 visits over 5 weeks, NPRS diminished to 1/10 in the lumbar spine, 3/10 in the cervical spine, and 2/10 in the right shoulder. Central and unilateral PA’s did not reproduce spine symptoms and minimal tenderness was noted along the right scapular muscles. ODI improved to 18%, NDI improved to 20%, and QuickDASH improved to 6%. The patient returned to occupational duties without restriction and was released to a home exercise program with resumption of recreational walking and aerobic fitness classes.

Discussion/Conclusion: Manual therapy consisted of graded central and unilateral joint mobilizations to the cervical, thoracic, and lumbar spine as well as long axis distraction of the cervical and lumbar spine. Soft tissue mobilization was concentrated around the thoracic scapular muscles. Therapeutic exercise focused on general spine mobility, right scapular endurance and progressive tolerance to aerobic exercise for at least 30 minutes. Patient education focused on encouraging frequent changes in position to diminish joint stiffness and an adjustable desk was purchased to allow greater variation between standing and sitting. This report demonstrates the importance of a multimodal approach to treating chronic musculoskeletal symptoms secondary to rheumatoid arthritis.