

Abstract - ID: 3

Authors: Lindsey Grove, Elon University; Scott Rezac, Rezac and Associates Physical Therapy, LLC

Title: Manual cervical spinal mobilization improves extremity strength and paresthesia in a patient with multi-quadrant symptoms secondary to cervical myelopathy

Background / Purpose:

Cervical spine myelopathy (CSM) is a clinical diagnosis involving the cervical spine, spinal cord, spinal nerve roots, and other surrounding tissues that can result in various debilitating physical symptoms. Literature comparing surgical, conservative, and physical therapy outcomes is lacking. The purpose of this case report is to demonstrate how physical therapy consisting of manual therapy, neural re-education, therapeutic exercise, and functional training was used to successfully treat an individual with stable CSM.

Case Description:

The patient was a 69-year-old Caucasian female, ¾ pack a day smoker self-referred to outpatient physical therapy for progression of paresthesias in all extremities with insidious onset 9 months prior. She had previously received a medical diagnosis of peripheral neuropathy and undergone an inconclusive EMG study. No cervical pain was reported at evaluation; however, limited cervical range of motion, palpable tenderness to C4-C7 paraspinals, mild right foot drop, gait deviation, quadriceps hyperreflexia, and a positive cervical distraction test was seen. The physical therapist made a differential diagnosis of CSM based on the presence of these clustered clinical findings and past medical history. Evaluation results were communicated to the physician who signed off on the physical therapy plan of care for stable CSM. The course of treatment consisted of 26 sessions that took place over 5 months.

Outcomes:

Reduction of lower extremity paresthesia was seen as early as the first session. A significant improvement of 67/80 (25% impairment) to 73/80 (7.5% impairment) in the subjects Lower Extremity Functional Scale score was observed. Right lower extremity manual muscle testing for dorsiflexor strength improved from 3/5 to 5/5. Improvements in cervical ranges of motion were noted. At discharge she was able to ambulate and perform gardening tasks for greater than 60 minutes without symptoms compared to at evaluation in which she experienced symptom onset in less than 15 minutes. Sleep quality improved from 50% to 0% disturbed at discharge. Subject reported overall return to full function.

Discussion / Conclusion:

Manual therapy consisting of manual cervical traction, lateral side glides at C3-C7, upper thoracic spine manipulation, and individualized extremity neural flossing techniques. Carry over for spinal segmental mobility and dynamic motor control was promoted with progressive therapeutic exercise and functional training such as deep neck flexor training coupled with lifting and bending tasks. Manual therapy interventions were utilized as indicated and tapered throughout treatment. This case report demonstrates physical therapy management of symptoms associated with CSM and may offer treatment options for future patients with stable CSM. Further research should be conducted to provide objective data to support the findings of this case report.

Abstract - ID: 5

Authors: Ronald Schenk, Daemen College

Title: Mechanical diagnosis and therapy instruction in accredited physical therapy programs in the United States

Background / Purpose:

Over 10% of all medical visits are directed toward musculoskeletal pathology or impairments in the United States, and a number of these affected individuals are referred to physical therapy. Physical therapy interventions for musculoskeletal disorders may include physical agents, stabilization exercises, manual physical therapy, and an exercise prescription which is based on the testing of repeated end range movements, which is foundational to the Mechanical Diagnosis and Therapy (MDT) approach. Often referred to as the McKenzie Method, MDT is a musculoskeletal classification based system developed by Robin McKenzie, a New Zealand physiotherapist, and the approach has been shown to be efficacious in the management of spinal musculoskeletal disorders. Despite the fact that research regarding the effectiveness of MDT is emerging, there is currently no evidence as to the extent of MDT education in professional and post-professional physical therapy programs. Therefore, the purpose of this study was to determine the extent to which MDT is instructed at the professional and post-professional level. The results from this study may be of value as an assessment tool for existing curricula within the framework of a program's educational philosophy and curricular plan. Additionally, the results may also be helpful for the development and facilitation of MDT instruction in entry-level physical therapy education programs, orthopaedic residency programs, and OMPT programs that do not currently address this content.

Methods:

This cross sectional study explored the extent of MDT instruction in physical therapy professional degree programs accredited by CAPTE and the American Board of Physical Therapy Residency and Fellowship Education (ABPTRFE). Three-hundred and fifty invitations to complete the survey were sent via email to program directors of physical therapy professional degree programs accredited by CAPTE and ABPTRFE. A letter of instruction was provided to each subject outlining the purpose of the study, an explanation of the anonymous nature of the survey, and that participation was voluntary. The survey included a request to forward the email to the McKenzie Institute for teaching MDT content. They were also provided with a link to complete the survey through a web-based service (Survey- Monkey.com).

Summary of Findings:

A total of 96 programs responded to the survey (response rate = 27.4%). Of these programs, 84 (87.5%) had integrated the McKenzie principles into their curriculum. Of the 84 respondents, 23 indicated that McKenzie principles were integrated into a required, entry-level or post-professional course, 40 indicated that it was part of the required integrated practice expectation content, and 16 did not report having an entry-level program. Faculty teaching MDT content appear to be well qualified, with the majority having more than 13 years of experience using McKenzie treatments in clinical practice. The primary reason for programs not teaching McKenzie principles is that it was not considered to be of high enough curricular priority for inclusion (n=4). Of the 96 programs that responded to the survey, eighty-four (87.5%) had integrated the McKenzie principles and practice into their entry-level education programs (Figure 1). The programs currently not teaching MDT reported several reasons, including lack of qualified faculty (n=4, 41.7), lack of scientific evidence to guide what is to be taught (n=1, 10.4), and the remainder provided individual responses within the other category, including eliminating the content to better follow low back pain clinical practice (n=1, 10.4%) and teaching concepts of McKenzie but not the entirety of the method (n=4, 41.7). Also in a separate question, all of the programs that had not integrated MDT do not plan to incorporate it into their curriculum in the future (n=12, 100%).

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Discussion / Conclusion:

This study examined the status of MDT education in entry-level education programs for physical therapists. To our knowledge, the results provide the first description of MDT education in entry-level education programs for physical therapists in professional and post-professional therapy programs. While most of responding programs (87.5%) stated that the McKenzie principles were currently included in their curricula, the results of our study demonstrate some variability in the educational background of the clinicians teaching and the years of experience the clinician had using MDT in clinical practice. For example, 36.23% (n=25) have completed part D of MDT training and 13.04% (n=9) of clinicians teaching MDT are diplomaed. This educational background can lead many clinicians to believe they are knowledgeable on MDT; however, only implementing extension based concepts to their patients. Of the clinicians that are instructing MDT, only 47.83% had greater than 13 years' experience implementing MDT in clinical practice. These inconsistencies may be related to a current lack of guidelines, regulations, and standards for MDT content within educational requirements, which may be a reflection of the current variable role of the McKenzie principles in physical therapist practice. Of the 96 programs that responded to the survey, 84 programs had integrated the McKenzie principles and practice into their entry-level education programs. There appeared to be variability in how the McKenzie principles were integrated into the curricula, as well as in the depth and breadth of instruction and level of McKenzie instruction among the faculty. This variability in MDT curricula suggests a need for the development of curricular guidelines and resources for physical therapist program instructors who are interested in delivering McKenzie related content. Of the 96 programs that responded to the survey, 84 programs had integrated the McKenzie principles and practice into their entry-level education programs. There appeared to be variability in how the McKenzie principles were integrated into the curricula, as well as in the depth and breadth of instruction and level of McKenzie instruction among the faculty. This variability in MDT curricula suggests a need for the development of curricular guidelines and resources for physical therapist program instructors who are interested in delivering McKenzie related content.

Abstract - ID: 7

Authors: Nick Rainey, Rainey Pain & Performance; Jodi Young, Bellin College

Title: The effectiveness of dry needling in reducing ankle swelling: a case series

Background / Purpose:

Swelling of the ankle is often seen in patients with ankle sprains or fractures. There is a plethora of research investigating needle stimulation and anti-inflammatory effects, and literature has suggested that dry needling applied directly into ligaments can decrease swelling in patients with acute or chronic ankle swelling due to sprains or fractures. Animal research has demonstrated that needle insertion affects biochemicals that mediate inflammation. However, to the knowledge of the authors, there is currently no research supporting improved outcomes in this population. The purpose of this case series was to determine if patients with ankle swelling would exhibit diminished swelling after the use of dry needling as an intervention. A secondary purpose was to measure functional outcomes through the use of objective outcome measures.

Case Description:

Six patients (mean age, 56.5 years old; F=5, M=1) with acute and chronic ankle swelling were treated with the same dry needling protocol. At baseline, all patients had a girth difference between 1.0 - 4.0 cm of swelling on the affected ankle compared to the unaffected ankle as measured by the Figure-of-Eight-20 method. The duration of swelling prior to presenting to the clinic ranged from two weeks to multiple decades. Dorsiflexion range of motion (ROM) on the affected side ranged from 3 degrees to 22 degrees, and all included patients had limited joint mobility. Besides dry needling, interventions deemed appropriate were pragmatically prescribed, including thrust and non-thrust joint manipulation and therapeutic exercises as necessary. Function was measured with the Global Rating of Change (GROC) scale and Focus on Therapeutic Outcomes (FOTO).

Outcomes:

Reported outcomes are measured at the session prior to the initial session of dry needling and at the session subsequent to the final session of dry needling. Only two patients exceeded the minimal detectable change (MDC) of 0.70 cm to 0.75 cm on the Figure-of-Eight-20 method for decreased ankle swelling. At initial evaluation these two had a duration of three weeks and six months, 1.5 cm and 2.1 cm of girth difference, and 6 degrees and 22 degrees of dorsiflexion ROM. However, all patients subjectively felt swelling had improved. All patients scored at least a four ("moderately better") on the GROC, and four patients exhibited improvement on FOTO.

Discussion / Conclusion:

It is unknown why all patients reported a subjective improvement in swelling, but did not show the same improvement objectively. Moderate improvement on the GROC suggest that this intervention may improve function. It is possible these outcomes were due to the natural course of healing, and had no relationship to the intervention. Further research should be done with larger sample size to determine what population benefits most from this intervention, and should also explore different parameters of dry needling and identification of variables.

Abstract - ID: 8

Authors: Carrie Eckenhoff, Regis University; Cameron MacDonald, Regis University; Anders Carlson, Regis University

Title: Student development in mentored management of chronic femoral acetabular impingement utilizing manual therapy and exercise

Background / Purpose:

Minimal evidence exists on the efficacy of student-mentored management of musculoskeletal complaints. This case report describes the mentoring of a doctor of physical therapy (DPT) student by an orthopedic manual therapy fellow-in-training (FiT) in managing femoral acetabular impingement (FAI).

Case Description:

Midway in his final 12-week rotation, the student evaluated and commenced management for a 37-year-old male with acute exacerbation of chronic hip pain consistent with FAI. This patient was limited in his ability to work and perform athletic activity, including running over three miles and skiing. The Lower Extremity Functional Scale (LEFS) score was 72/80 initially. Poor motor control in the frontal plane during a right single leg squat was noted, and the FADIR and FABER tests reproduced his pain. The right femoroacetabular joint was hypomobile posteriorly and inferiorly and passive external rotation was limited. Palpable tender points were noted in the right gluteal muscles. The FiT facilitated the student's clinical reasoning process with time allotted to review the literature and discuss the treatment plan. Evidence suggests that a combination of manual therapy and exercise is beneficial in managing FAI. Practice and psychomotor feedback occurred weekly between patient visits to refine techniques for hip mobilizations specific to this patient. Mobilizations (grade I-IV) included distraction in flexion/ external rotation with a belt, and posterior glides in supine. At initial evaluation, the student was comfortable performing the techniques on his own, but both the student and FiT agreed that close supervision was warranted to ensure optimal patient outcome and satisfaction. The patient was included in ongoing dialogue for management decisions. Other interventions included trigger point dry needling performed by the FiT, and exercises focused on neuromuscular re-education.

Outcomes:

Management occurred for 8 visits over a 7-week period. At the end of care, the patient was running 6-8 miles without pain, working without limitations, and had no symptoms skiing. The FADIR and FABER tests no longer reproduced his symptoms and the LEFS score improved to 80/80. On the Global Rating of Change (GROC) scale, the patient "a very great deal better" (+7). By discharge, the student reported confidence in performing these techniques independently without close supervision and the patient was consistently reporting improved pain and comfort during and after the techniques.

Discussion / Conclusion:

This case study provides indications of successful management of chronic FAI in a relatively short period by a FiT-mentored DPT student. It also provides one example of how the mentorship relationship can be structured to facilitate the student's confidence and skill in implementing strong clinical reasoning and manual technique. Limitations of this case report include no control group or independent variable, so we are unable to conclude that the outcomes related to either student confidence or patient improvement were a result of the specific approach or interventions.

Abstract - ID: 9

Authors: Zachary Carroll, The George Washington University; Alex Bengtsson, The Jackson Clinics

Title: Manual therapy and exercise for tactical athlete with knee pain secondary to synovial hemangioma: a case report

Background / Purpose:

Synovial hemangiomas are rare benign tumors formed by anomalous blood vessels within articular capsule or synovial membrane resulting in localized pain, edema/effusion, limited ROM, and hemarthrosis. There are as few as 200 cases diagnosed at the knee and current literature is limited to case studies focusing on MRI diagnostics and treatment by surgical resection, arthroscopic excision, and arthroscopic embolization/ablation. The purpose of this case report was to demonstrate the effectiveness of manual therapy and exercise for an individual diagnosed with a synovial hemangioma. This case is unique in nature given current limitations to conservative treatment in the literature and the patient's occupational requirements.

Case Description:

The patient was a 46-year-old male who presented with an insidious onset of L knee pain and swelling in 2015. A 2018 MRI revealed mass in posterior knee initially diagnosed as osteochondroma which was later changed to synovial hemangioma. Patient is a federal agent frequently working overseas. Duties range from seated desk work to 8-10 hour patrols with 80 pound vest and firearm requiring prolonged standing, walking and running. He presented to physical therapy with chief complaints of L knee pain and stiffness with walking, running, stair climbing, prolonged sitting, squatting, and lifting. Additionally, he reported associated complaints of insidious R hip and ankle stiffness and tightness.

Outcomes:

Patient was seen twice a week for 8 weeks with 60-90 minute sessions. Statistically significant change for all patient goals using the Patient Specific Functional Scale (PSFS) was achieved and self-reported overall improvement was 75%. Patient exhibited increased strength and range of motion for his left knee and right ankle. At time of discharge, he was able to return to a weekly outdoor running program and high intensity strength & power training to optimize occupational performance, which he was last able to perform prior to onset in 2015.

Discussion / Conclusion:

We theorized that the patient's participation restrictions and activity limitations were the result of impaired joint mobility, muscle length, strength, and power at the knee secondary to the synovial hemangioma. Further, it was suspected that the hemangioma contributed to his impairments distally at the ankle and proximal at the hip, affecting lower chain coordination, balance, and motor control as well general deconditioning due to symptoms. While we did not expect our interventions to have a direct impact on the space occupying lesion itself, we hypothesized that optimizing relevant joint mobility, muscle length, and strength would offer joint protection by addressing local chronic synovitis and that balance & coordination training would improve lower chain kinematics to prevent further hemarthrosis associated with the condition. Manual therapy and exercise were shown to be beneficial in addressing impairments associated with a health condition most often treated by surgical intervention according to current literature. This case report raises the argument that conservative treatment consisting of manual therapy and therapeutic exercise can improve the functional limitations of future patients with synovial hemangiomas of the knee.

Abstract - ID: 10

All Authors: Charles Nichols, University of North Texas Health Science Center; Jean-Michel Brismée, Texas Tech University Health Sciences Center; Troy Hooper, Texas Tech University Health Sciences Center; Antony Bertrand-Grenier, Centre Intégré Universitaire de la Santé et des Services Sociaux de la Mauricie-et-du-Centre-du-Québec, Université du Québec à Trois-Rivières; Kerry Gilbert, Texas Tech University Health Sciences Center, Marc-Olivier St-Pierre, University of Quebec in Trois-Rivieres Jeeisha Kapila, Texas tech University Health Sciences Center; Stéphane Sobczak, Université du Québec à Trois-Rivières

Title: Glenohumeral joint capsule tissue tension loading correlates moderately with shear wave elastography: a cadaveric investigation

Background / Purpose:

Joint capsular tissue restrictions result in joint range of motion (ROM) limitations. The effects of joint mobilization and tension loading on capsular tissue properties remain unknown. Ultrasound shear wave elastography (SWE) has been used *in vivo* to measure stiffness in organs, tendons, and muscles. This study aims to investigate the reliability and validity of SWE readings in measuring capsular tissue property changes during loading against a reference standard.

Purpose: To investigate: (1) capsular tissue mechanical property changes using SWE and a durometer, a device validated to measure tissue hardness, under various tensile loads; (2) SWE and durometer measurement reliability; and (3) correlation of SWE and durometer measurements to evaluate if SWE technology could allow measurement of tissue changes during joint mobilizations and capsule stretching techniques.

Methods:

The inferior glenohumeral joint (GHJ) capsule from 5 fresh human cadaveric specimens (mean age 77.8 \pm 5.4 years) was harvested. Tissue specimens were placed in a fixed stand using custom clamps and tensile loading was applied to capsular tissue using 1, 3, 5 and 8kg weights. A conforming gelatin pad was applied to the specimen and visualized with B-mode ultrasound using a linear probe. Once an acceptable image was obtained, the SWE mode was activated and measurements of elasticity were taken using the region of interest identified in the Q-box by a blinded investigator. A durometer was applied to tissue specimens and measurement of hardness was obtained by a separate blinded investigator.

Results:

Reliability was established for the SWE and durometer measurements using intraclass correlation coefficients (ICC_{3,5}). A Pearson Product-Moment Correlation assessed association of SWE with durometer. Reliability for the durometer measurements using ICC_{3,5} was .90 (95% CI .79-.96) and SWE using ICC_{3,5} was .95 (95% CI .88-.98). Pearson Correlation Coefficient values for 1, 3 and 5kg were .56, .36, and -.56, respectively, 1 and 3kg combined was .72 and 1, 3 and 5kg combined was .62. The 8kg measurements were severely limited due to thinness and SWE measurement saturation of tissue samples.

Conclusion / Significance:

Both durometer and SWE measurements were highly reliable and correlated moderately when measuring GHJ capsule elasticity. This study suggests validity for the SWE to measure capsular tissue stiffness changes *in vitro* at lower loads (1 and 3kg). Likewise, GHJ capsule hardness measurements with a durometer had excellent reliability and could be used as a control method to validate diagnostic methods such as SWE. This study provides a baseline for future non-invasive evaluation of the mechanistic effects of joint loading and mobilization on capsular tissues *in vivo*.

Abstract - ID: 11

Authors: Christopher Allen, Army-Baylor Doctoral University; Gail Deyle , Army-Baylor Doctoral University; Dan Rhon, Army-Baylor University; Norman Gill, Army-Baylor University; Evan Petersen, University of the Incarnate Word; Ben Hando, Wilford Hall Ambulatory Surgical Center; Steve Allison, Army-Baylor University

Title: Corticosteroid injection versus a physical therapy approach for the management of osteoarthritis: a randomized clinical trial

Background / Purpose:

Corticosteroid injections (CSI) are commonly used for treatment of acute and chronic pain associated with knee osteoarthritis (OA). Patients with knee OA are more likely to receive CSI than physical therapy (PT) prior to total joint replacement. There is substantial evidence for the benefit of both approaches. There has not been a pragmatic comparison of CSI to PT for patients with knee OA.

Methods:

Patients were recruited from two large hospitals, presenting to primary care with knee pain and confirmed clinical and radiographic evidence of osteoarthritis were randomized to receive either a 1) corticosteroid injection treatment approach (CSI) or 2) a physical therapy (PT) treatment approach consistent with best evidence (exercise, manual therapy, and education). All patients received education consistent with the current Department of Defense and Veterans Affairs Clinical Practice Guidelines for Non-Surgical Management of Hip and Knee Osteoarthritis prior to randomization. The primary outcome was the Western Ontario and McMasters University Osteoarthritis Index (WOMAC) at 1 year, assessed with a linear mixed effects model.

Results:

156 subjects were enrolled in the study (mean age = 56.1 years; 48.1% female; mean body mass index = 31.5). There was no difference in pain and disability between both groups at baseline. The mean between-group differences on the WOMAC were significant at 8 weeks (15.08, 95CI 1.19 to 28.97), 6 months (16.54, 95CI 2.63 to 30.45), and 1 year (19.52, 95CI 5.50 to 33.54) favoring the physical therapy group. The median percent change in total WOMAC scores at 1 year was 51.8% for the CSI group and 70.8% for the PT group. Using failure to achieve a 50% improvement on the WOMAC at 1 year as the event of interest, physical therapy provided a 24.5% absolute risk reduction (ARR) and 4 patients needed to receive PT in order to prevent 1 patient from not achieving a 50% improvement (NNT = 4). Patients in the PT group were also significantly more likely than patients in the CSI group to report a 4+ ('moderately better') or higher on the global rating of change at 1 year (OR 2.13, 95CI 1.06 to 4.28; P=0.032).

Discussion / Conclusion:

Patients receiving an evidence based physical therapy program consisting of manual therapy and exercise had significantly better outcomes at 1 year compared to patients that received corticosteroid injections. The differences were large and clinically relevant.

Abstract - ID: 13

Authors: Austin Sheldon, North American Institute of Orthopaedic Manual Therapy and ATI Physical Therapy

Title: Differential diagnosis and physical therapy management of a 45 year-old female with mid lumbar spine radiculopathy

Background / Purpose:

Middle lumbar spine lumbar radiculopathy is uncommon in comparison to lower lumbar spine radiculopathy. Because of the relative rarity, the management of an upper lumbar spine radiculopathy may be difficult to the inexperienced clinician. The purpose of this case report is to describe the differential diagnosis and physical therapy management of a female with middle lumbar spine radiculopathy.

Case Description:

A 45-year-old female presented to OP PT services two weeks after initial injury with a primary complaint of lumbar spine pain and right lower extremity pain and weakness affecting function. The patient was unable to tolerate prolonged supine position, unable to ambulate greater than 100 feet, unable to tolerate sustained sitting and standing, and unable to work. Probable mechanism of injury was lifting office supplies at work. She reported a strain in her back on the date of injury, with onset of right-central low back pain and right lower extremity pain 2-3 days later. Other subjective complaints included worsening of symptoms with coughing and sneezing, falling due to weakness in the right leg, and inability to work. Significant tests/measures applicable to the case include myotomal weakness of key muscles of L3-L4 myotomes, a positive prone knee bend test, pain reproduction with compression, and muscle atrophy of the right leg. The patient demonstrated centralization phenomenon during the examination. The patient was prescribed a Medrol dose-pack by her PCP but did not have any diagnostic imaging/testing done prior to the physical therapy examination due to insurance requirements. The patient initially responded to an extension-based program; however, progress plateaued after 3 visits. Treatment included segmental dry needling, extension based exercises with passive prone knee bend, and manual therapy techniques including P/A mobilizations, lower thoracic thrust manipulation, manual traction, therapeutic exercise, and work conditioning. The patient was seen over the course of six weeks (12 visits), given a HEP when outcome measure and subjective complaints diminished, and returned to work without surgical intervention.

Outcomes: LEFS: IE: 10, 3rd visit: 36, 6th visit: 56, 9th visit: 64, discharge: 70. Oswestry: IE: 78%, 3rd visit 62%, 6th visit: 44%, 9th visit: 34%, discharge: 20%

Discussion / Conclusion:

Mid lumbar spine radiculopathy is uncommon in comparison to lower lumbar spine radiculopathy; however, the treatment interventions used to manage pain and improve function lead to meaningful clinical and functional improvements.

The patient made positive improvements with both spinal and lower extremity patient reported outcome measures, as well as subjective improvements including return-to-work, gait, pain level.

This case demonstrates that a multi-modal and conservative approach utilizing directional preference, directional preference combined with neurodynamics, manual therapy including dry needling, and return-to-work activities.

Abstract - ID: 14

Authors: Gretchen Seif, Medical University of South Carolina; William Buck, The Medical University of South Carolina

Title: Inclusion of trigger point dry needling in the treatment of a patient with Parkinson's disease status post Botox injections

Background / Purpose:

Parkinson's disease (PD) is a progressive disorder that over time can diminish an individual's quality of life. As the disease progresses, there are changes in gait, balance, and posture. The typical patient with PD will develop a stooped forward head posture that can lead to difficulties with eating, drinking, and swallowing. Over the last several decades, botulinum neurotoxin has been utilized to address various neurologic movement disorders including PD to address posture and positioning. To the authors' knowledge, there are no studies addressing the use of trigger-point dry needling in patients with a diagnosis of PD to improve posture. The purpose of this case report is to describe the use of trigger-point dry needling with a patient with PD who had severe complications after Botox injections.

Case Description:

The patient is a 75-year-old retired financial advisor, diagnosed with PD in 2003 and managed with medications and high intensity exercise. On 6/19/2018, he had Botox injections for cervical dystonia in the following muscles: right sternocleidomastoid, scalenes, levator scapulae, lower trapezius and the left lower trapezius, splenius cervicis and longissimus. Following the Botox injections, he had difficulty lifting his head off his chest. Five months after the injections, he was told that he may never be able to lift his head to neutral and was referred to physical therapy (PT). The patient's initial Neck Disability Index score was 26/50 (52%) and he reported pain of 4/10 in the cervical spine. His active cervical extension was initially 45° of flexion. For 2 months, the patient had 20 total visits PT visits that included manual therapy, stretching, and therapeutic exercise to assist the patient in achieving cervical spine neutral. Due to limited overall improvements, the clinical decision to include trigger-point dry needling was made due to continued active trigger-points, cervical pain, and continued difficulty with swallowing due to cervical positioning. At visit 21 and 22, trigger-point dry needling was performed to active trigger-points in the bilateral sternocleidomastoid, upper trapezius, splenius cervicis, and scalenes.

Outcomes:

At visit 21, his active cervical extension was 40° of flexion before treatment, increased to 22° of flexion after manual therapy and stretching, and further increased to 5° of flexion after trigger-point dry needling. At visit 22, the patient's active cervical extension was 32° of flexion before treatment and improved to 12° of flexion after trigger-point dry needling and stretching.

Discussion / Conclusion:

The inclusion of trigger-point dry needling in the treatment of a patient with PD with severe complications after Botox injections demonstrated within and between-session improvements in the ability to achieve cervical neutral positioning. This case study suggests that that utilization of trigger-point dry needling may be effective in patients with PD to address postural dysfunctions. Future research should focus on the use of trigger-point dry needling in patients with PD.

Abstract - ID: 15

Authors: Ross Fagnoli, Good Shepherd Penn Partners; Cameron MacDonald, Regis University; Joseph Moffa, Drexel University

Title: Avoidance of planned cervical spine surgery with cervico-thoracic spinal manipulation in a patient presenting with cervical radiculopathy – a case report

Background / Purpose:

Cervical radiculopathy (CR) is a neurological disorder that is attributed to mechanical compression, neuropraxia, vascular impairment or chemical irritation of a cervical nerve root. 75-90% of patients with acute CR experience improvement in symptoms with non-surgical interventions; however, a significant upward trend of surgical procedures are performed each year. Although evidence supports the use of cervical and thoracic manipulation for acute neck pain with mobility deficits, there appears to be a lack of high quality evidence supporting its use in the presence of radiating pain. This case describes the successful management of a patient with cervical radiculopathy including manipulation.

Case Description:

A 53-year-old male presented with acute onset of neck pain with symptoms radiating into the right upper extremity. Imaging revealed ossification of the posterior longitudinal ligament in the cervical region and disc extrusions at C4-C7 with central canal narrowing. Previous unsuccessful management included pharmacologic interventions and an epidural corticosteroid injection. A multilevel cervical fusion was scheduled. Examination revealed 7/10 pain radiating throughout the right upper extremity with numbness and tingling in his second, third and fourth digits. Neurologic screening revealed diminished triceps deep tendon reflex, myotomal weakness, and dermatomal sensory loss in a C7 nerve root distribution. Testing was positive for the CR clinical prediction rule, including adverse upper limb neurodynamics, positive Spurling's, cervical distraction relief, and cervical rotation ROM less than 60 degrees to the involved side. Hypomobility was noted throughout lower cervical and mid-upper thoracic segments. Initial management began with two unsuccessful sessions focused on repeated movements with a cervical retraction bias. On visit three, manual left cervical downglide mobilization and manipulation targeting the C6-C7 segments resulted in centralization. Manual supine thoracic P-A manipulation and seated CTJ extension mobilizations resulted in abolishment of his remaining neck pain. The patient performed self-mobilizations at home to supplement the manual interventions.

Outcomes:

After 6 sessions over 6 weeks, NPRS score improved from 7/10 to 0/10, NDI improved from 44% to 2%, cervical ROM improved to WNL, UE neurodynamic testing was negative, and triceps strength improved from 3/5 to 4+/5. The patient returned to work as a taxi driver without use of pain medication and his surgery was canceled.

Discussion / Conclusion:

This case describes the positive outcome for a patient with cervical radiculopathy utilizing cervical and thoracic manipulation. A test-retest management approach allowed for the modification and progression of manual interventions, ultimately resulting in a successful outcome with avoidance of surgery. Currently, there is moderate level evidence that suggests a benefit to providing cervical and thoracic manipulation for CR. This case may be used to support the emerging evidence for utilization of spinal manipulation in the presence of radiculopathy.

Abstract - ID: 17

Authors: Michael Steimling, Good Shepherd Penn Partners; Nicholas Gulla, Good Shepherd Penn Partners; Michael O' Hara, Temple University

Title: A multimodal manual therapy and cervicovestibular approach to management of a patient with post-concussion syndrome: a case report

Background / Purpose:

Post-concussion syndrome (PCS) is the persistence of a constellation of physical, cognitive, emotional, and sleep symptoms beyond the usual recovery period after a concussion. PCS inter-professional management is guided by the resulting signs and symptoms which increasingly is recognized to include cervical spine management. The biomechanical forces needed to sustain a concussion exceed that needed to cause whiplash associated disorder (WAD). Patients with a coinciding cervical injury may induce almost identical symptoms as cervicovestibular involvement that masquerades as primary PCS findings. Adverse changes in the proprioceptors in the cervical spine may affect the sensorimotor control of gaze stabilization, eye-head movement, and postural stability. This case presents the findings and management, including a pragmatic multimodal treatment focused on manual therapy and cervicovestibular exercises, of a patient with a history of multiple concussions and ongoing PCS.

Case Description:

A 22-year-old male for 4-year history of right side periscapular pain and neck stiffness with static postures with history of 4 diagnosed concussions related to playing high school and collegiate football and one motor vehicle collision in which he experienced WAD. He had additional complaints of chronic fatigue, frequent headaches, difficulty concentrating and complaints of dizziness. Also, he was unable to complete his first semester of professional school due to his symptoms all of which were exacerbated by high level cognitive tasks. Cervical and Thoracic symptoms could be produced with unilateral posterior to anterior pressure in the cervical spine C3-T3 on the right articular column and with end range cervico-thoracic right rotation and extension. Visual tracking and pursuit, saccades, passive capital flexion, and palpation of the suboccipital muscles produced dizziness, periocular pressure and headache. JPE laser testing was abnormal for right rotation.

Treatment consisted of cervical and thoracic thrust and non-thrust mobilizations, thoracic mobility, motor control, and scapulothoracic exercises, vestibulo-ocular and joint position error retraining.

Outcomes:

The patient attended 15 sessions over 5 months. His dizziness handicap index improved from 34 to 14, neck disability index improved from 38 to 14, numeric pain rating scale reduced from 4 to 1/10. While the patient is not asymptomatic and continues to be managed by neurology for PCS he was able to complete his first year of professional school.

Discussion / Conclusion:

This case report described the multimodal management of a patient with PCS and concomitant cervical pain and dysfunction. The patient experienced meaningful improvements in dizziness, headache, and periscapular pain following treatment consisting of manual and vestibular therapies. It may be that in this case the patient's improvement was associated with normalization of vestibular ocular and sensorimotor function at the upper cervical spine. Further research into cervical sensorimotor dysfunction in patients with PCS would help to elucidate the role of manual and vestibular therapy in the management of patients with PCS.

Abstract - ID: 18

Authors: Jeremy McSpadden, Baylor Scott & White Institute for Rehabilitation

Title: Hamate subluxation with Guyon's canal syndrome abated with manual physical therapy – a case study

Background / Purpose:

Compression of the ulnar neurovascular bundle within Guyon's canal is a relatively rare phenomenon, though there is a lack of studies to demonstrate the exact prevalence. The purpose of this case study is to report one such case of ulnar nerve compression post traumatic injury which was successfully abated with manual manipulation.

Case Description:

A 13-year-old female reported a sudden onset of 10/10 pain and loss of function in her right hand after "karate chopping" her friend. CT imaging in the ER cleared her of fracture; she was diagnosed with CRPS and referred to PT two weeks later. She presented with severe guarding behavior (refusal to perform any AROM of the hand) and 10/10 pain / paresthesia along the ulnar distribution of her hand & forearm. Cubital tunnel and cervical contribution were screened and cleared. Palpation revealed a palmar prominence of the hamate which was attributed to causing the ulnar compression within Guyon's canal. Dorsal HVLA thrust of the hamate was performed with the patient reporting immediate reduction in pain, allowing for AROM and gripping activities to restore functional use of the hand. Post treatment grip strength and AROM was symmetrical between hands.

Outcomes:

Post treatment the patient demonstrated symmetrical grip strength and AROM between her wrists. A follow-up session was scheduled but not attended as the mother reported the patient had returned to normal function

Discussion / Conclusion:

This case was initially diagnosed as complex regional pain syndrome, though she did not fit the established Budapest criteria. Differential diagnosis and a biomechanical examination revealed a hamate subluxation causing Guyon's canal syndrome. This finding allowed for appropriate treatment via manual manipulation and therapeutic exercises with rapid return of function to the patient.

Abstract - ID: 19

Authors: Steven Hnat, Kentucky Orthopedic Rehab Team; Cameron MacDonald, Regis University; Amy Hammerich, Regis University

Title: Clinical decision making while managing an athlete with low back pain and headaches: a case study

Background / Purpose:

Physical Therapist often manage low back pain, however few studies have examined the treatment of potential lumbar plexus contribution to meningeal induced headaches. There is evidence linking cervical muscles to the cervical dura-mater via a myodura bridge at the proximal end of the spinal cord. Disc encroachment at the meninges can be problematic with the prevalence of symptomatic herniated lumbar disc at 1-3%, with 95% occurring at L₄-L₅ and L₅-S₁ levels. This case study describes clinical decisions made during the management of an acute lumbar disc injury with associated increased headache frequency.

Case Description:

An 18-year-old male presented to physical therapy following recent onset of sharp pain in the low back radiating to the right gluteal region with tingling to the foot following a CrossFit competition. His medical history is remarkable for 6 months of migraines (averaging 6 per month) requiring Toradol, seizures, and ventricular shunt. Magnetic resonance imaging revealing an extruded disc that completely effaces the right lateral recess, causes mild narrowing of the spinal canal, contacts and dorsally displaces the right S1 nerve root. He reports that his gluteal pain progresses down his leg and then causes headaches. His primary goals were to eliminate low back and leg pain, avoid surgery, and participate in an upcoming competition. Fear Avoidance Belief Questionnaire (FABQ) results were 23/24 for physical activity (FABQ-PA) and 19/42 for work (FABQ-W) and an Oswestry Disability Index (ODI) of 12%. He had a reproduction of symptoms with lumbar flexion, crossed straight leg raise at 25°, slump test, centralization with lumbar extension and performed 12/25 right single leg heel raises. Initial management focused on centralization with extension based exercises in combination with rigid and flexible supportive taping. Progressions were made to side lying active straight leg raise combined with lumbar rotational mobilizations. Patient experienced a resolution of leg symptoms and reduction in headaches 1 per month. Following a vacation he experienced a regression to 6 headaches per month without low back pain and no significant progress was made over the next 2 months. Microdiscectomy was performed in hopes of reducing headaches and post-operative management focused on decreasing fear avoidance, cognitive functional therapy techniques, strengthen, and returning to sport.

Outcomes:

Overall headaches frequency reduced from 6 to 0, FABQ-PA reduced to 0/24 and FABQ-W to 4/42, and the ODI reduced to 0%. Single leg heel raise increased to 25/25 repetitions. Sensation improved despite denial of sensory changes preoperatively and patient returned to sport.

Discussion / Conclusion:

This case demonstrates the value of immediate and continuous examination and evaluation of an individual to identify changing worsening symptoms and treatment response. A multimodal and multidisciplinary approach to treating acute lumbar pain with associated headaches resulted in successful return to sport and resolution of exacerbated preexisting headaches.

Abstract - ID: 20

Authors: Gretchen Seif, Medical University of South Carolina; Elliot Lance, Medical University of South Carolina; Sara Kraft, Medical University of South Carolina; Aaron Smith, Medical University of South Carolina

Title: A case study of a patient with a traumatic knee injury and kinesiophobia at a student run free clinic

Background / Purpose:

Tibial plateau fractures often are the result of a traumatic incident which produce complex varus and valgus forces at the knee, representing 1% of fractures that occur. Up to 99% of all tibial plateau fractures occur with subsequent soft tissue damage, 80% with anterior cruciate ligament and 36% with posterior cruciate ligament (PCL) tears. Typically, patients with this level of complexity are often seen by physical therapists for an extended period of time at a high frequency to achieve maximal rehabilitation potential. If a patient is uninsured, a student-run free clinic may be their only option for physical therapy services. When patients present with kinesiophobia, then the typical treatment timeline may be extended. While pain neuroscience education is becoming part of the education of student physical therapists (SPTs) to address kinesiophobia, it is not clear whether SPTs can accurately recognize when this education is needed and apply it appropriately in patient care. The purpose of this case report is to present a patient without insurance with a complex knee injury and kinesiophobia under the direction of SPTs' supervised 1-on-1 by licensed clinicians at a student-run free clinic.

Case Description:

The patient is an uninsured 33-year-old male with a right tibial plateau fracture, PCL tear, lateral collateral ligament (LCL) tear, and hamstring injury from a traumatic soccer injury. He was three-week post open reduction internal fixation of the tibial plateau, PCL and LCL reconstruction. The patient initially was ambulating with crutches non-weight bearing with a hinge knee brace. His significant initial examination findings included right (R) knee active range of motion (AROM) from 21° of flexion to 102° flexion, a kinesiophobia score of 37/68 on the Tampa Scale of Kinesiophobia (TSK), and a Lower Extremity Functional Scale score of 31/80. The plan of care implemented by SPTs incorporated typical knee strengthening and ROM exercises and included pain neuroscience education (PNE); specifically, the 'living alarm', basic neuroanatomy, and reassurance that his body can heal.

Outcomes:

The patient was seen for 35 visits over a 9-month period. His knee flexion AROM improved from 102° to 136° degrees, knee extension AROM from 21° flexion to 2° into hyperextension. His LEFS score improved from 31/80 to 68/80 (MCID=9). His TSK improved from 37/68 to 21/68 (MCID=6). At discharge, he reported full recovery as he was able to return to work and soccer. According to Sala-Barat et al., the average TSK score for athletes that subjectively want to return to sport activities is 22/68.

Discussion / Conclusion:

This case study demonstrates that a patient with a complex knee injury and kinesiophobia can show full recovery at a student-run free clinic. Further research on the efficacy of student-run free clinics for uninsured populations is warranted.

Abstract - ID: 22

Authors: Courtney Mason, Medical University of South Carolina; Spencer Cowen, Medical University of South Carolina; Gretchen Seif, Medical University of South Carolina

Title: Can pre-clinical students correctly identify pain mechanisms and apply pain neuroscience education while treating a patient in a student-run free clinic? Yes!

Background / Purpose:

Current literature indicates that pain neuroscience education (PNE) is a useful tool in the treatment of patients with nociplastic pain and that pre-clinical students can correctly distinguish between pain mechanisms. However, the extent to which pre-clinical students can apply PNE to the treatment of a patient with nociplastic pain is not established. The purpose of this study is to describe the evaluation and treatment of a patient with a primary diagnosis of fibromyalgia, a complex medical history, and psychosocial factors provided by pre-clinical students at a student-run free clinic.

Case Description:

The patient was referred to a student-run free clinic with a diagnosis of fibromyalgia, history of hypertension and persistent, global pain. The patient had complicating psychosocial factors including high levels of stress, depression, and self-reported Post-Traumatic Stress Disorder. The students compared the patient's presentation with literature describing pain mechanisms and hypothesized that the patient had symptoms consistent with nociplastic pain. This hypothesis was confirmed by the supervising licensed physical therapist. The students used a multifaceted treatment approach to reduce pain, improve overall fitness, and equip the patient with healthy coping techniques. Treatments included aerobic and strength training, manual therapy, relaxation exercises, lateralization training, and PNE, using 1-2 explanations and metaphors for nociplastic pain per treatment session. Metaphors included "the brain is in a pain meeting" to address patient's concerns about memory and emotional changes due to her pain and the "living alarm system" metaphor to explain her allodynia.

Outcomes:

At initial visit, the patient stated on a scale of 0 to 10 with 0 being no pain and 10 being the worst pain she has felt that her worst pain was 10/10 and best was 5/10. At discharge her worst and best pain were 8/10 and 2/10, respectively, a clinically meaningful change (MCID=2/10). A body chart was administered at the fifth visit; the patient marked 32 painful sites. The patient marked only 15 sites at discharge. The PCS and FABQ were introduced at the sixth visit; the PCS improved from 42 to 40, and the FABQ increased from 43 to 73 at discharge. After 10 sessions, the patient indicated on a Global Rating of Change scale that she believed herself to be "moderately better."

Discussion / Conclusion:

This case study demonstrates that pre-clinical students can correctly identify the pain mechanism and apply PNE in the treatment of a patient with nociplastic pain. While the patient reported clinically meaningful improvement in pain, the FABQ score indicated an increase in fear avoidance beliefs. This is not uncommon for patients that are newly exposed to PNE. Future, more robust research is needed to demonstrate the viability of this approach as a model for preclinical student education in treating patients with nociplastic pain.

Abstract - ID: 23**All Authors:**

Josh Cleland, Franklin Pierce University; Breanna Reynolds, Bradley University; Emilio Puente-dura, Baylor University; Morey Kolber, Nova Southeastern University; Rebekah Dagraedt, Bradley University; Megan Flynn, Bradley University

Title: Local and peripheral change with cervical spine thrust joint manipulation in individuals with temporomandibular disorder with myalgia: a secondary analysis of a randomized clinical trial

Background / Purpose:

Temporomandibular Disorder (TMD) represents the third most common chronic pain condition. Individuals with chronic TMD have demonstrated widespread pain and signs of central and peripheral sensitization, including reduction of pressure pain threshold (PPT) in the orofacial region and remote locations. A known relationship between TMD and the cervical spine support investigation of cervical intervention for individuals with TMD. The specific effect of cervical spine thrust joint manipulation is unclear and has not been studied in a randomized fashion. The purpose of this study was to determine immediate and short term local and peripheral change when cervical spine thrust joint manipulation is added to a standard program of education, exercise, and soft tissue mobilization of the suboccipital region in a defined sample of individuals with TMD with myalgia. This abstract reports only secondary outcomes.

Methods:

Fifty participants with TMD (confirmed with diagnostic screening) were seen for 4 visits over 4 weeks. All participants had myalgia; other sources of temporomandibular pain or dysfunction may have also been present but were not a reason for exclusion. All participants received standardized treatment with the addition of the randomized intervention: cervical thrust joint manipulation or sham manipulation. Results for primary outcomes of interest including function, pain, fear, and Global Rating of Change (GROC), are presented elsewhere. Results presented here include the analysis of secondary outcomes of jaw and cervical range of motion (ROM), Numeric Pain Rating Scale (NPRS), and PPT of masticatory muscles and a remote location at the first dorsal interossei. A 2 x 4 mixed model ANOVA was used with intervention group as the between-subjects factor and time as the within-subjects factor; the hypothesis of interest was the group by time interaction.

Results:

There were no statistically significant interaction effects of these secondary outcomes. However, main effects were noted for NPRS of the jaw ($p < .001$) and neck ($p < .001$), MMO ($p < .001$), lateral deviation ($p = .027$), cervical ROM ($p < .001$), and PPT ($p < .001$ for masticatory muscles and $p = .004$ in 1st dorsal interossei), indicating both groups changed over time. Immediate and overall change in each measure favored the thrust group. PPT values were not correlated with pain, but were correlated to one another at local and peripheral locations.

Discussion / Conclusion:

There was no statistical difference between groups. However, both local and remote measurements showed statistical improvement in both groups over time. PPT in remote locations was correlated with PPT in local regions of pain. These changes may support centrally mediated pain in this chronic pain population. Physical therapy intervention, including cervical thrust joint manipulation, may have an effect in pain modulation at local and peripheral sites in individuals with TMD and myalgia.

Abstract - ID: 24

Authors: Breanna Reynolds, Bradley University; Emilio Puentedura, Baylor University; Morey Kolber, Nova Southeastern University; Josh Cleland, Franklin Pierce University

Title: Effectiveness of cervical spine thrust joint manipulation added to behavioral education, soft tissue mobilization, and exercise in individuals with temporomandibular disorder (TMD): a randomized clinical trial

Background / Purpose:

Temporomandibular Disorder (TMD) is a common and costly problem often leading to chronic pain. There is moderate evidence for physical therapy (PT) intervention in the management of TMD. A known relationship between TMD and the cervical spine exists, however, studies examining the efficacy of cervical interventions in this population are limited. The purpose of this study was to determine the immediate and short-term effects of cervical spine thrust joint manipulation (TJM) added to behavioral education, soft tissue mobilization, and a home exercise program (HEP) on reducing pain and disability in individuals with a primary complaint of temporomandibular disorder (TMD) with myalgia.

Methods:

Fifty individuals with TMD (n=50) were randomly assigned to receive cervical TJM or sham manipulation for four visits over 4-weeks. Participants in both groups received standardized behavioral education, HEP, and soft tissue mobilization. Primary outcomes included maximal mouth opening (MMO), Numeric Pain Rating Scale (NPRS), TMD Disability Index, Jaw Functional Limitation Scale (JFLS), Tampa Scale of Kinesiophobia (TSK-TMD), and Global Rating of Change (GROC). Self-report and objective measurements were taken at baseline, immediately after initial treatment, 1-week, and 4-weeks. A 2 x 4 mixed model ANOVA was used with intervention group as the between-subjects factor and time as the within-subjects factor. Separate ANOVAs were performed for dependent variables and the hypothesis of interest was the group by time interaction.

Results:

There was no statistically significant interaction for MMO or NPRS. Statistically significant 2-way interactions were noted in JFLS ($p = .026$) and TSK-TMD ($p = .008$), favoring the TJM group. Both groups showed statistically significant main effects in all measures over time. GROC favored the TJM group with statistically significant differences in successful outcomes noted immediately after baseline treatment ($p = .022$, NNT = 5) and at 4-weeks ($p = .047$, NNT = 4).

Discussion / Conclusion:

Differences between groups were small, however statistical significance was reached for JFLS, TSK-TMD, and GROC. Cervical TJM may be beneficial in the treatment of TMD.

Abstract - ID: 25**Authors:**

Ray Lunasin, Regis University; Amy Hammerich, Regis University; Cameron MacDonald, Regis University

Title: Addressing lumbopelvic dysfunction with a multiplanar long axis distraction sequenced approach: clinical pearl

Background / Purpose:

Pelvic asymmetry (PA) has been linked to low back pain and pelvic girdle pain with positive outcomes from joint manipulation. Leg length discrepancy (LLD) and PA have been theorized to be correlated but defining the cause of postural dysfunction is an ongoing debate. Tingren et al (2006) reported PA with LLD being reversible as long axis distraction manipulation (LADM) was effectively used to impact PA and LLD. PA potentially contributes to sacroiliac joint dysfunction allowing increased shear forces and instability. LADM is used to address PA within lumbopelvic pain, customarily in supine or prone while the clinician grasps the lower extremity via the ankle with a caudal distraction force, applying an HVLA distraction at end-range. Position-dependent varying degrees of pelvic mobility should be considered for maximizing potential change of innominate positioning or response to mechanical stimulus; using only supine or prone positions may limit efficacy. A novel approach is utilizing supine, prone, and side-lying positions sequentially administering LADM at midrange with the knee extended and hip in neutral position to address the variable position-dependent multiplanar nature of the innominates. This case series describes a novel treatment utilizing a repeated, multiplanar LADM approach for five patients with lumbopelvic pain.

Case Description:

All patients were female with a chief complaint of lumbopelvic pain (>1 year) without radicular symptoms. Mean age was 61.6 years (13.6; 38-76) and BMI was 28.3 kg/m² (3.8; 21.8-32.1). All described pain in the sacroiliac joint with prolonged standing and forward bending; 3 out of 5 reported pain with prolonged sitting. Each patient exhibited PA with LLD with positional assessment of the iliac crests, ASIS, and medial malleoli in supine. Laslett's sacroiliac joint test cluster produced symptom provocation in all cases with at least 2 of 4 positive tests. Subjective history and musculoskeletal exam found no red flags or contraindications to joint manipulation. Primary treatment included sequenced LADM on 2 visits and an individualized home exercise program targeting specific individual impairments of flexibility, strengthening and functional mobility of the lumbopelvic region. Average plan of care was 4.4 sessions, 1 time per week.

Outcomes:

Significant improvements in pain and disability were reported following treatment. The mean NPRS score decreased from 5 (1.3; 3-7) to 0.8 (1; 0-2) (MCID=2); the mean ODI score decreased from 43.6 (2.3; 40-46) to 12 (7.3; 0-22) (MCID=12.9). Long-term follow-up by phone (>6 months) was attempted; 3 of 5 patients responded reporting continued symptom improvement and retention of functional gains.

Discussion / Conclusion:

Sequenced LADM may be more effective by accounting for heterogeneity of lumbopelvic impairments, utilizing a multiplanar component, and an arrangement that may decrease both restraint of the region's complex neuromusculoskeletal structures and pain provocation during manipulation. Further research would be needed to determine true effectiveness of this interventional approach.

Abstract - ID: 27

Authors: Ryan Cummings, Regis University; Terrence McGee, Johns Hopkins Hospital; Amy Hammerich, Regis University; Cameron MacDonald, Regis University

Title: Orthopaedic manual physical therapist management of an adolescent swimmer with traumatic lumbar spondylolysis presenting as low back pain with lateral shift: a case report

Background / Purpose:

Low back pain (LBP), including spondylolysis, in adolescent athletes has a lifetime prevalence of 66% between the ages of 12-20 years. Spondylolysis is a stress reaction caused by microtrauma during physical exercise. Although etiology for spondylolysis remains uncertain, implications for genetic predisposition and repetitive trauma remain strong. In contrast, direct evidence of a relationship between spondylolysis and a lateral shift is limited. Lateral shifts may be explained by reflexive or active muscle spasms to avoid spinal nerve irritation. Poor prognostic indicators for conservative management of LBP include a positive crossed straight leg raise in the presence of a lateral shift. The purpose of this case report is to illustrate a pragmatic and multimodal management approach for a young athlete with traumatic onset lumbar spondylolysis presenting with low back pain and related lower extremity pain and a contralateral lateral shift.

Case Description:

A 13-year-old male swimmer with onset of traumatic acute LBP and lateral shift presented to an outpatient physical therapy clinic. The patient reported sustaining a kick to the lower back while playing water polo two months prior to initial evaluation. His parents reported localized bruising with progressive worsening of symptoms resulting in difficulties with functional movements and participating in swimming. Imaging demonstrated bilateral edema at L4 without distinct fracture line or spondylolisthesis. Paternal history was significant for spondylolysis. Patient reported a 6/10 on the numerical pain rating scale (NPRS) and 24% on the Oswestry Disability Index (ODI). Physical examination demonstrated decreased lumbar flexion in standing with reproduction of symptoms at 30° flexion, familiar right buttock pain with positive left straight leg raise at 60°, and palpation revealed right gluteus medius, quadratus lumborum, and erector spinae hypertonicity. Postural examination revealed left lateral midline shift with mild scoliosis and decreased lumbar lordosis. Finally, neurological testing of dermatomes, myotomes, and reflexes were unremarkable. Based upon clinical findings and ICF-Guidelines, patient was classified into the acute low back pain with related lower extremity pain subgroup. Management commenced with lateral shift correction, soft tissue mobilization to right paraspinals, dry needling to the right gluteus medius, joint mobilization/manipulation of the thoracic spine, and neurodynamic mobilizations to the left lower extremity. Finally, progressive lumbopelvic motor control re-education and spinal loading were provided for remaining movement coordination impairments.

Outcomes:

The patient completed 7 visits over the course of 5 weeks. Clinically important improvements demonstrated a decrease in NPRS to 0/10 and ODI improvement from 24% to 0% at 30 days. This improvement continued for 3 months with full return to sport.

Discussion / Conclusion:

This case demonstrates the utilization and successful outcomes of an impairment-based orthopaedic manual therapy treatment approach in the management of a young athlete with traumatic spondylolysis presenting as low back pain with related lower extremity pain and lateral shift.

Abstract - ID: 28

Authors: Alisa Pravdo, University of Maryland School of Medicine; Peter Bowman, University of Maryland Baltimore; Jessica Werth, University of Maryland Baltimore; Jennifer Kovalick, University of Maryland Baltimore; Christine Leimkuhler, University of Maryland Baltimore; Joshua Haffner, University of Maryland Baltimore; Reuel Tizabi, University of Maryland Baltimore; Katherine Kline, University of Maryland Baltimore

Title: Does A specific exercise protocol along with manual therapy effectively improve outcomes for non-operative patients with shoulder pain in adults 40-65 years old? A case series

Background / Purpose:

Shoulder pain affects 16-21% of the general adult population and is the third most common musculoskeletal complaint treated by primary care physicians. Shoulder pain contributes to a multitude of factors including limited overall function, joint mobility, range of motion (ROM), and inefficient muscle firing patterns that can be associated with significant morbidity. Research exists demonstrating interventions to promote functional rehabilitation for patients with shoulder pain secondary to impingement syndromes and rotator cuff pathology. However, there is a lack of established research protocols for physical therapists to reference. Treatment programs combining manual therapy along with exercise have been shown to decrease shoulder pain when compared to exercise alone. The purpose of this case series is to describe and create a physical therapy protocol incorporating manual therapy for adults with shoulder symptoms and limited shoulder elevation.

Case Description:

This study details the rehabilitation protocol, clinical impressions, examination findings and outcomes for 3 patients ages 40-65 years old, who underwent outpatient physical therapy intervention 2-3x/week for approximately 4-8 weeks. There were 6 patients who fit the inclusion criteria over an 8-month period. The exercise protocol consisted of two phases of treatment, with the patients progressing to phase 2 after meeting the necessary, pre-determined criteria. In order to qualify for phase 1, the patients had to demonstrate at least 50% shoulder AROM compared to the contralateral side and at least 3-/5 shoulder strength throughout. Phase 2 requirements included full shoulder AROM and at least 3+/5 shoulder strength throughout. Treatment consisted of soft tissue mobilization (STM) to the rotator cuff (RC), and/or end range glenohumeral joint mobilization with rotator cuff, middle trapezius, lower trapezius, serratus anterior, and upper trapezius strengthening and neuromuscular re-education exercises to improve shoulder elevation. Outcome measures used include shoulder strength, shoulder active range of motion (AROM), and changes in the Shoulder Pain and Disability Index (SPADI) outcome tool.

Results:

Three of the patients in the study demonstrated significant improvements in shoulder strength, SPADI outcome scores and shoulder AROM within 6 weeks. SPADI scores improved an average of 24 total points per subject. The patients demonstrated an average improvement of 27 degrees in active elevation. The additional three patients self-discharged from physical therapy without known reason and were unable to be reached by telephone after multiple attempts.

Discussion / Conclusion:

A multi-modal approach to treating shoulder pain and various symptoms may include manual therapy along with RC strengthening and exercises emphasizing upward rotation of the scapula to improve glenohumeral rhythm and shoulder elevation. Further research with long-term follow up is needed to determine an appropriate protocol for manual therapy and shoulder girdle strengthening to improve overall function in adults.

Abstract - ID: 29

Authors: Andrew Hammond, Johns Hopkins Hospital; Kevin McLaughlin, Johns Hopkins Orthopaedic Surgery

Title: Saphenous nerve interventions for suspected MCL sprain in the context of an inductive reasoning model

Background / Purpose:

In cases of trauma, medial knee pain is commonly attributed to pathologies such as meniscal lesions, ligamentous injury, and muscular injury. Multiple case studies have suggested an association between the saphenous nerve and medial knee pain.

Inductive reasoning involves processes such as pattern recognition, and generally involves using past experiences to make judgements regarding the probability that any particular case belongs within a particular diagnostic category. This case describes the use of an inductive reasoning model in the diagnosis and treatment of a patient with medial knee pain referred for MCL sprain.

Case Description:

A 70-year-old female presented to physical therapy with reports of right medial knee pain following an incident 7 weeks prior, during which she twisted her knee. An orthopaedic physician subsequently diagnosed the patient with a grade II MCL sprain. Radiographs were unremarkable for fracture. Her activity limitations included ascending stairs, car transfers, and walking. Easing factors included rest. Pain spanned from the distal medial thigh to the medial aspect of the lower leg. Pertinent examination findings included reproduction of symptoms in the knee and leg with palpation of the saphenous nerve in the medial thigh, as well as with saphenous nerve mobility testing. The patient also presented with reduced knee extensor strength and a mild reduction in knee flexion range of motion (ROM) with an empty end-feel on the involved side. Neurodynamic mobility interventions were the focus of visits 1 and 2 including soft tissue mobilization and nerve 'sliders'. Visits 3 and 4 focused on re-introducing desired activities and quadriceps strengthening.

Outcomes:

Patient completed 4 visits over the course of 5 weeks. Numeric Pain Rating Scale for stairs improved from 5/10 to 0/10 by visit two. Knee flexion ROM normalized by visit two. Lower Extremity Functional Scale improved from 38% to 0% by visit three.

Discussion / Conclusion:

This case study describes a successful episode of care for a patient with a suspected MCL sprain utilizing neurodynamic interventions in the context of an inductive reasoning model. Given the anatomy of the saphenous nerve, it may be provoked by activities requiring knee extension combined with hip extension such as walking, sit to stand, or climbing stairs. This, combined with the patient's symptom distribution and normal knee extension ROM, raised the index of suspicion of saphenous nerve involvement. Confirmation testing through palpation and neurodynamic testing prompted the treatment threshold to be reached. A test/retest model as well as daily outcome measures were utilized to assess the effectiveness of interventions and accuracy of diagnosis. No cause and effect conclusions can be made, but given the patient's rapid positive response, it is the authors' opinion that the patient's symptoms at the time of initiation of physical therapy services was more likely neurogenic versus ligamentous in nature.

Abstract - ID: 30

Authors: Breanna Reynolds, Bradley University; Emilio Puentedura, Baylor University; Morey Kolber, Nova Southeastern University; Nathaniel Cairns, Bradley University; Rachel Weaver, Bradley University; Josh Cleland, Franklin Pierce University

Title: Reliability and construct validity of the Jaw Functional Limitation Scale and Temporomandibular Disability Index

Background / Purpose:

Self-report scales provide a measure of current function and change over time. This measurement of function is important to physical therapy practice and research; however, there is a lack of research supporting reliability and validity of functional scales for individuals with temporomandibular disorder (TMD). The Jaw Functional Limitation Scale (JFLS) and TMD Disability Index (TMD-DI) have been suggested for use in this population. The purpose of this study was to evaluate the test-retest reliability and construct validity of the TMD-DI and JFLS in a physical therapy setting.

Methods:

Methodology included a single group repeated measures design. TMD-DI and JFLS were completed by participants at baseline, 1 week, and 4 weeks. The Global Rating of Change (GROC) was used to dichotomize stable and improved individuals. Intraclass correlation coefficients (ICC) were examined for test-retest reliability in stable participants. Construct validity was measured through an independent t-test comparing stable and improved groups on change scores.

Results:

89 participants with TMD (80.9% female, mean duration of symptoms 69.8 months, mean age 38.2 years) were included in the study. ICC for stable patients indicated excellent agreement in both measures at 1 week (n=36) and 4 weeks (n=11). These ICC values ranged from 0.850 to 0.934. Statistically significant differences were noted in JFLS change scores at 4 weeks ($p < .001$), but not at 1 week ($p = .056$). The change scores for TMD-DI at both 1 week ($p = .010$) and 4 weeks ($p = .001$) were statistically different between stable and improved patients.

Discussion / Conclusion:

Results indicate excellent test-retest reliability of the JFLS and TMD-DI in stable individuals at both 1 and 4 weeks. Statistically significant differences in change scores in the JFLS at 4 weeks and in the TMD-DI at both 1 week and 4 weeks provide some support for construct validity of these measures. Further research is needed to support these conclusions.

Abstract - ID: 31**Authors:**

Griffin Lee, HonorHeath; Jimmy Flis, HonorHealth

Title: The role of sex and gender in physical therapy practice - a hypothesis paper

Background/Hypothesis:

Chronic pain has risen to the forefront of medicine. In the early stages of research of chronic pain conditions, sex specific differences in pain were ignored. Newer research has begun to highlight differences in the experience of pain based on sex and gender, sex being defined as a biological construct and gender as a social and cultural construct. Knowing differences in sex and gender exist and affect pain, if these factors are considered in the evaluation and treatment of chronic pain, then outcomes in physical therapy may potentially be improved.

Summary of Findings:

Imaging studies have revealed that different areas of the brain are activated in response to laboratory induced pain. Men are shown to activate more pre-frontal control structures and females are shown to activate more emotional processing centers. Differences are also found in drug metabolism. For example, females require two to three times more morphine than males to produce comparable levels of analgesia. These examples, among many others, highlight differences between sexes at the physiologic level. Many differences also exist in relation to societal gender roles. These include coping strategies, reasons for seeking care, and timing on when they seek care. On the surface, differences exist in the way practitioners treat pain dependent upon a patient's sex/gender. These are driven by subconscious biases of the provider. Women tend to be treated less aggressively at initial encounters until they demonstrate they are as sick as male counterparts. Clinician perceptions tend to be that women are less sensitive to pain, more tolerant and less distressed when faced with pain. Contrary to this popular belief, women have been demonstrated to have lower pain-pressure thresholds as well as lower pain tolerance. Regarding treatment outcomes, there is some evidence that there are differences between men and women following physical therapy treatment, specifically for those who have undergone rotator cuff repair and Achilles' tendon repair. In both cases, women had higher disability following the surgery and course of rehab compared to men. There is also evidence suggesting that across a number of chronic pain conditions, women and men had similar levels of initial improvement following an interdisciplinary pain management program, but at later follow ups women were found to be closer to their pre-treatment scores whereas men had maintained post-treatment scores. While these examples demonstrate differences in outcomes between men and women, it is important to note that other studies demonstrate no difference in outcome.

Conclusion / Significance:

Further research should consider sex and gender as a variable in an effort to determine the most effective and efficient treatment for men and women across all musculoskeletal conditions. Additionally, clinicians need to be aware of their subconscious biases related to gender and how they may be impacting their assessment and treatment.

Abstract - ID: 32

Authors: Ellen Witte, St. Ambrose University; Mark Levsen, St. Ambrose University; Candi Gardner, Genesis Physical Therapy; Kevin Farrell, St. Ambrose University; Martin Barclay, Genesis Health System

Title: Clinical decision making in the examination and treatment of left sided chest pain: a case report

Background / Purpose:

The initial goal of musculoskeletal evaluation is to determine appropriateness for care even if the patient has been screened by other medical professionals. The purpose of this case is to differentiate musculoskeletal structures with the greatest likelihood of involvement in a patient with left sided chest pain.

Case Description:

A 42 year-old male presented with a 4 month history of constant left chest “tightness” (P1) with intermittent “shooting pain towards his sternum” (P2), intermittent left fifth digit numbness/tingling (P3), and left cervical spine “pinching” (P4). P1 - P4 were aggravated with sleeping in any position and sitting for greater than 10 minutes. P1 - P2 were relieved with general activity. He additionally reported a 20-year history of left upper thoracic constant “tugging” (P5) which varied in intensity and worsened since onset of P1-4, but reported no aggravating factors. Prior to evaluation, the patient underwent a Bruce protocol stress test with a normal response indicating low likelihood for visceral cause of symptoms. This was supported by normal vitals response on evaluation and reproduction of symptoms with cervical motion. The patient presented with P1-P2 as his chief complaint. Significant objective findings included: upper crossed posture, C8 dermatomal sensation loss, reproduction of P1, P2, P4, P5 with left cervical posterior quadrant, reproduction of P1, P2, P4 with left C6-7 unilateral P-As. Thoracic spine and rib 1-8 accessory motion testing were all negative for reproduction of P1- P4, but T3-4 P-A’s reproduced P5. The differential diagnosis was C6-7 dysfunction as the most likely cause of P1-4, and T3-4 dysfunction as the most likely cause of P5. Initial intervention included C6-7 mobilization with secondary emphasis on postural re-education exercises.

Outcomes:

The patient was seen 10 times over 12 weeks. Complaints P1 - P3 resolved within 2 visits utilizing manual treatment directed at C6-7 and postural exercises and P4 resolved within the next 4 visits. P5 resolved within final 4 visits with mobilization to T3-4 and Mulligan scapular mobilization. Left posterior quadrant improved from painful/guarded at evaluation to full and pain-free with overpressure at discharge. Pain-free left cervical active rotation improved from 55 to 67 degrees. Numeric Pain Rating scale improved from 8/10 to 0/10. He returned to weight lifting with no limitations.

Discussion / Conclusion:

This case addressed the importance of differentiating between cervical and thoracic origin for effective and efficient intervention of left sided chest pain. All symptoms could be reproduced with mechanical examination indicating appropriateness for physical therapy intervention. Therefore, examination and treatment was directed at the appropriate spinal levels alleviating all symptoms.

Abstract - ID: 33

Authors: Stephen Shaffer, High Point University; Morgan Steiner, High Point University

Title: Thoracic spine and rib cage joint mobilizations as a treatment for postural orthostatic tachycardia syndrome (POTS): a case report

Background / Purpose:

Postural Orthostatic Tachycardia Syndrome (POTS) is a form of dysautonomia and orthostatic intolerance that is clinically diagnosed when the heart rate (HR) increases by a minimum of 30 bpm or equals 120 bpm within the first 10 minutes of standing. Patients with POTS often have increased sympathetic activation that may be misdiagnosed as anxiety based on symptoms that could be a compensatory response to cardiovascular impairments during orthostasis. The current most common treatments for POTS include increasing salt/fluid intake, raising the head of the bed, and pharmacological management. Spinal mobilization demonstrates a sympathetic response and presents a possible conservative treatment option relevant to manual therapists. The purpose of this case report is to explore a novel treatment option targeting the autonomic nervous system through thoracic spine / rib cage joint mobilizations.

Case Description:

A 22-year-old female presented with a 10-year history of dizziness, visual disturbances upon standing, decreased heat / exercise tolerance, irregular HR, syncope, general fatigue, and malaise. An increase in symptoms within the first year of undergraduate study prompted her to seek out a physician specializing in POTS; treatments were unsuccessful and discontinued. Three years later, the patient consulted with a physical therapist to trial a new approach to treatment. Significant findings included hypomobility and allodynia at T/R1-12 with focal points at T4-6 and R1-6. The comparable sign was transitioning from supine-to-standing with duration of symptom resolution recorded. Grade III anterior-to-posterior / posterior-to-anterior mobilizations were applied to the thoracic spine / rib cage until tissue change. A home exercise program included self-mobilization.

Outcomes:

The Numeric Pain Rating Scale, the COMPASS 31 (a self-report measure of autonomic symptoms; modified from annual to weekly recall), and the Single Assessment Numeric Evaluation (SANE) were used. NPRS improved from 9/10 to 2/10. Initial COMPASS 31 score was 56.179 / 100. Over 24 treatment sessions in eight months, the COMPASS 31 score demonstrated an overall decline, with an average score of 28.693. The SANE was 95%. The patient was able to participate in graduate school activities with decreased severity and frequency of her symptoms.

Discussion / Conclusion:

This unique case report demonstrates an improvement in POTS symptoms after thoracic spine / rib cage joint mobilizations. Future studies should evaluate if the treatment effect is reproducible and if this approach could be useful in the long-term management of POTS.

Abstract - ID: 34

Authors: Dustin Hawk, St. Ambrose University, Rock Valley Physical Therapy; Kevin Farrell, St. Ambrose University; Todd Kersten, Rock Valley Physical Therapy; Anna Perry, Rock Valley Physical Therapy; Candi Gardner, Genesis Physical Therapy

Title: Neurodynamic mobilization techniques in the treatment of a patient referred with diagnosis of adhesive capsulitis: a case report

Background / Purpose:

Adhesive capsulitis (AC) is an inflammatory process that results in pain, glenohumeral (GH) capsule fibrosis, and GH hypomobility. Targeted manual therapy (MT) and therapeutic exercise are often effective for patients with AC, however many continue to have persistent symptoms. Evidence suggests a possible link between altered upper extremity (UE) neurodynamics and AC. Thus, UE neurodynamics should be evaluated, especially in patients with chronic, recalcitrant AC. This case describes a patient's outcomes with chronic AC after altered UE neurodynamics were addressed.

Case Description:

The patient was a 64 year-old, right-handed, female referred to a physical therapist by an orthopaedic surgeon with the diagnosis of right shoulder AC. The patient reports a 2.5-year history of right shoulder AC that had been previously treated with ten GH joint corticosteroid injections and two bouts of physical therapy (PT) with transient improvement. The most recent exacerbation of her symptoms began 5 months prior to the current PT evaluation. She received a GH intraarticular injection and a subacromial injection two weeks prior to evaluation, with relief in resting pain reported. Chief complaint at evaluation was lateral shoulder pain while reaching behind her back. Physical examination findings revealed active right shoulder flexion, abduction, and ER limited by 75% due to pain. Right shoulder active internal rotation (IR) was limited to L1 due to lateral shoulder pain, compared to T6 contralaterally. Right GH joint accessory motion, cervical AROM, cervical passive physiological and accessory intervertebral motion were normal. Right radial nerve upper limb tension test (RNULTT) was limited to 45° abduction with reproduction of her pain, compared to 130° abduction contralaterally. The right first rib was elevated and hypomobile with reproduction of her pain. Treatment focused on first rib depression mobilizations and progressive MT techniques to improve radial nerve neurodynamics. Once first rib mobility improved, lateral cervical glides were performed with the right arm in a radial nerve biased position of 30° abduction, 30° IR, 0° elbow extension, and full wrist pronation/flexion. Her home exercise program consisted of postural exercises and radial nerve sliders that were progressed to tensioners once irritability decreased.

Outcomes:

The patient completed 12 PT visits in 6 weeks. She achieved full asymptomatic shoulder AROM, RNULTT improved to 130° of shoulder abduction, and IR improved to T6 without symptoms. Her Patient Specific Functional Scale improved from 4/10 to 9.7/10. Neck Disability Index improved from 38% to 1%. CareConnections Upper Extremity functional ability improved from 70% to 100%.

Discussion / Conclusion:

Clinically meaningful changes in shoulder pain, disability, and AROM were observed following an individually tailored approach that focused on progressive MT techniques to improve first rib mobility and radial nerve neurodynamics. MT directed at neural interfaces should be considered to address altered UE neurodynamics in patients with chronic, recalcitrant AC.

Abstract - ID: 35

All Authors: Ger Moua, St. Nicholas Hospital

Title: Progressive management in a challenging lateral epicondylalgia presentation - the role of cervico-thoracic and breathing impairments

Background / Purpose:

Lateral epicondylalgia is defined as pain at the lateral elbow associated with gripping activities and repetitive wrist movements of the dominant arm. Differential diagnosis can include degenerative changes in the tendon, radial nerve entrapment syndromes, and referred pain from the cervical spine. This case report describes the management of a patient with lateral elbow pain complicated by a past and concurrent history of cervical spine and thoracic cage impairments, utilizing clinical reasoning with an orthopedic manual physical therapy approach.

Case Description:

A 54-year-old female presented with acute right elbow pain after using an air hammer while working. She completed an episode of PT care for neck pain two weeks prior to the start of her elbow pain. Her past medical history included L shoulder pain post MVC, neck pain, obesity, and sleep apnea with use of CPAP; there was no history of surgical intervention related to elbow pain. Turning her palm up, down, and gripping tasks aggravated symptoms. Using an elbow brace decreased symptoms. Pain ranged between 3/10 and 8/10 on the Numeric Pain Rating Scale (NPRS). There was positive symptom reproduction with wrist extensor testing, pronation manual muscle testing, Cozen's test, and Mill's test. Radial nerve neurodynamic assessment was negative. Grip strength was 15 lb on the right with symptom reproduction and 40 lb on the left. Cervical spine and shoulder examination was negative for reproduction of R elbow pain. She identified the following limitations on the Patient-Specific Functional Scale (PSFS): Putting parts together: 4/10; Driving: 5/10. Initial interventions consisted of cross friction mobilization of the common extensor tendon, eccentric wrist exercises, elbow lateral glide mobilization with movement, and ergonomics education. Her symptoms improved but plateaued during this episode. Reassessment of the cervical spine, thoracic cage, soft tissue, and radial nerve reproduced symptoms. After further questioning, the patient reported difficulty breathing through the R nasal passage. This limitation was likely associated with cervical motion and thoracic expansion limitations. Manual interventions to the cervical spine, thoracic cage, and soft tissue were performed, improving symptoms.

Outcomes:

The patient was seen for 16 visits over 9 weeks. Her right hand grip strength improved to 45 lb and was pain-free. Her final NRPS was 0/10. Reassessment of the items given on her initial PSFS revealed the following improvements: Putting parts together: 8/10; Driving: 9/10. Patient contact at 6 and 9 months reported a pain-free state with a full return to work.

Discussion / Conclusion:

This case discusses a plateau in symptoms necessitating a revision of the original management plan. Further reassessment identified additional impairments in the cervical spine, thoracic cage, and local soft tissue restrictions due to difficulty breathing. This case highlights the need to continually screen for other contributing factors for lateral elbow pain.

Abstract - ID: 36

Authors: Kindyle Brennan, University of Mary Hardin-Baylor; Daniel Jupiter, University of Texas Medical Branch at Galveston

Title: Rate and maintenance of improvement in myofascial pain: dry needling alone vs dry needling with intramuscular electrical stimulation

Background / Purpose:

Myofascial Pain syndrome (MPS) is a chronic musculoskeletal disorder, characterized by taut, hypersensitive muscular nodules/bands, which has been demonstrated in approximately 33% of patients that have musculoskeletal pain. Dry needling (DN) has shown efficacy in the treatment of MPS, and has demonstrated both mechanical and neurophysiological effects. Transcutaneous electrical nerve stimulation (TENS) has been shown to provide short-term pain relief and decrease fatigue levels in individuals with MPS. Combining intramuscular electrical stimulation (IMES) with DN in the treatment of MPS has not been studied extensively, but initial results are promising. The purpose of this study was to determine if there is a difference in the rate of improvement between those treated with DN only and those treated with DN and IMES, and if improvements are maintained 6 weeks post treatment.

Methods:

Forty-five participants (male= 8, female=37, mean age=27.9 years) were randomly assigned to one of two treatment groups: dry needling alone (DN, needles in situ x 10 minutes; n=25) or DN with IMES (DN/IMES, dual channel stimulator, 10 MHz, x 10 minutes; n=20). Both groups completed the NDI and NPRS at week 0, week 3, week 6, and week 12 of the study. Treatments were administered to the involved upper trapezius (unilateral or bilateral) once a week for 6 consecutive weeks.

Results:

Participants in the DN group demonstrated a significant improvement in disability and pain between week 0 and week 6 ($p=0.008$ and 0.017 , respectively). The DN/IMES group also demonstrated significant improvement in disability and pain ($p=0.017$ and 0.00002 , respectively) between week 0 and 6. Within group changes in pain did not differ for either group, but did show significant change between week 0 and 3 for the NDI in the DN/IMES group ($p=0.029$). The change scores did not differ for either outcome between groups at any time point. No change was noted in the NDI or NPRS scores between week 6 and week 12 in the DN group ($p = 0.498$ and 0.801 , respectively) or the DN/IMES group ($p= 0.714$ and 0.164 , respectively).

Discussion / Conclusion:

Both DN alone and DN with IMES resulted in improvement in pain and disability in individuals with MPS involving the upper trapezius. Disability improved at a faster rate in the DN/IMES group, but no differences in improvement in disability or pain existed between the groups at week 6 or 12. Both groups maintained results six weeks following cessation of treatment. Our findings indicate that DN with or without IMES results in improved disability and pain, which is maintained for at least 6 weeks. Disability improved at a faster rate in the group receiving DN and IMES, but no differences in improvement in disability or pain existed between the groups at week 6 or 12.

Abstract - ID: 37

Authors: Nicole Sturdevant, St. Ambrose University; Kevin Farrell, St. Ambrose University; Candi Gardner, Genesis Physical Therapy; David Wedeking, Genesis Physical Therapy and Sports Medicine; Kirsten Ukleja, Genesis Physical Therapy and Sports Medicine

Title: Physical therapy screening in a patient referred for shoulder pain: a case report

Background / Purpose:

Thorough medical screening should be performed on initial examination, even if patients have been referred from another provider. Clinical practice guidelines for concussions suggest mental status/cognition, physical status, cranial nerves, tone/strength/reflexes, gait, and balance testing to be assessed by physicians. The purpose of this case is to demonstrate thorough pertinent screening for a patient referred for shoulder pain, even after being referred by a physician.

Case Description:

A 70-year-old female reported to physical therapy after a fall. She had no recollection of her fall and was unable to stand without assistance afterward. She also reported unsteady gait, dizziness, nausea, decreased balance, lightheadedness and emotional lability immediately afterward. She was taken by ambulance to the emergency room, and a neck CT scan and shoulder x-ray revealed no significant findings. No further neurologic/concussion screening was performed in the emergency room. She was referred to physical therapy for evaluation of right shoulder pain. Her chief complaints were right sided neck/shoulder dull achiness, 4th and 5th digit stiffness/pain, facial lacerations, and right sided rib pain. Due to concussion like symptoms at time of injury, the treating therapist deemed it necessary to perform medical screening. The screen included assessment of cranial nerves, vestibulo-ocular reflex and saccades testing, vitals, craniovertebral ligament testing, Hoffman's reflex, and neurological assessment. Findings revealed high blood pressure (180/80 mmHg) and saccadic eye movement and visual disturbances with H-testing. Right cervical rotation was 48°, limited by right sided neck pain. Right active shoulder flexion was 98°, limited by pain. Palpation at C5-7 and empty/full can testing elicited right shoulder symptoms. Ulnar upper limb tension tests elicited 4th and 5th digit symptoms. While the patient had mechanical shoulder pain, the referring physician was contacted to report the abnormal findings from the medical screen including saccadic eye movement and high blood pressure. The patient's physician requested to see the patient for further evaluation.

Outcomes:

Upon return from her physician, a week after the initial physical therapy visit, the patient's subjective concussion complaints and H-test abnormalities had spontaneously resolved. The physician attributed continual high blood pressure to "white coat syndrome", although she increased the patient's Lisinopril dosage. After reassessment, therapy addressed the cervical spine as the source of signs and symptoms while concussion signs and symptoms were monitored. After five visits, right cervical rotation had improved to 55°, limited by tightness. Right active shoulder flexion was 160°, limited by pain. Numeric pain rating has decreased from 5/10 to 2/10.

Discussion / Conclusion:

While musculoskeletal complaints may be a patient's chief complaint, the importance of thorough screening of all systems is imperative. Concussive symptoms and hypertension were identified and reported back to the referral source. Once other medical concerns appeared to resolve, the patient received physical therapy treatment to address musculoskeletal complaints.

Abstract - ID: 39

Authors: Michael Griggs, UI Health; Emily Nicklies, UI Health

Title: Lumbar mobilization and exercise for the treatment of insertional Achilles tendinopathy

Background / Purpose:

Achilles tendinopathy is a common cause for posterior ankle pain affecting the tendon at midportion or the calcaneal insertion. Insertional Achilles tendinopathy (IAT) accounts for 20-24% of all Achilles pathologies. Research is limited regarding interventions for IAT, with most studies focusing on local treatment at the tendon. Recent evidence suggests a link between the lumbar spine and chronic lower extremity pain. This concept of spine related extremity pain (SREP) encompasses changes at the central nervous system, thus leading to central sensitization. This case study presents the management of a patient with bilateral IAT with the addition of lumbar spine treatment to standard care.

Case Description:

A 55-year-old sedentary female presented with one year history of bilateral heel pain. Previous treatment included use of a walking boot for six weeks. Prior radiography showed posterior and plantar calcaneal enthesophytes bilaterally. Aggravating factors included descending stairs and walking 10 minutes. Easing factors included pain medication and rest. Examination revealed limited dorsiflexion range of motion, 0 degrees on the right and -10 degrees from neutral on the left. Haglund's deformities were observed, along with tenderness to palpation at Achilles insertions bilaterally. Visit 1-5 treatment focused on calf stretching, eccentric heel raises, and ice massage. The patient reported reductions of pain within sessions with local treatment, but carryover was minimal due to pain limiting exercise compliance. On visit 6, patient revealed history of chronic lower back pain which warranted a lumbar screen. Findings included increased left heel pain with lumbar extension and prone passive accessory intervertebral movement assessment with central posterior to anterior force (CPA) at L4. CPA mobilizations at L4 reduced bilateral Achilles pain in walking immediately after manual treatment. Lumbar mobilizations and exercises were added to her treatment plan. Visits 6-13 focused only on lumbar interventions without local Achilles treatment and the patient reported improved carryover of pain relief across sessions.

Outcomes:

Scores on the Lower Extremity Functional Scale (LEFS) improved from 19/80 to 39/80; the Foot and Ankle Ability Measure ADL Subscale (FAAM-ADL) improved from 30/84 to 54/84 and Patient Specific Functional Scale (PSFS) items for pain-free standing and walking improved from 0/10 to 7/10 and 5/10 respectively. After her 13th visit, she experienced an injury requiring a change in the PT plan of care.

Discussion / Conclusion:

This case report described the successful management of bilateral IAT through manual therapy and exercise directed at the lumbar spine. Advanced clinical reasoning changed the course of treatment after minimal change with local treatment was noted. Remarkable improvements in symptom carryover were noted following lumbar directed treatment. It is possible that treating the spine modulated peripheral nociceptive input into the CNS decreasing central sensitization. Further research would help elucidate the relationship of SREP, central sensitization, and chronic tendon pain.

Abstract - ID: 40

Authors: Lawrence Ramiscal, Augusta University; Steve Karas, Chatham University; Liz Henry, LifeForce Physical Therapy and Wellness; Erland Pettman, North American Institute of Orthopedic Manual Therapy

Title: Pain prevalence in upper cervical stability testing in healthy individuals

Background / Purpose:

Cervical spine manipulation in the presence of upper cervical instability is potentially harmful. Harm may be reduced by following International Federation of Orthopaedic Manipulative Physical Therapists (IFOMPT) guidelines and sound clinical reasoning, including accurate upper cervical stability testing. To date, there is no consensus on how to interpret the results of cervical instability tests. Localized pain is the most commonly reported symptom, but is also the most suggestive of a false positive. This makes utilization of cervical manipulation based on pain perception inconsistent. As a result, patients may not receive optimal treatment. The primary purpose of the study was to document the prevalence of pain and other possible symptoms that may occur with testing among asymptomatic subjects to better quantify a normal, negative response. Our secondary purpose was to determine if symptoms elicited in one test would likely be reported in other tests.

Methods:

A convenience sample of 129 healthy adults, with asymptomatic necks participated in this study (M=55, F=74; age range 18-62 years; mean=31 years). Exclusion criteria included a history of cervical trauma, throat infection, recent head/neck/dental surgery, diagnosis of congenital collagenous compromise, or inflammatory arthritides, collagen or inflammatory arthritis. Eight tests were conducted: 1) distraction (D), 2) distraction with cervical flexion (DCV), 3) anterior atlanto-occipital (AAO), 4) posterior atlanto-occipital (PAO), 5) anterior atlanto-axial (AAA), 6) lateral atlanto-axial (LAA), 7) alar lateral flexion (ALF), and 8) alar rotation (AR). Subjects were asked to report any symptoms and rate them on a scale between 1-10. We performed a frequency count of the reported symptoms to determine the prevalence. We carried out a factor analysis to determine the redundancy among the eight tests.

Results:

The prevalence of pain when these tests were performed in these asymptomatic individuals was 14.7% as compared to less than 1% for the 11 other symptoms, including pressure, pleasant, discomfort, stiffness, lump-in-throat, breathlessness, fullness, stretching, heaviness, headache, dizziness. Those who reported pain with cervical instability tests had pain scores less than 5/10. The factor analysis revealed that only six tests loaded significantly within one factor when pain was elicited (AAO, PAO, AAA, LAA, ALF, and AR).

Discussion / Conclusion:

Localized low-level pain appears to be common including more adverse symptoms (even though less prevalent) when upper cervical tests are performed in asymptomatic subjects. Also, with the exception of the distraction tests, it is possible that among asymptomatic individuals, eliciting a low-level pain on one test may also elicit the same response on the rest of the remaining tests. This may suggest that when cervical instability tests are used to diagnose cervical instability, symptoms alone, particularly pain, are not reliable criteria. As manual physical therapists, it puts the emphasis on following clinical guidelines such as IFOMPT's and sound clinical reasoning. The results of this study also suggest that manually detecting excessive translation or soft end-feel may be more appropriate in determining the presence or absence of cervical instability.

Abstract - ID: 41

Authors: Max O'Malley, St. Ambrose University; Kevin Farrell, St. Ambrose University; Candi Gardner, Genesis Physical Therapy; Jill Hipskind, Saint Ambrose University

Title: Effectiveness of manual physical therapy to the cervical spine to improve upper extremity pain and weakness in a patient with lateral epicondylitis: a case report

Background / Purpose:

Current evidence supports the use of cervical mobilizations in conjunction with distal interventions to address lateral epicondyle pain and grip weakness. However, little research has been done to examine the effect of exclusively using proximal interventions to treat epicondylitis. The purpose of this case study is to detail the treatment of lateral epicondylitis exclusively using proximal mobilizations in the lower cervical spine in conjunction with active facet opening exercise.

Case Description:

Description: 47-year-old female dental hygienist with referral for left lateral epicondylitis. Subjective complaints include gradual 6-month onset of left dorsal forearm pain, numbness in digits 3-5, and regularly dropping items. States symptoms are worst after 12-hour work shifts. Patient feels best on Sundays prior to the work week. Describes her work demands as standing for 12 hours, most of which she is stooped forward with her head rotated to the left. Reports no known mechanism of injury. Objective exam reveals inconsistent dermatomal changes C4, C6 and T2; Triceps reflexes 1+ bilaterally; radial and median ULTT were positive. Active cervical rotation is limited bilaterally and hypomobility identified in low cervical spine. Shoulder ROM screen equal bilaterally with no pain referral. Significant grip weakness and pain present left compared to right (21 versus 68 pounds). Pain with grip is aggravated with cervical compression and partially alleviated with distraction. Initial quick Dash: 22% disability.

Outcomes:

The patient was seen for 4 visits in a 2 week period. Manual interventions involved C5-7 right rotational PPIVMS to improve facet opening on the affected side. Active facet opening exercises followed each manual intervention and involved deep neck flexor holds in supine and repeated R cervical rotation to reinforce left side facet opening. HEP included repeated rotations to right and chin tucks to be performed on the hour at work. Left grip strength improved from 21lbs to 65lbs, NPRS improved from 3/10 to 0/10, right cervical rotation improved from 41 to 65 degrees, and distal numbness resolved. Quick DASH improved from 22% disability to 9%. Subjective improvements included no longer dropping or fearing she would drop items at work.

Discussion / Conclusion:

Current research supports the use of proximal mobilizations at the cervical spine to address lateral epicondylitis, but it is typically done in conjunction with distal interventions as well. This case supports the use of strictly proximal interventions, C5-7 rotational PPIVMS in conjunction with active facet opening and postural exercise, to treat a patient with unilateral grip weakness and pain.

Abstract - ID: 42

Authors: Jeegisha Kapila, Texas Tech University Health Sciences Center; Troy Hooper, Texas Tech University Health Sciences Center; Jean-Michel Brismée, Texas Tech University Health Sciences Center; Charles Nichols, University of North Texas Health Science Center; Kerry Gilbert, Texas Tech University Health Sciences Center; Roger James, Texas Tech University Health Sciences Center

Title: Correlation between shear wave elastography and humeral head displacement during sustained posterior shoulder glide mobilization in a healthy cohort

Background / Purpose:

Asymmetrical capsular tightness is widely implicated for hypomobility, pain, and functional limitations in shoulder dysfunction such as subacromial impingement, adhesive capsulitis, rotator cuff tear, and labral lesions. Posterior shoulder joint mobilization alone or with other forms of manual therapy effectively improve capsular flexibility. Despite the evidence supporting the clinical effectiveness of joint mobilization, the rationale behind its application is not well understood. Recent innovations in ultrasound imaging allow examination of the viscoelastic properties of biological tissues. Concurrent humeral head displacement measurement and posterior shoulder soft tissue elastography allows the quantification of tissue's viscoelastic properties. Therefore, the purpose of this study was to correlate posterior shoulder capsule and infraspinatus muscle shear wave speed (SWS) measures with humeral head-displacement during a sustained posterior glide mobilization of shoulder joint. A secondary purpose is to evaluate tissue SWS changes immediately following shoulder joint mobilizations.

Methods:

This study was a within-subject pretest-posttest and cross-sectional correlational design. Twenty-four healthy subjects (7 males, 14 females; aged 21- 47 years) were recruited. Posterior capsule and infraspinatus SWS measures and B-mode humeral head displacement were collected for all subjects. They were positioned in supine with the shoulder abducted to 45°. An investigator applied sustained posterior glide mobilization force (90 N) to the anterior shoulder for 30 seconds using a hand-held dynamometer. A second investigator placed a 10-2 MHz linear ultrasound transducer on the posterior shoulder to evaluate humeral head displacement, infraspinatus tendon and posterior capsule SWS stiffness measures before and during each mobilization. The subjects were instructed to relax their shoulder muscles and electromyography visual feedback was provided throughout the experimental procedure.

Results:

Spearman ranked order partial correlations controlling for gender and BMI showed fair to moderate association between humeral head displacement and infraspinatus and posterior capsule SWS measurements. A strong correlation was observed between infraspinatus and posterior capsule SWS. Posterior capsule SWS increased during the posterior glide ($F [1, 20] = 243.3, p < 0.001, \eta^2 = 0.92$) and was significantly different after the glide ($p < 0.005$). Similarly, infraspinatus SWS significantly increased during the posterior glide ($F [1, 20] = 221.9, p < 0.001, \eta^2 = 0.917$) but was not significantly different after the posterior glide compared to before the glide ($p = 0.315$). Moderate to good intra-rater reliability was found for posterior capsule and infraspinatus SWS and humeral position at rest and during sustained mobilization (0.74-0.90).

Conclusion / Significance:

Humeral displacement and posterior capsule stiffness are fairly correlated during sustained posterior glide mobilization. The findings of this study may have future clinical implications for developing optimal intervention strategies for various shoulder dysfunction.

Abstract - ID: 43

Authors: Meghan Schoenberger, Kessler Rehabilitation Center; Richard Hubler, Seton Hall University

Title: Imaging referral for a 16-year-old female dancer with left knee pain seen direct access: a case report

Background / Purpose:

The promotion of Direct Access (DA) and growth of autonomy in physical therapy (PT) practice requires clinicians to appropriately triage patients. Stress fractures (SF) are a source of lower extremity (LE) pain that represent 10% of sports injuries. This overuse injury can happen with repetitive load or inadequate rest time, occurring more commonly in women than men. Relevant risk factors of SF include increased workload, frequent competitions in the same day, growth and development, and previous injury. The following objective criteria can assist in differential diagnosis: worsening focal bone pain, focal and/or distant percussion pain, tuning fork, hop test, and fulcrum tests. Ultrasound has also been researched as a diagnostic tool for determining SF with 81.8% sensitivity. These criteria may be utilized to assist the clinician in determining the need for an imaging referral. The purpose of this case study is to examine the risk factors and objective tests that led to a referral by the physical therapist for imaging.

Case Description:

A 16-year-old female competitive dancer, presented to PT as DA, with complaints of worsening left knee pain over the last year. She described a burning, radiating pain from fibular head to lateral malleolus, as well as her LE feeling dead and heavy with jumping, landing, dancing and prolonged standing. Upon evaluation, patient (pt) had reproduction of lateral malleolar pain with fibular head mobilization and vice versa. Noted wincing and withdrawal with palpation to fibular shaft. Single-leg (SL) stance and SL squat reproduced symptoms. Findings were discussed with pt and parent and imaging was recommended. Pt parent referred and requested follow up with an orthopaedic physician (OP). Pt followed up with OP 3 weeks later, imaging was not performed and she was referred back to PT. Re-evaluation was performed 4 weeks after initial evaluation without change in symptoms. After 2 visits of PT, pt experienced bruising and worsening of symptoms. Continuous ultrasound was performed at 1.5 MHz for 30 seconds to fibular head with notable pain reported. Pt was referred by physical therapist for x-rays. Lateral and AP views obtained "Probable reaction of the distal fibular diaphysis." Communication with radiologist, OP, and parent continued over the next several weeks. The pt and parent were educated on adequate rest, activity modification, and nutritional choices to promote healing and reduce injury risk.

Outcomes:

The pt presentation led to referral for x-ray. Imaging showed a "subtle periosteal reaction along the anterior distal fibular diaphysis." The pt was referred back to OP and restricted activity for 4 weeks. After no change in symptoms, MRI was performed revealing a Grade 1 bone stress injury. The pt was instructed to cease all dance activities and placed on active rest for another 4 weeks.

Discussion / Conclusion:

This case demonstrates the clinical decision making and autonomy of a physical therapist in determining the need for imaging referral. While this pt may not have been appropriate for manual therapy and exercise at this time, education was provided to promote recovery and reduce injury risk. The pt and parent were educated in the benefits of appropriate nutrition, activity modification, and the injury risks of overtraining. She was also provided with a comprehensive home exercise program to address impairments found in the hip and ankle to be performed once cleared for return to sport. Previous literature is limited in determining a diagnostic criteria for imaging referral for SF. While an x-ray is not the gold standard imaging for SF, the duration of the pt symptoms, convenience, and cost of image led the clinician to

choose this imaging. Future research should be conducted to determine a test item cluster for identification of stress fractures.

Abstract - ID: 44

Authors: John Hagan, Good Shepherd Penn Partners; Amy Hammerich, Regis University

Title: Spinal manipulation combined with joint position sense training in a patient with chronic neck pain, headaches, upper limb pain, and post-concussive syndrome-a case report

Background / Purpose:

The incidence of cervicogenic headache (CH) has been reported as high as 53% in patients with headache after a whiplash injury. There is level I evidence that the use of spinal manipulative therapy has been shown to be effective in the management of adults with CH. Level I evidence also supports the use of both upper cervical and upper thoracic spine manipulation in individuals with CH that have a positive cervical flexion rotation test (CFRT). This case report describes a multi-modal approach of manual therapy, neurodynamic exercise and proprioceptive exercise in the successful management of a patient with CH after sustaining a whiplash injury.

Case Description:

Patient was a 20 y.o. female university student involved in a MVA 5 months prior to her initial evaluation. After the MVA, the patient had imaging that was unremarkable and was given a medical diagnosis of post-concussive syndrome. The patient received a prior course of PT and OT, including general upper body strengthening, modalities, massage, and vestibular and ocular exercise. This course of rehab led to improvements in vestibular and ocular deficits, but only modest improvement in neck and arm symptoms, with no effect on headache frequency or intensity. Upon examination, the patient had impairments in cervical mobility, positive CFRT, positive upper limb tension test (ULTTa), impairments in joint position error test (JPET) and deep neck flexor endurance test (DNFET). Based on +CFRT and unilateral headache consistent with CH, spinal manipulation was delivered to the upper cervical and upper thoracic spine for the first 3 sessions. Therapeutic exercise was also prescribed to address impairments in upper limb neurodynamics, deep neck flexor training, and joint position sense training of the cervical spine, with corresponding home management.

Outcomes:

Patient was seen for 7 visits over 6 weeks. Initial neck disability index (NDI) was 20 and NDI at discharge was 0. Initial NPRS was 4/10 and 0/10 at discharge. At discharge, the patient demonstrated full pain-free ROM of c-spine, (-) ULTTa, (-) CFRT, normalization of DFET, CCFT, and JPE test. After her third follow-up, patient was headache free and remained so for the remainder of care. The patient was able to maintain all improvements at 3-month follow-up.

Discussion / Conclusion:

Vestibular and ocular exercise combined with modalities and general strength training was not sufficient in returning this patient back to her premorbid level of function after sustaining a whiplash injury. Implementing manual therapy, neurodynamic exercise and proprioceptive training to the cervical spine appeared to make a rapid and dramatic impact on this patient's outcome. This case report serves as an example of the importance of performing a thorough examination of the cervical spine in the management of individuals with CH after a whiplash injury.

Abstract - ID: 45

Authors: John Hagan, Good Shepherd Penn Partners; Cameron MacDonald, Regis University; Stephanie Albin, Regis University

Title: Integration of pain neuroscience education and manual therapy for the management of chronic great toe pain and dysfunction – a case study

Background / Purpose:

Chronic pain limits function of 20% of the population. Traditional medical management centers on patho-anatomic and biomechanical explanations for pain and disability which can increase patients' fear and negatively influence outcomes. Pain neuroscience education (PNE) has been shown to be effective in decreasing fear, improving attitude toward pain, pain cognition, physical performance, and pressure pain thresholds. Graded Motor Imagery (GMI) has been shown to be an effective means of managing chronic pain. Limited evidence exists for the combination of manual therapy and PNE to treat chronic pain conditions. This case study describes the successful implementation of PNE, GMI and manual therapy in the management of chronic toe pain that failed to improve with more traditional conservative and surgical approaches.

Case Description:

33 y/o female presented with a 3-year history of right-sided great toe and foot pain that failed to improve with 2 previous episodes of PT management. Prior interventions focused on patho-anatomic impairments. A peroneal nerve ablation procedure had been completed based on abnormal EMG findings. Six different physicians had provided six differing patho-anatomic diagnoses. Examination noted no significant ankle and foot mobility, nor strength deficits, however pain and apprehension was present in toe movements. Impairments in 2-point discrimination and localization were present below 80% accuracy. R great toe and foot allodynia and hyperalgesia was present. Functionally unable to wear shoes with narrow toe box, perform toe-off phase of gait and participate in normal activities. Central sensitization was identified. PNE was commenced with education in the 3 stages of GMI. Localization exercises were performed on the dorsum of R great toe and 2-point discrimination exercises given. Manual therapy was provided to address pain in the great toe through manipulation of the ankle and mid-foot and mobilization with movement of the great toe allowed her to perform functional exercises without pain.

Outcomes:

After 6 visits over 8 weeks, NPRS reduced from 7/10 to 1/10, and pressure-pain thresholds increased by >50%. The patient completed all 3 stages of GMI and also demonstrated >90% accuracy of 2-point discrimination and localization. LEFS improved from 55 at IE to 68. The patient was able to wear all her shoes without increase in pain, demonstrate a normal gait pattern, and returned to all of her recreational activities.

Discussion / Conclusion:

For this patient, a traditional approach to treating pain with both a patho-anatomic and biomechanical emphasis was shown to make little improvement in pain and function. The implementation of an integrated approach including PNE, GMI, and manual therapy showed an association with improvement on this patient's pain and function. To effectively manage individuals with chronic pain with signs of central sensitization, PNE may play a vital role along with manual therapy and exercise.

Abstract - ID: 46

Authors: Kasey Hogan, Memorial Hermann; Alexis Lugo, Memorial Hermann; Dustin Bessire, Memorial Hermann; Gina Herrera, Memorial Hermann; Caitlyn Lang, Memorial Hermann; Dexter Upton, Memorial Hermann; Lane Bailey, Memorial Hermann; Nikki Shelton, Memorial Hermann; Sean Harris, Memorial Hermann; Toni Roddey, Texas Woman's University

Title: Is there a difference in the ability to perform a side plank in subjects with back pain versus subjects with back and concordant leg pain with neural provocation testing?

Background / Purpose:

Low back pain (LBP) is a highly prevalent and disabling condition in the US commonly managed by physical therapists. Often trunk muscle endurance is tested in people with LBP. Several studies have examined these tests (i.e. front planks and Biering-Sorenson test); however, few have studied the side plank (SP), a physical performance test used in the clinic. Research fails to account for the floor effect of SP testing for those unable to perform a SP. This study examines the relationship between subjects with LBP and subjects with LBP and leg pain (LBP+LP) in their ability to perform a SP. Subjects were defined as having leg pain if they had positive neural provocation testing. Our hypothesis was that there would be a difference between subjects' ability to perform a SP for those with LBP and LBP+LP.

Methods:

This study was a retrospective cohort study completed at two PT clinics in Houston, TX. Institutionally approved consent was obtained for all subjects seen by PT both pre-operatively and conservatively. Subjects were categorized in the LBP+LP group if they presented with positive neural provocation tests (Slump, Femoral Nerve, and/or Straight Leg Raise) that reproduced their leg pain. Subjects attempted a standard SP, and if unable for any reason, the modified version from knees bent was attempted. Subjects were instructed to hold until fatigue, until pain rose more than 2 points on the Numeric Pain Rating Scale or if more than 2 cues were given for form. A variable of "0", "1", or "2" for each side was given based on subjects' ability to hold the testing position for at least one second. A "2" denoted the ability to perform the standard SP, a "1" for the modified version, and a "0" if the subject was unable to complete any form of the SP because of their chief complaint. A Mann-Whitney U test, alpha set at 0.05, was used to compare the total score of the SPs between groups.

Results:

There were 211 subjects: 52 for LBP and 159 for LBP+LP. A significant difference was found (p -value < 0.0005) in SP scores between those with LBP and those with LBP+LP in the ability to perform SP testing, with the score medians for right and left side respectively 2 ± 0.606 , 2 ± 0.674 for the LBP group and 1 ± 0.762 , 1 ± 0.767 the LBP+LP group.

Discussion / Conclusion:

This study addressed the floor effect related to those persons with LBP and LBP+LP that are unable to perform the SP test. Differences were found between groups. Those with LBP+LP demonstrated inferior abilities with this test. Further research is needed to examine the differences in subjects with LBP and LBP+LP.

Abstract - ID: 47

Authors: Kathleen Shaughnessy, Memorial Hermann; Alyson Beck, Memorial Hermann Hospital System; Jaron Perry, Memorial Hermann; Dustin Bessire, Memorial Hermann; Gina Herrera, Memorial Hermann; Caitlyn Lang, Memorial Hermann; Dexter Upton, Memorial Hermann; Nikki Shelton, Memorial Hermann; Sean Harris, Memorial Hermann; Toni Roddey, Texas Woman's University

Title: What's plank got to do with it: side plank symmetry in pre-operative vs. non-operative subjects with low back pain and leg pain (retrospective cohort study)?

Background / Purpose:

There are few well-validated and widely performed physical performance tests (PPT) for persons with low back pain (LBP). Prone planks and Sorenson tests, while valid and reliable, don't allow for assessment of asymmetries in lateral trunk muscles. It's possible the presence of unilateral leg pain, in individuals with LBP, results in asymmetries better identified by PPT such as side planks (SP). Current research investigating differences in pre-operative and non-operative subjects with low back and leg pain (LBP+LP) is limited. However, research in other body regions suggests that the presence of asymmetries increases injury risk. We hypothesize individuals intending to undergo surgical intervention for LBP+LP would demonstrate greater asymmetries in SPs. The purpose of this study is to investigate whether a difference exists in SP symmetry between pre-operative and non-operative groups in a retrospective cohort study of persons with LBP+LP.

Methods:

Subjects were referred to outpatient physical therapy, within a hospital-based rehabilitation system, from August 2017 to December 2018. The referring physician determined group assignment based on recommendation for surgery or conservative care. Leg pain was defined as self-reported pain, originating from the subject's back, traveling down the leg(s), and reproduced with a neurodynamic examination (slump, straight leg raise, or femoral nerve tension test). Subjects attempted SPs from their feet or knees for time. SP order and time between trials was not standardized. A symmetry variable was used to evaluate SP performance (absolute value of the difference in SP time performed on each side). Differences between groups for descriptive and SP data were evaluated using independent t-tests, alpha set at 0.05.

Results:

Data was collected on 211 subjects; 63 were eliminated due to incomplete data sets, with 148 (55 pre-operative, 93 non-operative) remaining. Between-group descriptive data was analyzed; baseline differences were found with Modified Oswestry Disability Index (MODI) scores, LBP at best, constant pain, and pain below the knee ($p < 0.0005$, 0.002, 0.001, and < 0.0005 respectively). The pre-operative group scored lower on the MODI and higher on the other categories. There was no difference in SP symmetry between pre-operative and non-operative groups, with $p = 0.072$ (7.2 seconds \pm 9.7 and 10.4 \pm 11.2 respectively).

Discussion / Conclusion:

Our hypothesis was not supported. While more symmetrical, the pre-operative group had lower overall plank times and more subjects who couldn't perform a SP (18/56 pre-operative vs. 8/96 non-operative) indicating a floor effect. Subjective questions (pain at best, constant pain, pain below knee) and the MODI were better at revealing differences between groups, and should be utilized in clinical examinations.

Abstract - ID: 50

Authors: Gary Kearns, Texas Tech University Health Sciences Center; Jillian Bason, Physical Therapy Associates; Michael Lucido, Baylor Scott & White Institute for Rehabilitation

Title: Novel use of Hoffman's reflex to identify early presenting cervical myelopathy in a patient with a medical diagnosis of lumbar radiculopathy: a retrospective case report

Background / Purpose:

Cervical spondylotic myelopathy (CSM) presents with variable neurological findings including neuropathic pain, extremity paresthesia or numbness, ataxic gait, lower extremity spasticity, proprioception loss, fine motor deficits in the hands, and bowel and bladder dysfunction. With no gold standard assessment for screening CSM it has been advocated to cluster abnormal neurological findings such as hyperreflexia of deep tendon reflexes (DTRs), Clonus, Inverted Supinator Reflex, Babinski sign and Hoffman's reflex, in order to improve diagnostic accuracy. As a stand-alone finding, Hoffman's Reflex is more specific than sensitive, but not pathognomonic. The purpose of this retrospective case report is to describe a novel application of Hoffman's Reflex performed in sustained, full cervical extension to sensitize the assessment and aid in clinical decision making in the presence of early presenting CSM.

Case Description:

A 66-year-old male with a diagnosis of lumbar radiculopathy presented with chronic lumbar pain secondary to degenerative lumbar spondylolisthesis with 1 year of worsening radiating right leg pain during standing, walking and looking overhead. Patient denied weakness, incoordination, difficulty walking or bowel/bladder changes. The patient presented with painfully impaired lumbar mobility, strength, stability and posture. Lumbar assessment did not affect the right lower extremity symptoms. Cervical extension range of motion reproduced the right lower extremity symptoms. Neurologic screening of upper and lower extremities revealed normal C4-T1 and L1-S1 myotomes, dermatomes and DTRs. Hoffman's Reflex was present bilaterally with minor flexion of index finger and thumb. When performed in sustained cervical extension, pronounced index finger and thumb flexion with the additional of wrist extension was noted. Impairment-based lumbar spine treatment was initiated with notification to the referring physician regarding provocation of symptoms with cervical extension and Hoffman's Reflex. Before cervical imaging the patient received 6 visits with improved subjective reports of lumbar pain and right lower extremity symptoms. On visit 7 patient presented with sudden worsening of symptoms with numbness, incoordination and weakness in bilateral upper extremities. Reassessment revealed hyperreflexia of right upper extremity deep tendon reflexes, bilateral grip weakness, right bicep weakness and a more pronounced Hoffman's Reflex when performed in sustained cervical extension. An immediate referral to neurosurgeon was initiated.

Outcomes:

Cervical spine magnetic resonance imaging demonstrated severe narrowing of thecal sac, compression and concurrent atrophy of the spinal cord. The patient underwent C4-5 laminoplasty, right C5 foraminotomy, complete C3 laminectomy, and partial C6 laminectomy by neurosurgeon.

Discussion / Conclusion:

With no gold standard to identify CSM, utilizing a sensitizing position for Hoffman's Reflex may result in a more timely referral for imaging and diagnosis before deterioration of neurologic status. Future research may focus on performing the Hoffman's Reflex in a position of sustained cervical extension as a means to screen early presenting of CSM when there is lack of objective findings.

Abstract - ID: 51

Authors: Brad Profitt, Marshall University

Title: Cervical spine diagnoses that may be commonly missed: clinical presentation and screening procedures for bow hunter's syndrome & alteration of motion segment integrity

Background / Purpose:

The purpose of this session is provide detailed insight into a couple cervical spine diagnoses that could have serious implications if not properly identified by the manual therapist. This session will explore two case studies of cervical diagnoses (Bow Hunter's syndrome and alteration of motion segment integrity) to highlight the importance of a detailed clinical history, thorough examination, solid clinical reasoning, and utilization of imaging to ensure accuracy of the diagnosis. These 2 patient cases provide insight into the need for properly triaging and managing patients with sinister pathologies to avert adverse outcomes in a manual therapy setting. The current evidence for both diagnoses and the individual patient cases will be presented during this session. The flow of patient triage and management, including request for imaging, will be discussed during the session. This session will promote the enhanced knowledge and understanding of the manual therapist who seeks to take on the role of a primary care musculoskeletal provider. This session will also speak to the value added to patient care when autonomy of practice allows all primary care musculoskeletal practitioners the right and privilege to order imaging. This type of true direct access will improve and enhance patient safety during care and help guide future treatment. Lastly, this session will demonstrate how the evaluating manual musculoskeletal practitioner has the best advantage to diagnose sinister pathologies and recommend the most accurate form of imaging based on their clinical examination findings when matched with the history and mechanism of injury.

Case Description:

Bow Hunter's syndrome (vertebral artery rotational occlusion, ICD 10-I65.09)-Case report 1: A patient presented to an outpatient physical therapy clinic with neck pain and dizziness. The evaluating provider requested imaging in the form of Computed Tomography Angiogram (CTA) with the patient in cervical rotation. This request was made secondary to the history and clinical exam. These findings will be discussed in detail during the session; however, a brief snapshot of the findings to be described now, as follows: there was fibrous entrapment of the vertebral artery at the atlantoccipital membrane that occurred only during cervical rotation. This lead to a diagnosis of a condition called Bow Hunter's Syndrome (ICD 10, I165.09). This condition is a rotational occlusion of the vertebral artery leading to dizziness during cervical rotation. There are some published case reports in the neurovascular surgery literature, and to this presenter's knowledge, none in the manual therapy literature regarding this condition. This serious and sinister pathology has very similar findings to other non-threatening pathologies, such as BPPV and cervicogenic dizziness. A detailed chart of these findings and their overlap of symptoms will be provided during the session. Alteration of motion segment integrity (spinal instability, ICD 10-M53.2X2)-Case report 2: A patient presented to outpatient physical therapy clinic with neck pain. The patient was 1-year post trauma and had been treated with several sessions of physical therapy during that 1-year period. The most recent treating PT requested the patient be consulted by the presenter, to render an opinion, the presenter serves as an advanced trained musculoskeletal provider within that clinic. Based on the history (duration and mechanism of injury) and examination, there was a request for cervical end range flexion/extension radiographs. The radiologist findings included, mild anterolisthesis of C4 on C5 in flexion. The radiologist recommended a follow-up MRI. The MRI was read as normal. Given the fact that the MRI is static and not at an end range loaded position, this finding was not unexpected. Additional work up on the radiographs was requested by the therapist.

Outcomes:

Bow Hunter's Syndrome (Case 1): Imaging was required to arrive at the final diagnosis in this patient's case. Moreover the special request for rotation during the CTA was required to reveal the vascular compromise. In a manual therapy setting, there could have been a serious adverse outcome if this diagnosis had not been found with a complete history, examination, and use of imaging. Manual therapy was contra-indicated in this patient case and had manipulation be rendered than the outcome would have potentially been catastrophic. The patient opted not to undergo surgical interventions and is currently managing symptoms with avoidance of end range cervical motions and therefore avert symptom onset. Alteration of Motion Segment Integrity (Case 2): Beyond the imaging reports there was a perception of increased segmental motion (hypermobility) upon palpation during clinical examination, and thus the radiographs were then sent for radiographic digitization analysis. Findings included alteration of motion segment integrity (ICD 10 M53.2X2) at the C4/C5 level as defined by the American Medical Association's Guide to the Evaluation of Permanent Impairment. This finding of spinal instability is contraindicated for manual therapy, and thus the imaging helped to direct care along the safest pathway. The patient was then able to receive the correct form of treatment that improved their daily function, and ultimately lead to an improved quality of life.

Discussion / Conclusion:

In Case 1 the patient had a vascular compromise that would not have been improved with conservative manual therapy and in fact was contraindicated for it. This case reveals the reality that often many conditions can have similar presentations. Some of these conditions are sinister in nature and require a higher level of clinical reasoning in order to flush out the diagnosis. In this particular case the result of treating the neck could have produced disastrous results for both the patient and the therapist. Manual therapists must practice at the highest level possible to ensure patient safety. In Case 2 the patient was in a chronic state of pain that had yet to be diagnosed and was leading to frustration for the patient as there had been no pain generator identified. The patient's quality of life was being negatively impacted by the condition due to the duration of suffering without a diagnosis. Applying sound clinical reasoning and allowing the physical examination findings to direct imaging recommendations produced the much needed diagnosis for the patient and ensured appropriate future care for the patient. Based on the two case reports presented it is paramount for the manual therapist to be astute at listening to the patient history, performing a thorough examination and when necessary going beyond the standard request for imaging. In both of these cases the final diagnosis would have failed to be yielded from standard imaging alone. Both patients were able to receive accurate diagnosis and thus receive the appropriate direction of future care. This provided both patients a great sense of relief as they had finally been given the correct diagnosis and could move forward with certainty and proper care.

Abstract - ID: 52

Authors: Josh Fede, Holy Cross Hospital Orthopedic Institute

Title: Multimodal management of chronic rotator cuff tendinopathy and kinesiophobia

Background / Purpose:

Rotator cuff tendinopathy can cause pain, disability, and fear-avoidance behaviors during functional and recreational activities. Modalities such as the biopsychosocial approach, pain neuroscience education, and tendon-specific loading principles in management of tendinopathy have shown success when assessed individually. Current research has emphasized increased patient education in neurophysiology for the treatment of pain and patient perception. The tendinopathy continuum model has recently changed the way we approach tendon-loading principles in symptom modification through cortical inhibition. The purpose of this case report is to describe the multimodal management of a patient with chronic rotator cuff tendinopathy and kinesiophobia based on recent evidence.

Case Description:

A 57-year-old female presented to physical therapy with complaints of right shoulder pain as a result of performing her recreational exercise. Since the onset of injury, she reported pain increased with activity and everyday movement. Diagnostic imaging confirmed a partial-thickness tear of the supraspinatus and tendinopathy of the infraspinatus and subscapularis. The confirmed pathological diagnosis along with her primary symptoms led to her becoming apprehensive with provocative movements out of fear of further injury. The patient was managed by providing pain neuroscience education to the patient about the tissue injury, perception of her disability and central nervous system processing of her pain. Exercise was prescribed initially for symptom modification via cortical inhibition with long duration isometrics, and weight bearing to promote limb confidence. Once symptoms were better controlled, a combination of heavy-slow resistance and eccentric exercises were prescribed in preparation for energy storage activities such as plyometrics. Once the subject met performance-based criteria, she was progressed to activity-specific exercises and tasks.

Outcomes:

The patient was treated for 9 sessions over a 12-week time period. This patient achieved all functional goals of returning to her recreational exercise pain-free and the minimal clinically important difference was reached in all outcome measures assessed. *Disabilities of the Arm, Shoulder, and Hand*, *Tampa Scale of Kinesiophobia-11*, and *Closed Kinetic Chain Upper Extremity Test* showed improvements in perception of function, perception of injury, and functional ability. The subject was pain-free at 3-month, 6-month, 9-month, and 12-month follow-ups.

Discussion / Conclusion:

This case highlighted the successful management of rotator cuff tendinopathy with combining the biopsychosocial model and tendon-loading principles based on the tendinopathy continuum model. A plan of care was developed that emphasized education and reinforcement of the patient's perception of diagnosis, conservative treatment, and fear of movement with a closely monitored progressive load management program. The subject showed objective improvements in self perceived disability, fear of movement, and function.

Abstract - ID: 53

Authors: Ty Schmidt, Regis University; Cameron MacDonald, Regis University; Bryan Dennison, Regis University

Title: Utilization of two stage whole neural path management for suspected common peroneal nerve neuropraxia in a female athlete: a case report

Background / Purpose:

Peroneal nerve compromise can result from mechanical stress. Proximity of the common peroneal nerve to the fibular head leaves the nerve susceptible to injury. Treatment has traditionally consisted of localized treatments. Response to neurodynamic treatment for localized inflammation directed at the neuroinflammatory/neuroimmune cascade proximally and distally to the area of lesion has been reported. This case describes the treatment of a female athlete using manual therapy, neurodynamics, taping, and exercise.

Case Description:

A 13-year-old female athlete presented two weeks after onset, with worsening left lower extremity (LLE) pain and paresthesia in relation to multiple sport participation. A rest week reduced her symptom intensity but she had return of symptoms with physical activity. Also reported aggravation of pre-existing ipsilateral low back symptoms in conjunction to the LLE pain. Examination noted moderate valgus knee posture, significant weakness in dorsiflexion and eversion (3-/5) and moderate hip abduction weakness (4/5). Neurodynamic testing identified pain and paresthesia reproduction at 35 degrees ipsilateral straight leg raise with peroneal nerve bias. Sensitivity to palpation of the gastrocnemius and soleus on the left. Side lying gapping position reproduced LLE paresthesia. A non-dermatomal pattern of pain and paresthesia was present including common, deep, and superficial peroneal sensory distributions. Excessive proximal tibiofibular mobility was present. Initial lower extremity functional score (LEFS) was 26/80. Management consisted of two intervention periods. Visits 1-4 included dry needling (gastrocnemius, soleus and anterior tibialis), neurodynamic sliding interventions with a peroneal nerve bias, lumbar gapping manipulation targeted to L4-5, and mobilization with movement for the distal fibula (posteriorly) with subsequent taping was included. Hip abduction and extension strengthening and home management program consisting of standing self-dorsiflexion mobilization was prescribed. Visits 5-9 included talocrural and subtalar mobilization/manipulation, closed chain LLE strengthening and motor control exercises for LLE alignment and a progressive plyometric program.

Outcomes:

After four visits the patient's LLE straight leg raise was 70 degrees with no impairments in LLE strength. LLE paresthesia and pain were absent with LEFS score 66/80. After nine visits she demonstrated an equal triple hop distance bilaterally with normalized loading mechanics and hip/knee alignment. She returned to pain free sport participation with a LEFS score of 78/80.

Discussion / Conclusion:

This case describes a positive outcome for a suspected common peroneal neuropraxia utilizing a regional neurodynamic and manual therapy approach. Features of the common peroneal nerve included sensory distribution and weakness in eversion and dorsiflexion. Differential diagnostic testing of inversion and proximally innervated musculature aided in determining a likely peripheral versus isolated nerve root lesion presentation. Evolving research on neurodynamic treatment gives potential for improvements not only at the sight of suspected lesion, but also throughout the nerve path. Lower extremity loading mechanics should also be considered for injury involving a lack of specific trauma.

Abstract - ID: 54

Authors: Steven Kinney, Regis University; Cameron MacDonald, Regis University; Bryan Dennison, Regis University

Title: Utilizing manual therapy and running activities in the management of an individual with knee osteoarthritis, obesity, and a sedentary lifestyle: a case report

Background / Purpose:

Manual therapy and exercise can be invaluable components of physical therapy management. This includes the management of functional impairments in individuals with osteoarthritis. Running activities can be selectively included as an effective exercise intervention. These interventions also affect overall health, fitness, and well-being. Even in the presence of comorbidities and degenerative disease processes, management can aim to restore function and enhance health, wellness, and functional abilities beyond baseline levels. This case illustrates the use of manual therapy and running activities in the management of impairments with knee osteoarthritis in an individual with obesity and a sedentary lifestyle.

Case Description:

A 62-year-old woman presented with acute left knee pain, along with radiographs revealing knee osteoarthritis. There was noted obesity and report of a relatively sedentary lifestyle. The patient also reported that many years prior she enjoyed working out, particularly running. Examination: Left knee pain was 3/10 at rest and 9/10 with activity. Left knee range of motion (ROM) was 5-95 degrees. Left knee flexion and extension manual muscle test was 3-/5. Tandem balance with left leg back was 6 seconds. International Knee Documentation Committee Subjective Knee Evaluation Form (IKDC) score was 44.8. Management included initial manual therapy and progressive therapeutic exercises. Joint mobilizations addressing tibiofemoral, patellar, and talocrural hypomobility were utilized in the first four of seven sessions. Manual therapy was not utilized in the final three sessions. Progressive ROM, balance, and motor control activities of the lower extremity were performed. Squatting, modified lunges, core stability, safe fall landing, and running activities were utilized with increasing frequency in later sessions. The patient progressed running through 20, 40, 80, and 120 meter intervals. Cues during running and pre-running activities were given for scapular retraction to increase core activation.

Outcomes:

Significant gains on the IKDC to 75.9 were observed. Pain level decreased to 0/10 with all activity. Despite not having run in many years and radiographic evidence of knee osteoarthritis, the patient was able to run pain free at the conclusion of therapy.

Discussion / Conclusion:

This case illustrates the role of the physical therapist promoting physical activity. Manual therapy could be a valuable starting point to gradually progress tolerance to activity levels to meet minimum standards and even surpass them. Physical therapists through aggressive and progressive loading, including running activities, can promote physical activity and challenge perceived barriers to movement.

Abstract - ID: 55

Authors: Frank Tudini, Campbell University; Bradley Myers, Campbell University; Richard Bohannon, Campbell University

Title: Reliability and validity of measurements of cervical retraction strength with a hand-held dynamometer

Background / Purpose:

Impaired neck muscle strength is related to neck pain, abnormal posture, and various cervical pathologies. While sophisticated devices to objectively measure neck strength exist, many are not practical in typical orthopedic practices or have questionable validity and reliability. The purpose of this study was to describe the reliability and validity of measurements of isometric cervical retraction strength obtained in a clinically viable and easily administered fashion with a hand-held dynamometer (HHD) from healthy adults.

Methods:

Forty participants (10 men and 10 women between 22 – 30 years of age and 10 men and 10 women 60 years of age and older) were included in the analysis of neck strength using isometric testing with an HHD fixed in a cradle on a table top. The highest neck retraction force recorded in Newtons (N) for each participant, was used for data analysis. Testing was performed by 2 examiners, who were blinded to the results, during the first session for inter-tester reliability and again 1 week later by examiner 1 for test-retest reliability. Relative intertester and test-retest reliability were determined using intraclass correlation coefficients (ICCs) (model 3,1). Absolute reliability was described using the minimal detectable change ($MDC_{95\%}$). Known groups validity was determined using a 2 (gender) x 2 (age group) general linear model analysis.

Results:

Both intertester and test-retest reliability were excellent as judged by ICCs (.885 - .968 and .974-.991, respectively). Absolute intertester reliability, as indicated by MDC, ranged between 21.1 – 39.1 N while absolute test-retest reliability ranged from 22.2 – 47.6 N. Validity was confirmed on the basis of expected gender and age differences (i.e., men were stronger than women and younger participants were stronger than older participants).

Discussion / Conclusion:

As decreased neck muscle strength is present among individuals with neck pain and improvements in neck strength are accompanied by reduced pain and disability, it is important to have reliable and valid measures of neck strength. Use of a fixed HHD, as described in this study can be used to obtain reliable and valid measures of isometric neck retraction strength in ostensibly healthy adults. A follow-up study to research its value in the assessment of individuals with neck pathology is pending.

Abstract - ID: 56**Authors:** Jeff Yaver, University of Florida Health**Title:** The validity of patient reported outcome measures in patients with low health literacy**Background / Purpose:**

Patient reported outcome measures (PROMs) are commonly used in by third party payers, research and clinical settings to assess the status of a patient or the value of an intervention. These measures are used to compare the score before the initiation of an intervention to how the patient scores themselves after the completion of the intervention. While many of the tests have undergone a battery of psychometric tests, the ability for the patient to read, comprehend and respond appropriately (readability) is harder to assess. The scope of the problem is such there were not any spine related PROMs that had been validated for patients who had low literacy. In the UK and U.S.A., 22% of the population read at a level of a 10 -year-old or at a 5th grade level, and the health literacy competency of 89 million Americans is less than basic. The AMA recommends that patient information be at or below the 6th grade level while the NIH suggests that the reading level be at or below the 8th grade. If patients do not understand or respond appropriately, the reliability and validity of PROMs will be adversely affected. This has the potential leading to erroneous conclusions about the relative success or failure of an intervention. The purpose of this literature review was to assess how readability influences PROMs

Methods:

SOLAR, Google Scholar, PubMed, PTnow and Goggle Scholar were selected for a literature search. The inclusion criteria included English language articles that were published between 2000 – 2019, in scholarly (peer reviewed) journals. The searches of the data bases occurred from 3/9/2019 - 4/21/2019. The key words utilized were: health literacy, musculoskeletal and outcome measures. Articles of original research that studied the relationship of health literacy and patient reported outcome measures were accepted. Articles that reported on the effects health literacy had on medical care or on patient education materials were excluded.

Summary of Findings:

Of the literature reviewed, Perez et al, was the sole article that came to the conclusion that the level of readability PROMs was not an issue. Their findings were based on evaluating 86 PROMs using 19 different readability algorithms. Their conclusions were that 74% (64 out of 86) were assessed to be at 6th grade level or below and that 94% (81 out of 86) were found to be at or below the 8th grade level. The authors stated that equal weight was given to each of the 19 algorithms, however, the reliability of these assessments in the healthcare setting is unknown which may have affected their findings. Their findings conflicted with those found by other researchers. Adams et al, assessed 10 PROMs using two separate measures. They were Gunning's FOG Index (FOG) and the Simple Measure of Gobbledygook (SMOG). SMOG has been noted to be best suited for healthcare literature due to being validated for comprehension at 100% and is based on more modern criteria for ascertaining reading level. Their findings were that 6 out of the 10 PROMs fit the criteria for 10-14-year-old level, but none the PROMs were assessed below that level. They concluded, based on current literacy levels, that 22% of the population in the UK and in the USA would not be able to reliably complete the PROMs. El-Daly et al examined 59 PROMs using the Flesch Reading Ease Score (FRES). FRES is a validated tool that is commonly used in the analysis of medical information and is recognized by the US legal system to be used in testimony. They found that 12% of the PROMs could be grasped by the average adult in the UK or USA. 31% of the tests yielded scores that were appropriate for the University graduate. Burckhardt and Jones reported that the McGill Pain Questionnaire may not be appropriate for patient with diminished literacy abilities. The verbal descriptive scale (VDS) and visual analog scales (VAS) are commonly used for patients to rate their pain. For literate patients, both of the tests demonstrated excellent test-retest reliability coefficients of 0.90 and

0.93 respectively. This is in contrast to patients who were considered illiterate. Their excellent test-retest reliability coefficients were 0.82 (good) and 0.71 (acceptable). Alvey and Palmer also used the FRES and the Flesch – Kincaid (F-K) measures to compare the Foot Health Status Questionnaire (FHSQ) and the Manchester-Oxford Foot Questionnaire (MOXFQ) to determine which test is best suited following hallux valgus surgery. The MOXFQ, although a newer test, was shown to be easier read and comprehended compared to the FHSQ. Both of these tests have multiple questions in their format. The MOXFQ consists of questions and only 2 of these questions scored above the 6th grade level while the FHSQ had 13 of the 26 questions score above the 6th grade level. PROMs can be assessed to be at different readability levels depending on the formula used/ For example, DASH is measured using SMOG, its readability is at a 12-year-old level while using the FRE it would be assessed 18-22-year-old level. However, the validity of these, and all other measures used to assess PROMs is unknown.

Conclusion / Significance:

Considering that 22% of people in the UK and U.S.A. read at a level of a 10-year-old, and 89 million Americans' basic health literacy competency is less than basic, ensuring that the data collected accurately captures the patient's perception is crucial. The reliability of the VAS and the VDS varied based upon the patient's literacy level. One researcher found that PROMs did not have a readability issue, whilst the remainder of the researchers found few PROMs that were suitable for this patient population. The application of PROMs in research, clinical decision making and research must be judiciously applied so that the correct findings are rendered.

Abstract - ID: 57

Authors: Jenifer Dice, Texas Children's Hospital; Doug Dendy, Texas Tech University Health Sciences Center; Phillip Sizer, Texas Tech University Health Sciences Center; Chad Cook, Duke University Sara Feuling, Texas Children's Hospital; Jean-Michel Brismée, Texas Tech University Health Sciences Center

Title: Manual therapy in pediatrics: a Delphi investigation of united states physical therapists

Background / Purpose:

Sparse research is available regarding OMT effectiveness in managing children with musculoskeletal and neurological impairments. Therefore, the purposes of the study were (1) build consensus amongst physical therapists holding advanced credentials in pediatrics, neurodevelopmental treatment (PCS/NDT group) and manual therapy (FAAOMPT group) regarding the appropriate OMT techniques use in the pediatric population; and (2) identify barriers and factors, which contribute to therapists' decision to use OMT techniques.

Methods:

United States physical therapists with credentials including PCS, C/NDT and FAAOMPT were recruited for a three-round Delphi investigation. An initial electronic survey identified musculoskeletal and neurological impairments in addition to manual techniques considered most effective to treat musculoskeletal and neurological impairments. Responses from the first Round were used to create the second Round, during which respondents used a 4-point Likert scale to score each survey item. In the third Round, respondents again scored each item to establish consensus. In addition to descriptive statistics, composite scores were calculated for each manual technique by impairment. Analysis was completed between groups to identify differences in effective techniques by impairment in addition to factors and barriers influencing decisions.

Results:

Delphi Round 1 was emailed to 835 credentialed physical therapists. Round 1 included 42 FAAOMPT and 41 PCS/NDT respondents (10% response rate) with the final round including 16 FAAOMPT and 17 PCS/NDT respondents from 21 states. Consensus was obtained for using neuromuscular techniques and joint mobilizations (grades 1-4) to treat impairments including pain and stiffness. Visceral manipulation and craniosacral therapy were considered ineffective in treating all impairments. Dry needling, grade 5 manipulations and grade 3-4 mobilizations were considered ineffective in treating decreased motor control, hypotonia and spasticity. Grade 5 manipulations were recommended for joint pain and hypomobility by 87.5% of FAAOMPT group while 76.5% of the PCS/NDT group recommended grade 5 manipulations should never be used in children. The most significant barriers for using OMT techniques in pediatric population were lack of knowledge and fear (harming pediatric patients and litigation).

Discussion / Conclusion:

While the results demonstrated consensus regarding selected techniques, those with statistically significant differences in opinion between groups imply a strong treatment bias based on experience, training and/or knowledge. Our findings should serve as an initial step in creating manual therapy guidelines and developing education opportunities to enhance physical therapists' knowledge in treating children. Blending of education and treatment approaches is necessary to ensure pediatric patients with selected impairments are treated efficiently and not sub-optimally due to lack of knowledge or expertise

Abstract - ID: 58

Authors: Gregory Almeter, Andrews University

Title: Clinical management of cervical spinal cord hematoma and scar tissue post motor vehicle accident: a case study

Background / Purpose:

High-velocity motor vehicle accidents (MVAs) are common and create the possibility of serious and even life-threatening injury. Screening for these injuries is an important component of a thorough examination. The purpose of this case is to demonstrate an instance of delayed onset positive atlanto-axial instability tests, after original testing was shown to be negative.

Case Description:

A 39-year-old woman was referred to physical therapy (PT) for her head and neck injuries from an MVA. She was diagnosed with post-concussion syndrome, sub-arachnoid hemorrhage, and a lateral whiplash type injury. Her CT and MRI imaging showed no cervical abnormalities. On her first PT visit, she presented with significant pain and range of motion (ROM) limitations. Her initial Numerical Pain Rating Scale (NPRS) score was 7/10 at its worst. She was painful in all planes of cervical movements, both actively and passively. Although she reported no symptoms of cervical instability such as bilateral/quadrilateral paresthesia or fear of movement, cervical instability tests were performed. Included were the Sharp-Purser test for transverse ligament and bony stability of the dens, alar ligament test, apical ligament test, and tectorial membrane test. All ligament testing was negative for instability. Therefore, treatment was commenced after the initial evaluation which was approximately one month following the accident. The intervention included modalities, gentle manual distraction, and passive ROM exercises. Three weeks after initiating therapy, the patient complained of quadrilateral paresthesia which prompted further investigation. The Sharp-Purser test was then positive; therefore, the patient was referred back to the physician. Weeks later, her physicians established scaring of the dura at C₂ as the cause the altered testing results. In addition, further imaging showed the presence of a hematoma at the C₂ level which was not originally noted. PT was resumed and continued for another 6 weeks, including manual traction, mobilization to regain cervical and upper thoracic joint mobility, and dural flossing techniques.

Outcomes:

At discharge, she regained roughly 80% of normal cervical ROMs in all planes. Her NPRS score improved from 7/10 to 2/10, and she was able to perform most functional activities with minimal pain. The quadrilateral paresthesia gradually diminished and were no longer a problem with activities of daily living.

Discussion / Conclusion:

This case is important as it behooved clinicians to be aware of the limitations of manual testing techniques, and the need for ongoing evaluation is essential.

Abstract - ID: 59

Authors: Evan Petersen, University of the Incarnate Word; Stephanie Thurmond, University of the Incarnate Word; Sydney Buchanan, University of the Incarnate Word; Diana Chun, University of the Incarnate Word; Ashley Falls, University of the Incarnate Word; Lauren Nealon, University of the Incarnate Word

Title: The effect of real-time feedback on learning lumbar spine joint mobilization by entry-level doctor of physical therapy students: a randomized, controlled, crossover trial

Background / Purpose:

Central posterior to anterior lumbar spine joint mobilization is a skill taught in entry-level physical therapy education. However, no study has investigated the use of real-time, objective feedback using a direct force measurement device to determine if it improves learning of this essential skill. Therefore, the purpose of this study was to examine the effects of real-time, objective feedback on learning lumbar spine joint mobilization techniques by entry-level doctor of physical therapy students.

Methods:

Twenty-four students in their first year of physical therapy education were randomized into two groups. Group 1 practiced with the real-time feedback device first and then without it, while Group 2 practiced without the device first and then with it. Both practice periods with and without the device were 4 weeks long. A crossover design was used to allow subjects in each group to act as their own control and to minimize the carry-over learning effect. Data were collected at Baseline, 5 weeks, 11 weeks, and 16 weeks. The crossover period was 5 weeks long, during which neither group practiced with or without the device. Eight force variables were measured: R1 Force; R2 Force; Grade 3 and Grade 4 Mean Peak Force, Frequency, and Amplitude. Students were tested at each time period against a fellowship trained manual physical therapist, who acted as the reference standard.

Results:

When students practiced with the real-time feedback device, they more closely matched the expert for two outcomes: 1) the mean difference in R2 Force between student and expert was better with the device (38.0 ± 26.7 N) than without it (51.0 ± 38.5 N), $P = .013$, and 2) the mean difference in Grade 3 peak to peak amplitude force was also better with the device (8.9 ± 9.3 N) than without it (11.8 ± 11.0), $P = .026$. All other force variables improved when students practiced with the real-time feedback device, however, the differences between when they practiced without the device were not statistically significant.

Conclusion / Significance:

By leveraging technology to provide precise feedback during manual skill practice, student physical therapists may be able to more quickly replicate the precision of expert joint mobilization forces utilized in published manual physical therapy clinical trials. The hypothesis was that practicing with the real-time feedback device would result in students more closely matching an expert's forces when performing the central posterior to anterior lumbar spine mobilization technique. Real-time, objective feedback improved learning for some aspects of lumbar spine joint mobilization by entry-level physical therapy students. Real-time feedback devices that directly measure joint mobilization forces can potentially be used in the classroom setting to help students learn manual therapy skills.

Abstract - ID: 60

Authors: Piyush Madani, Henry Ford Health System; Cameron MacDonald, Regis University; Amy Hammerich, Regis University

Title: Regional manual interventions and progressive multi-modal management for a female patient with low back pain and osteoporosis

Background / Purpose:

Low back pain (LBP) management using treatment-based classification (TBC) and regional interdependence approach has been shown to generate improved patient outcomes. As many patients with low back pain present with impairments beyond the lumbar region, it is important that clinicians assess and address issues of regional interdependence for improved outcomes particularly when other comorbidities are present. The purpose of this case study is to demonstrate use of clinical decision making in management of an individual with LBP and osteoporosis using the updated TBC in a multimodal treatment approach

Case Description:

65-year-old woman presented with complaints of LBP radiating to her posterior hip and thigh for one month without injury or trauma. She had stable symptoms, low to moderate numeric pain rating score (NPRS) 3-6/10, and Modified Oswestry Disability Index (ODI) score 20% at the cut-off of low-moderate disability. She reported feeling better with sitting and bringing knees to chest. Walking and standing increased discomfort. Medication included 1000 mg cholecalciferol for osteoporosis. Pain and hypomobility were noted on L4-5. Active and passive motions did not centralize her symptoms. Posture included rounded shoulders and increased thoracic kyphosis. Range of motion, joint play, muscle weakness, and muscle length imbalances were noted at the right hip. Negative tests included straight leg raise and crossed straight leg raise, prone instability test, and no aberrant motions. Evaluation supported classification in the TBC movement control approach due to low to moderate pain and minimal/moderate disability with stable condition, a comorbidity of osteoporosis, and low psychosocial risk factors. Lumbar flexion exercises were commenced and progressed to extension and dynamic pelvic stability exercises. Multi-plane hip mobilizations were administered. Considering osteoporosis, non-thrust joint mobilization at L4-5 level were used starting with low grades progressing to higher grades. Prone cervical and thoracic extensions and hip strengthening were added. Pectoral stretches, lower trapezius strengthening exercises, and cervical ROM exercises were included based upon objective findings. Loaded rotation based exercises were avoided given her osteoporosis.

Outcomes:

By discharge, she reported significant back pain reduction to 1-3/10. There was complete resolution of leg pain. ODI score reduced to 10% (>MCID 6% point change), GROC was +5.

Conclusion / Significance:

This case demonstrates superior outcomes when lower back interventions are coupled with a regional interdependence approach including directed hip, cervical and thoracic manual therapy and exercise. This supports current literature emphasizing the interdependence of hip and spine related presentations and importance of cervical and thoracic intervention both with lumbar function and osteoporosis. This patient originally presented with directional preference but stable symptoms and lower disability fitting into TBC movement control and symptom modulation category. She was able to progress to functional optimization with minimal pain and disability and successfully discharged with self-management strategies.

Abstract - ID: 61

Authors: Gary Kearns, Texas Tech University Health Sciences Center; Jean-Michel Brismée, Texas Tech University Health Sciences Center; Troy Hooper, Texas Tech University Health Sciences Center; Brad Allen, Texas Tech University Health Sciences Center; Micah Lierly, Texas Tech University Health Sciences Center; Timothy Pendergrass, Texas Tech University Health Sciences Center; Deborah Edwards, Texas Tech University Health Sciences Center; Kerry Gilbert, Texas Tech University Health Sciences Center

Title: Influence of clinical experience on accuracy and safety of dry needling the obliquus capitus inferior in unembalmed cadavers

Background / Purpose:

Suboccipital myofascial trigger points are common in patients with headaches. Due to no investigations into how clinician experience influences accuracy and safety of dry needling techniques, the purpose of this investigation was to compare the influence of clinical experience on accuracy, safety and incidence of potential adverse events, and clinician opinion on needle placement of two techniques targeting the Obliquus Capitus Inferior (OCI) in unembalmed cadavers.

Methods:

Three physical therapists each inserted 3 needles per side, per technique, totaling 12 needle insertions per cadaver. Technique, side and order of each investigator was randomized for each cadaver. Investigators inserting needles were blinded to the Ultrasound Imaging (US) monitor. The insertion site for both techniques is equidistance between C2 spinous process and C1 transverse process. Each investigator inserted a 0.30 x 50 mm dry needle and advanced until the C2 posterior laminar arch was reached or the investigator had an estimated 5 mm of needle shaft remaining outside of the skin. A “yes” or “no” decision was made regarding whether the C2 posterior laminar arch was reached. A 10-second US video recording was taken of needle pistoning. Following data collection, a clinician trained in interpreting US images and blinded to the needling investigator’s experience level, viewed each video clip and recorded whether the needle reached the C2 posterior laminar arch. A three-way loglinear analysis was performed to develop a hierarchical loglinear model for associations between clinician experience level, technique, and accuracy. The model was selected using a backwards elimination stepwise procedure. Chi-square tests were performed to examine whether clinicians were able to determine trial accuracy.

Results:

Eight cadaveric specimens had a mean age of 80 and BMI of 25.1. Examiner experience affected needling accuracy. The expert clinician was more likely to be successful (68.3%) than experienced (50%) or novice (34.5%) examiners. The expert clinician was 4.06 and 2.15 times more likely to be accurate than the novice and experienced clinicians, respectively. The association between clinician accuracy and their opinion was significant ($p = .008$). Predictions were correct for the expert, experienced, and novice clinicians 86.6%, 67.0%, and 51.0%, respectively. The needle contacted the spinal cord for the expert, experienced and novice clinicians in 0%, 0%, and 2.4%, for the cranial-medial technique, respectively, and 2.4%, 4.8%, 2.4% for the caudal-medial technique.

Discussion / Conclusion:

No significant difference in accuracy between the two techniques to reach the OCI was found. Increased clinical experience with both techniques improved accuracy; however, experience did not eliminate potential adverse events as all investigators recorded at least one incident of striking or puncturing the spinal cord. Clinicians using dry needling may consider addressing more superficial symptomatic muscles or those with lower associated risks for potential adverse events before targeting the OCI in headache presentations.

Abstract - ID: 62

Authors: Mark Erickson, Florida Gulf Coast University; Sara North, University of Minnesota

Title: Master class pedagogy in orthopedic manual physical therapy education: evidence from the field

Background / Purpose:

The master class is a time-honored tradition in music pedagogy in which the instructor teaches in small groups with one student playing while the instructor and peers offer critique, and the “master” offers additional insight through discussion and demonstration. Case-based learning (CBL) improves knowledge, clinical reasoning, enthusiasm for learning, critical thinking and problem-solving, student collaboration, cultural sensitivity, understanding the multiple aspects of patient care, consideration of psychosocial, ethical, legal, and economic issues, and independence while promoting clinical application of material. Simulation experiences in health profession education typically include standardized patients, high fidelity mannequins, and mock clinics with students in the role of patient. The Master Class design has been adopted in entry-level physical therapy education and has resulted in enhanced learning. Benefits center on 1) creating a more realistic clinical learning environment in the classroom, 2) reinforcing concepts, 3) developing orthopedic examination and treatment skills especially pain science education, manual skills for joint mobilization including thrust manipulation, therapeutic exercise applications, cognitive-functional training, body awareness training, and 4) clinical reasoning, 5) building an effective team, and 6) enhancing student confidence. The purpose of this platform presentation is to introduce, describe the application of, and outcomes following an innovative instructional pedagogy, case-based Master Class clinical simulation, to physical therapy educators who teach orthopedic manual therapy.

Methods:

This study integrated the master class format with case-based learning and simulation in three orthopedic courses in an entry-level DPT program. For each case-based simulation, one student assumed the role of PT while the instructor assumed the role of the patient. The SPT performed patient management in front of 12 peers for approximately 45 minutes with multiple groups running simultaneously. Peer observers served as clinical instructors to provide feedback and offer consultation. Faculty continuously transitioned between the roles of instructor and patient to facilitate learning, and large group reflections followed master sessions to ensure consistency. Students, faculty and adjunct faculty serving as lab assistants were surveyed following the courses with an emphasis on measuring students’ perceptions of the simulation’s applicability to clinical practice, the impact of master class on student learning, the perceived effects of master class on preparedness for academic assessments and clinical performance, and impressions of the instructor feedback format.

Results:

Respondents (84/120; 70%) reported that master class case simulations with peer observation helped to integrate and apply relevant content, learn orthopedic examination and treatment, and practice diagnostic reasoning and effective communication strategies in an applied environment. The instructor in the role of patient was perceived as beneficial, and preparation was improved for both academic assessments and treatment on clinical internships. Qualitative feedback from instructors supported this novel format for increased student-faculty interaction, increased depth of student performance assessment, lower risk, and a more realistic clinical environment compared to traditional simulation experiences. The DPT students reported that master class case simulations with peer observation helped to integrate and apply relevant content (93%), learn orthopedic examination (90%), and learn orthopedic treatment (83%), with 90% of respondents reporting that the instructor in the role of patient was beneficial. The master class format specifically helped students to learn diagnostic reasoning (86%) and effective communication strategies (76%) in an applied environment. Student preparation was improved through master class

participation for both academic assessments (80%) and performance during clinical internships (86%). Additionally, 76% of respondents reported reduced stress felt during master class as compared to a practical exam, with 43% reporting 50-90% less stress. Themes in students' favorite aspects of master class simulation included immediate, accurate and precise instructor feedback on orthopedic skills and exposure to alternate decision making approaches through peer modeling and instructor-facilitated discussions. Suggested areas of improvement included even smaller group sizes and increased emphasis on treatment vs. examination. Qualitative feedback from master class instructors supported this novel format for increased student-faculty interaction, increased ability to assess depth of student performance, increased rate of orthopedic skill development, and a more realistic simulated clinical environment compared to traditional classroom simulation experiences.

Discussion / Conclusion:

DPT student perceptions regarding simulation through the case-based master class format with the instructor as patient indicate benefits for learning to integrate and apply orthopedic psychomotor, clinical reasoning, and communication skills, supporting use of this unique model in academic training. The dual pedagogical innovations of 1) applying the case-based master class format to orthopedic physical therapy training and 2) structuring simulation using instructors as patients, merge to create a useful instructional design to increase student preparedness for the clinical environment. Implementation of this innovative instructional strategy was reasonable without significant curricular revision, making it an attractive option to faculty. The model also reinforces the authenticity of the patient presentation in a clinical environment, fostering student engagement in the classroom setting. This initial investigation indicates the master class case-based simulation format added greater value than expected, was well received by students and faculty, and appears to be an effective instructional strategy to address clinical reasoning, preparedness, communication, and psychomotor skills in an entry-level DPT program. Future studies exploring clinical internship assessment outcomes linked to master class applications may add additional insight in the development of the PT profession's growing leadership in sound clinical reasoning and educational efficiency. Orthopedic physical therapy educators desire, and are ultimately responsible to prepare students to effectively manage patients through mastery of psychomotor, communication, critical thinking, and clinical reasoning skills. The master class case-based clinical simulation is an effective pedagogical design to help us meet these educational responsibilities in an efficient manner. Orthopedic physical therapy educators are well positioned to be leaders in education innovation initiatives that enhance professional education in an effort to best meet the needs of those we serve, and this model seems to advance our pursuit of these efforts.

Abstract - ID: 63

Authors: Jesse Resari, Kaiser Permanente; Cameron MacDonald, Regis University; Richard Zaruba, University of Jamestown

Title: Treatment of migraine headache and neck pain using an impairment based manual therapy and exercise approach: a case report.

Background / Purpose:

Headache can be a challenging condition to classify and manage with common findings including neck pain, decreased range of motion and stiffness. Recent studies suggest manual therapy may be effective for cervicogenic headache, but is unclear with regards to tension, cluster and migraine headaches. This case report will highlight the potential benefit of using an impairment based approach for migraine headaches with associated neck pain.

Case Description:

A 26-year-old female was referred for chronic left sided neck pain and migraine headaches. She initially sought medical attention for intermittent numbness around her mouth which started spontaneously a month before seeing her physician. Her neck pain started twelve years prior secondary to a motor vehicle collision and then diagnosed with migraine headache two years later. Patient reported moderate to severe headaches almost daily accompanied by occasional light sensitivity. Red flag screening for potential serious pathology was unremarkable. Her neck pain was 5/10 and her headache was 8/10 using a Numeric Pain Rating Scale (NPRS) at baseline. Her Headache Disability Index (HDI) score was 56% and Neck Disability Index (NDI) score was 34%. Objective findings included decreased left neck rotation (48/64 degrees) limited by pain, increased headache with neck retraction, hypomobility and tenderness of the left C5/6 articular pillars, left C1/2 joints and hypomobility of upper thoracic spine with accessory motion testing, a negative Cervical Flexion Rotation Test (CFRT) for cervicogenic headache consideration and an increased headache and inability to perform the deep neck flexor endurance test for 10 seconds. Neurological examination including cranial nerves were normal. Patient received an impairment based treatment approaches consisting of manual therapy and exercise. Manual therapy consisted of non-thrust mobilization to C1/2 joints and left C5/6 and traction manipulation of Occiput/C1, C1/2 joints and upper thoracic spine. Exercise program included deep neck flexor training and stretching of suboccipital muscles.

Outcomes:

Patient completed a total of 5 visits over 8 weeks. Neck pain and headaches decreased to 1/10 and 4/10 respectively using NPRS. Her NDI score improved to 12% and HDI to 32%. She had full left neck rotation with mild soreness at end range. Neck retraction produced mild stiffness. Mild tenderness was noted for the accessory motion testing of left C5/6 articular pillars, C1/2 joints and upper thoracic spine. She achieved 10 seconds on the deep neck flexor endurance test without headache.

Discussion / Conclusion:

This case report illustrates the potential clinical benefits of impairment based treatment consisting of non-thrust mobilization, thrust manipulation and specific neck muscle retraining for patients with migraine headache and neck pain. Continued study is needed to further delineate these possible benefits.

Abstract - ID: 64

Authors: James Viti, University of St. Augustine for Health Sciences

Title: Use of aquatics exercise and body support treadmill training with manual therapy for a patient with radiating leg pain.

Background / Purpose:

The purpose of this case report is to describe the use of aquatic exercise, body support treadmill training, manual therapy and therapeutic exercise for a patient with radiating left leg and limited ambulation.

Case Description:

A 74-year-old Caucasian male presented to the clinic in a wheelchair. He reported that one week prior, he leaned forward in his chair, while coughing. He noted a sudden onset of pain in the left lumbosacral region. The following day he reported sharp burning pain radiating into the left anterior lateral thigh region. Pain was rated a 9-10 when he attempted to walk and was relieved with sitting. The patient exhibited a 25 degree forward flexed posture in standing. He was able to walk 5 feet with complaint of sharp, burning pain in the left anterior lateral thigh. He exhibited diminished sensation in the L2 dermatome, SLR was 52 degrees left with reproduction of leg pain and 45 degrees right. Lumbar distraction in hook lying and B knees to chest eased his back pain. Tenderness was present over the left Gluteus Maximus/Piriformis, TFL and Quadratus Lumborum. The Modified Oswestry Disability Questionnaire (ODQ) was 66%. The patient was initially treated with aquatic exercise to reduce load bearing and flexion exercises. From Week 5-7 (visit 9-14) Body Support Treadmill Training was initiated and progressed. Extension exercises were initiated at visit 10, which consisted of prone on elbows and prone press ups. Strengthening was initiated on visit 13 and consisted of prone hip extension. At visit 18 and 19, manual physical therapy consisting of soft tissue mobilization, and non-thrust joint manipulation resolved any residual soreness and stiffness.

Outcomes:

At visit 15 (7 weeks), the forward flexed posture was reduced to 5 degrees. Active lumbar flexion was 80 degrees and extension 10 degrees and pain free. SLR was 70 degrees right (increased 17 degrees) and 65 degrees left (increased 20 degrees). The patient was able to walk on the treadmill without body support for 30 minutes with no leg pain noted (back pain was 1-10). At visit 19, lumbar AROM was full and pain free, SLR was 75 degrees B and pain free. He was ambulating in the community without limitation. The Modified ODQ score had improved to 4%.

Discussion / Conclusion:

Aquatics exercise and body support treadmill can be effective interventions for treating patients with radiating leg symptoms in combination with therapeutic exercise and manual physical therapy.

Abstract - ID: 65

Authors: Brian Russ, Nova Southeastern University; Ovidio Olivencia, Nova Southeastern University
Amanda Feldstein, Tampa General Hospital; Cameron Lombardi, Nova Southeastern University
Andrew Miller, Nova Southeastern University; Mong Seyla-Touch, Nova Southeastern University

Title: the reliability of the Upper Limb Tension Test: a comparison of an experienced clinician and a doctor of physical therapy student

Background / Purpose:

The Upper Limb Tension Test with median nerve bias (ULTT1) is a common orthopedic test performed in physical therapy clinics designed to assess the mobility of the median nerve, accompanying branches, and associated nerve roots (C5, C6, C7). The ULTT1 has been shown to have diagnostic utility for conditions such as cervical radiculopathy and carpal tunnel syndrome, and a positive test may have prescriptive value. The reliability of the ULTT1 has been demonstrated, however, there is a paucity of evidence regarding the ability of a student to perform this test in a comparable manner to that of an experienced clinician. The purpose of this study was to determine the interrater reliability between an experienced clinician and a Doctor of Physical Therapy Student (SDPT) when performing the ULTT1.

Methods:

Twenty asymptomatic subjects (mean age 25-years) were recruited via convenience sampling. Following consent, a second-year SDPT investigator and a clinician with 18 years of clinical experience and fellowship training performed the ULTT1 on each subject. A separate examiner recorded elbow extension range of motion (ROM) at the terminal point of the test, which was used for the analysis. Data was analyzed using SPSS software to determine intraclass correlation coefficients (ICC), and the MDC_{95} was computed to determine the error threshold.

Results:

Mean elbow flexion ROM for the experienced clinician and the student examiner was 33.7° and 34° respectively. The single measure ICC was .78 (95% CI .52-.91), which indicates good reliability between raters when performing the ULTT1. The MDC_{95} was calculated to be 12°.

Discussion / Conclusion:

The results of this study indicate that extensive clinical experience may not be necessary to accurately perform the ULTT1. This is demonstrated by the interrater reliability of the ULTT1 when performed by an SDPT compared to an experienced clinician. The MDC_{95} indicates that changes of 12° or greater are needed to exceed the threshold of error. One limitation to this study is that the testing was only performed by one experienced clinician and one SDPT. Another limitation is the limited sample size, which may not be a large enough to gather accurate data for reliability. While the study does demonstrate good interrater reliability of the ULTT1, further research is warranted to collect additional data on this topic.

Conclusion / Significance:

Physical therapists with any level of experience can feel confident in their skills when performing the ULTT1 on a patient as this study revealed good reliability. It is also important to remember the MDC_{95} value when documenting change as 12 degrees is necessary to exceed the threshold of error. Future research should be done to confirm generalizability for all populations and clinicians

Abstract - ID: 66

Authors: Brian Swanson, University of Hartford; Michael Lawrence, University of New England; J. McAuley, University of New England

Title: Changes in glenohumeral translation, electromyographic activity, and pressure-pain thresholds following sustained or oscillatory mobilizations in stiff and healthy shoulders

Background / Purpose:

Posterior glide glenohumeral (GH) mobilizations are utilized to improve motion and decrease pain in patients with shoulder pathologies, thought to be due to capsular stretch and neurophysiologic effects. Research has demonstrated contractions of the rotator cuff (RC) musculature occurring during mobilizations. It remains unclear how different GH mobilizations influence mobility, RC activity, and pain processing, or if effects are different in stiff rather than healthy shoulders. Therefore, this trial compared the effects of grade III oscillatory and sustained posterior GH mobilizations on translation, RC activity, and pressure pain threshold (PPT) in stiff and healthy shoulders.

Methods:

A randomized controlled laboratory study design was utilized, with eighty-eight participants (44 control, 44 stiff shoulders) randomly assigned to one of two mobilization conditions. Pre-intervention measurements of GH translation via ultrasound imaging, RC activity as measured by electromyography (EMG), and PPT testing bilaterally at the deltoid and forearm were collected. All participants then received four 30-second bouts of grade III posterior GH mobilizations, either sustained or oscillatory. Immediately post-intervention, measurements of RC activity, GH translation, and PPT were repeated. Data were analyzed using tests of difference and regression modeling.

Results:

Sustained glides (2.78 ± 3.32 mm) demonstrated significantly greater changes in translation compared to oscillatory glides (1.05 ± 3.86 mm), $p = .028$. Stiff shoulders demonstrated higher total RC activity than controls both pre ($+24.51\%$, $p = .004$) and post-intervention ($+23.10\%$, $p = .01$). Small changes in PPT were observed across all conditions; no significant differences were observed at the shoulder, but a statistically significant increase was observed in the forearm bilaterally. There were no significant differences in PPT response between either the mobilization or stiff vs control conditions.

Discussion / Conclusion:

Sustained mobilizations resulted in greater changes in GH translation than oscillatory mobilization. RC activity was higher in the stiff shoulder group, and remained higher post intervention despite gains in GH translation, while the healthy controls demonstrated increased levels of EMG activity despite increased translation. This suggests that the gains in translation were the result of a mechanical rather than neurophysiologic effect, and not the result of a mobilization mediated inhibition of the musculature. There were no significant differences in effect on PPT between modes of mobilization, with both sustained and oscillatory mobilizations generating small effects that did not reach the levels of clinical significance. As these effects were observed bilaterally and distal to the site of mobilization, they appear to be centrally, rather than locally, mediated.

Acknowledgements: Grant funding was provided by the American Academy of Orthopaedic Manual Physical Therapy Cardon Rehabilitation Grant and the University of New England Office of Sponsored Programs.

Abstract - ID: 67

Authors: Ulrike Mitchell, Brigham Young University; A Johnson, Brigham Young University; Robert Larson, Brigham Young University; Lauren Adams, Brigham Young University; Jade Kho, Brigham Young University; Tayva Musig, Brigham Young University

Title: Reliability of hand-held and fixed dynamometer measurements when assessing trunk strength

Background / Purpose:

Trunk muscle function has been identified as an important factor in the optimal performance of sport, while inadequate core muscle strength has been linked to the development of low back pain. Hand-held dynamometers are widely available and have been shown to reliably and validly assess strength of upper and lower extremity muscle groups. Recently, it was shown that a hand-held dynamometer was a reliable and valid method to evaluate isometric trunk flexion and extension strength with the participants in prone position. The purpose of this study is to assess if a hand-held dynamometer produces reliable results when hand-held versus fixed on a wall with the participant in sitting position.

Methods:

12 young adults ($32.4y \pm 12.5y$, 6 men) were assessed. Isometric trunk flexor and extensor strength were measured using peak force with a MicroFET 2 hand-held dynamometer (Hoggan Scientific LLC, Salt Lake City). The participants were seated on a height-adjustable treatment bench. The fixed dynamometer strength assessment was always first. A specially fabricated belt that connected to a fixed dynamometer was placed around the participants with them facing away from it for flexor strength and facing towards it for extensor strength measurements. The testing order (flexion/extension) was randomized by coin toss. The participants performed a set of 3 isometric contractions in each direction with 20 second pauses in between trials. After 1 minute the participants performed the same set of contractions against hand-held resistance. The dynamometer was placed on the sternum for flexion strength, and in between the scapulae for extension strength assessment. The whole testing procedure was repeated. For all testing a research assistant observed the hip flexion angle and pelvic rotation to ensure that it stayed relatively constant.

Results:

Strength measurements for extension with dynamometer fixed: 17.6 (6.6), hand-held 18.5 (4.1); mean difference 0.9 kg, $p=0.67$; for flexion with dynamometer fixed: mean kg (SD) 18.1 (8.5), hand-held 18.7 (5.6); mean difference 0.6 kg, $p=0.84$. The extension/flexion ratio is 0.97 for fixed and 0.99 for hand-held data. Test-retest reliability: 1) with dynamometer fixed, extension: ICC=.991, CI .984 - .996, flexion: ICC=.992, CI .986 - .996, and 2) hand-held dynamometer, extension: ICC=.974, CI .942 - .991, flexion: ICC=.981, CI .957 - .994. Correlations: 1) fixed dynamometer to hand-held extension testing: $r=0.70$ ($p=0.011$), and 2) fixed dynamometer to hand-held flexion testing: $r=0.90$ ($p<.0001$).

Discussion / Conclusion:

Hand-held dynamometry has excellent test-retest reliability. The correlations between measurements performed in sitting with the dynamometer hand-held and fixed were high and higher for flexion than for extension testing. Isometric extension data in the literature show great variability (9.9 to 23.7kg) and our results lie somewhat in the middle. However, our flexion data are higher than usually seen in the literature (6.2 to 9.8kg), which renders our extension/flexion ratio <1 .

Abstract - ID: 69

Authors: Emmanuel Yung, Sacred Heart University; Michael Wong, Azusa Pacific University; Cheongeun Oh, New York University; Langone Health Division of Biostatistics Department of Population Health; Jason Grimes, Sacred Heart University; Erica Barton, Kaiser Permanente Regional Spine Center; Muhammad Ali, Performance Physical Therapy; Allison Breakey, Hartford Healthcare at Backus Outpatient Care Center

Title: Blood pressure-related hypoalgesia and sympatho-inhibition following mobilization in neck pain-concurrent analyses from an RCT

Background / Purpose:

Blood pressure (BP)-related hypoalgesia exists whereby higher resting BP is related to reduced (acute) pain perception- an inverse relationship seen in the normotensive population (n=10,371). Nonetheless, this BP-related hypoalgesia mechanism was not included by a prominent theoretical model of how joint mobilization works. Only one study related hypoalgesia with sympatho-excitation using lateral glide (LAT) mobilization, dosed at 3 x 30 seconds. Conversely, posterior (AP) mobilization decreased systolic BP (SBP) in pain-free adults when uniquely dosed at 5 x 10 seconds. Consequently, it seems helpful to explore if either AP or LAT mobilization decreases pain and BP, related to borderline normotensive individuals whereby a further BP increase may be worrisome. The purposes of the study were: (1) to evaluate the relationship of resting/baseline BP with pain response 2-days post-intervention and (2) to evaluate the cardiovascular effects of AP and LAT mobilization.

Methods:

Forty-three (23F) participants with non-chronic mechanical neck pain [baseline mean \pm SD: heart rate 61.34 \pm 8.70 bpm, SBP 114.16 \pm 13.84 mmHg, DBP 71.23 \pm 6.95 mmHg, average Numeric Pain Rating Scale (NPRS) at rest 2.92 \pm 1.25; Neck Disability Index 7.74 \pm 3.41] randomly received 5 x 10 seconds of either mobilization to the neck. Research assistants determined cardiovascular variables before, during, and after the intervention and neck NPRS (average: current, best, worst) before and 2-days post-intervention. A linear regression model was used to evaluate the association between independent variables and average NPRS reduction in a univariate manner. Subsequently, multivariate regression models were fitted to the data using a step-wise variable selection approach to identify independent predictors of outcomes while controlling for confounders. Mean differences between-groups on cardiovascular variables were compared using multilevel mixed-effect modeling for repeated measures, adjusting for baseline characteristics by entering treatment, time, and baseline values (age, gender, and BMI) as covariates.

Results:

Baseline SBP was significantly related to average NPRS reduction 2-days post-intervention on univariate and multivariate analyses (coefficients -0.029 \pm 0.013, p=0.036 and -0.026 \pm 0.012, p=0.032, respectively). Average NPRS decreased for both groups (from 2.92 \pm 1.25 to 1.90 \pm 1.26, p-value<0.001). There were no between-group differences in average NPRS reduction and cardiovascular changes. Mixed-effect model ANOVA revealed a significant change in SBP over time (estimate -1.94 \pm 0.70 mmHg, p-value=0.016).

Discussion / Conclusion:

Our study was the first to relate baseline SBP with NPRS reduction, explaining SBP-related hypoalgesia. Each 10mmHg higher baseline SBP was related to a 0.29-unit average NPRS decrease 2-days post-intervention. When uniquely dosed, both mobilizations decreased NPRS and SBP. Given a baseline 3/10 average NPRS as our cohort: patient A hypothetical baseline SBP is 138mmHg while patient B has 98mmHg. Evaluating this 40mmHg difference (-0.029*40), patient A NPRS may improve by 1.16/10,

resulting in a clinically insignificant value of 1.84/10. Further, in borderline normotensive individuals, a unique dose of either mobilization might provide pain relief without increasing SBP.

Abstract - ID: 71

Authors: Thomas Koc Jr, Kean University; James Phillips, Bergen P.T. Associates; Deborah DeLuca, Seton Hall University; Annette Kirchgessner, Seton Hall University

Title: The Intra-rater reliability of the Clavicular Jump Test

Background / Purpose:

Shoulder pain is the third most common musculoskeletal complaint in today's society, with approximately 50% of patients seeking medical attention, including physical therapy. Patients with shoulder pain often present with clavicular dysfunction at the sternoclavicular (SC) joint. However, limited reliable SC tests are available. The Clavicular Jump Test (CJT) has been used to assess for clavicular dysfunctions, but its reliability has not been established. Therefore, the purpose of this study is to determine the intra-rater reliability of the Clavicular Jump Test (CJT).

Methods:

This study was a repeated measures research design. A total of 96 subjects (47 males, 49 females, mean age of 28.0 ± 4.8 years) volunteered to participate in this study. The CJT was performed by placing the examiner's index and middle fingers on the proximal clavicle to evaluate for levelness of the clavicles while the examiner was standing facing the participant. Then, the examiner evaluated the new position of the proximal clavicle while the participants were raising their arms slowly over their head. A positive test was considered when the proximal clavicle moved superiorly or "jumps", whereas a negative test was considered when the proximal clavicle moved inferiorly or remained level. The participants performed 2 trials on the same day. During Trial 1, the examiner performed the CJT on both the right and left sides, and recorded the findings. During trial 2, the examiner was blind folded, and the principal investigator (PI) placed the examiner's fingers on the clavicle during arm elevation. The examiner reported the findings to the PI.

Results:

A Pearson Chi square test of the CJT of Trial 1 and Trial 2 on the right side indicate a significant agreement, $\chi^2(1) = 44.293, p < 0.05$. The calculated kappa statistic (k) of the CJT of Trial 1 and Trial 2 on the right side indicated "substantial levels" of agreement, $k = .672, p < .05$. A Pearson Chi-square test of the CJT of Trial 1 and Trial 2 on the left side indicate a significant agreement, $\chi^2(1) = 5.696, p < 0.05$. The calculated kappa statistic (k) of the CJT of Trial 1 and Trial 2 on the left side indicate "fair" levels of agreement, $k = .241, p < .05$. A post-hoc power analysis was conducted and showed to have a power $(1 - \beta) = 0.84$ for the Chi-square testing.

Discussion / Conclusion:

The results of the study showed fair-to-good intra-rater reliability for the CTJ. Standardization of the testing procedure prior to the study appeared to decrease potential bias from the examiner's clinical experience and/or any teaching/learning effects. The side difference in the intra-rater reliability could be due to that a different examiner's hand was used to perform the CTJ for a different side of the participant's clavicle. The results of the study indicate that the CJT may be a useful test for assessment of patients with shoulder/clavicular dysfunction.

Abstract - ID: 72

Authors: Catherine Patla, University of St. Augustine for Health Sciences; Kristin Hernandez, University of St. Augustine for Health Sciences

Title: Femoral retrotorsion as the source of sacroiliac symptoms – a case report

Background / Purpose:

The presence of femoral retrotorsion limits the ability to functionally utilize internal rotation (IR) of the hip. Postures which require the internal rotation of the hip can place more stress on the sacroiliac (SI) area as a compensation. This case report highlights a patient's self management of the SI symptoms by avoiding the postural positions requiring internal rotation. Retrospective analysis shows a significantly higher correlation of femoral retroversion (57%) in patients with these pain descriptors versus asymptomatic patients in whom the incidence of retroversion is only 5-15% (Prather 2019). Patient education is an important component of pain management for this population.

Case Description:

A 42-year-old female with bilateral SI/buttock pain, intermittent and present for years, but recently worsening with new job as secretary where she often sits on a stool. Pain has been intermittent for many years, but recently worsening with new job as secretary where she often sits on a stool. Symptom is worse in the morning, worse with sitting and better with standing. She has tried changing shoes and chair seats without improvements. Pain ranges from 5-10/10. Modified Oswestry is 17% disability. Lumbar ROM is 75% of normal in all planes. Strength is 4/5 in hip flexion and extension bilaterally. Neuro exam normal. SI assessment was non-provocative Hip examination indicated a limitation of passive IR of the hip with hard end-feel and symptom reproduction at end range. Craig test was positive for retrotorsion of 19 degrees on left and 25 degrees on right. As a functional assessment, patient was seated with exaggerated external rotation of the hip which eliminated the sitting SI area symptoms.

Outcomes:

Patient was managed by education to avoid IR positions of the hip. Avoiding the IR positions eliminated her symptoms. Sitting in chairs and car seat required exaggeration of an external rotated hip. Standing postures required her to exaggerate the turned out foot. Through education, patient realized that she often would try to correct the turned out foot.

Discussion / Conclusion:

SI joint and hip mobility are integral to functioning of the pelvic/hip complex. Examination of the hip is important to isolate from pelvic/SI motion in order to assess the exact hip limitations and end-feel. Given the structural nature of a femoral torsion, mobility cannot be improved. It is imperative that patients are aware of their unique functional positions to avoid so as to limit stress directed in another region of the body. Management of a patient with a femoral torsion can be carried out exclusively through education as long as other tissues have not been injured.

Abstract - ID: 73

Authors: Catherine Patla, University of St. Augustine for Health Sciences

Title: Decreased mobility of cuboid rotation as the source of Achilles tendinopathy— a case report

Background / Purpose:

Joint mobility is required in order to have adequate function of musculature. Internal rotation of the cuboid functions to allow midtarsal and hindfoot pronation on weight bearing. The lack of internal rotation of the cuboid limits the ability to perform midtarsal pronation which then limits contraction of the gastrocnemius and soleus on weightbearing and therefore contributes to muscle /tendon stress. The continued stress on the contractile structure leads to a tendinopathy which results in limited functional use with pain of the gastrocnemius/soleus.

Case Description:

A 44-year-old female massage therapist, presenting to physical therapy with idiopathic onset of right Achilles pain, worsening over the past 6 months. History identifies left Achilles rupture with immobilization and full resolution of symptoms about 20 years ago. Pain level varies from 0-10; feels better in the morning and worse as the day progresses. On initial examination, data identifies: passive dorsiflexion, at 0 degrees knee extension: 15 right @ with pain, 20 left (L). Passive dorsiflexion, at 90 degrees knee flexion: with pain, 25 L. Decreased hamstring flexibility on R with no pain, Strength: 3-/5 L plantar flexion. Passive dorsiflexion painful to approximately 2-5 degrees more than active. Tenderness on palpation of Achilles tendon is present. Single leg heel raise is unable to perform due to pain. On sessions one and two, treatments consisted of: soft tissue mobility to gastrocnemius, calcaneal glides into eversion, and self-stretches. With no changes of symptoms/signs on the third session, further examination was carried out. Findings included: passive midtarsal pronation limited with no pain, minimal tenderness to palpation of tendo-achilles and cuboid rotation limited with no pain. The third treatment consisted of cuboid manipulation followed by complete resolution of pain by end of session and full AROM pain-free and full strength.

Outcomes:

Cuboid non-thrust manipulation was performed to improve pronation of the midfoot. The manipulation was followed by non weight bearing muscle reeducation with manual resistance for pronation and supination of midtarsal and hindfoot. No pain was experienced during this muscle reeducation session. Gait training was emphasized to restore functional pronation on weight bearing. Bilateral heel raises were carried out without pain and limited to half of a raise. Patient could not single heel raise due to weakness and apprehension. Strength gains to perform a single heel raise took several months due to noncompliance of exercising by the patient.

Discussion / Conclusion:

This case demonstrates the principle that mobility is necessary before length and strength can be utilized effectively. Previous treatments to directly treat the tendinopathy were not successful in reducing the weight-bearing pain.

Abstract - ID: 75

Authors: Nancy Talbott, University of Cincinnati; Amanda Stertzbach, University of Cincinnati; John Volmer, University of Cincinnati

Title: The role of the long head of the biceps in adhesive capsulitis: a systematic review

Background / Purpose:

Adhesive capsulitis (AC) of the shoulder results in a characteristic movement pattern of limited motion and function. Mobilization, manipulation, soft tissue techniques and other interventions have been utilized to treat individuals with AC with little effect on the progression of the condition. Traditional views of spontaneous recovery and capsular adhesions have not been supported by research. Research has demonstrated several changes that occur in individuals with AC including alterations in the rotator interval (RI), the coracohumeral ligament (CHL) and the superior glenohumeral ligament (SGHL). Located between the supraspinatus tendon and the subscapularis tendon, the RI also contains the tendon of the long head of the biceps (LHBT), which is anchored between the SGHL and the CHL. Normally, the LHBT moves during IR and ER with an average excursion of 19.4mm. Thickness of the overlying CHL, underlying SGHL or excess fluid could inhibit this movement, play a role in the limitations that occur in AC and be important in the appropriate selection of treatment techniques. The purpose of this systematic review was to evaluate the involvement of the LHBT in AC using published literature.

Methods:

The authors performed a search of the literature using a combination of keywords including "adhesive capsulitis," "frozen shoulder," "stiff shoulder," "biceps," and "long head of biceps." The databases utilized were Medline, PubMed, CINAHL, Cochrane and Embase. The authors included studies that involved imaging or direct observation of the LHBT in individuals with and without AC. Ten articles were identified that met criteria.

Results:

Four studies investigated fluid, edema or volume of the LHBT. Two found no difference in biceps sheath volume compared to controls, one recorded a decrease in the volume and the fourth identified changes in the pattern of biceps sheath filling during movement. Synovitis in the biceps was reported in the area of the biceps anchor or in the LHBT in five studies, occurring significantly more frequent than in subjects without AC. Movement of the LHBT was found to be limited during ER in three studies.

Discussion / Conclusion:

This review discovered some evidence for the involvement of the LHBT in AC. Thickening of the structures around the capsule and alterations in fluid flow potentially affect the movement of the LHBT which may limit shoulder movement, especially external rotation. Treatments specific to the LHBT may be needed to promote mobility of this structure. Further studies specifically investigating LHBT movement, pathological changes and treatment techniques in individuals with AC are needed.

Abstract - ID: 76

Authors: Craig Hensley, Northwestern University; Alexandra Anderson, The Physical Therapy Academy

Title: The use of manual therapy targeting the thoracic spine in the successful management of ankle pain in a figure skater.

Background / Purpose:

Ankle sprains are common among junior figure skaters. Both local and remote structures can be a primary source of foot/ankle pain. There is a paucity of literature regarding thoracic spine dysfunction in those with ankle pain. The purpose of this case report is to describe the successful management of ankle pain after an ankle sprain with manual therapy techniques directed at the thoracic spine.

Case Description:

The patient was a 16-year-old female figure skater presenting to physical therapy with complaints of right lateral ankle pain following an ankle sprain 1-month prior to evaluation. The ankle pain was restricting participation during figure skating practice and competitions, as well as high school physical education class. She also reported a 1-year history of low back pain (LBP) and occasional discomfort in the thoracic spine. Pertinent past medical history included bilateral ankle sprains. The patient scored a 3/10 at worst for her lateral ankle pain on the Numeric Pain Rating Scale (NPRS) and 73/80 on the Lower Extremity Functional Scale (LEFS). The patient's ankle pain was reproduced with ankle ROM and special testing at the ankle. Neurodynamic testing revealed thoracic "tightness" with a slump, leading to a more thorough examination of the thoracic spine. Active rotation to the right and a central posterior to anterior (PA) glide at T7 revealed hypomobility and symptom reproduction of the patient's ankle pain. Examination of the lumbar spine was remarkable only for local lumbar symptoms.

Outcomes:

The patient was seen for a total of 9 visits over 7 weeks. Performing 1 bout of central PA non-thrust mobilization/manipulation (grade III) targeting T7 had an immediate positive effect on thoracic rotation and ankle pain reproduction at T7. Lumbar stabilization, hip flexor stretches, and thoracic extension AROM over a foam roller were provided as part of her home exercise program. The combined program was successful in returning the patient to pain-free figure skating and physical education class. Changes were noted on the NPRS (0/10 at worst) and LEFS (80/80). She scored a +7 on the Global Rating of Change.

Discussion / Conclusion:

This case describes the use of thoracic spine non-thrust mobilization/manipulation in the management of a figure skater with ankle pain and thoracic dysfunction. It is imperative that clinicians perform ongoing assessment of patients with foot/ankle pain and consider the spine as a possible source of symptoms, even in the presence of local reproduction of ankle pain. Future research should explore the prevalence of thoracic spine dysfunction in patients with foot/ankle pain.

Abstract - ID: 77

Authors: Helene Strange, Duke Physical Therapy and Occupational Therapy at Hillsborough

Title: How are we different: Parsonage Turner syndrome, cervical radiculopathy and adhesive capsulitis

Background / Purpose:

1.64 in 100,000 patients are affected by Parsonage-Turner Syndrome (PTS). The etiology is unclear, however patients most often experience a prolonged auto-immune response prior to onset of symptoms. PTS is a brachial plexus neuritis that is commonly misdiagnosed as cervical radiculopathy or adhesive capsulitis. Further testing of spinal nerve roots and peripheral nerves can help differentiate PTS from other pathologies. The purpose of this case study is to illustrate the clinical reasoning process and assessment to rule out other pathologies when presented with a patient previously diagnosed with PTS from a referring physician.

Case Description:

The patient was a 35-year-old female presenting with a one-month history of insidious onset R upper quadrant pain, progressive weakness and loss of ROM of the UE. Pain was worse at night and with any activity above waist height. The reason for PT attendance were functional limitations with performance of work duties as a neurology professor and ADLs. The patient presented with a 3/10 pain at rest and 10/10 pain at worst when performing any ADLs above waist height. AROM shoulder flexion on the R was 80 degrees as compared to 170 contralaterally. Active abduction was 45 degrees compared to 170 on the L. PROM flexion and abduction on the R were 123 and 140 degrees respectively with empty end feels, compared to 180 degrees on the L. Measurement of T1 to radial styloid while reaching behind her back was 36 cm on R as compared to 23 cm on L. Reflexes were normal, however, sharp-dull testing was diminished with fatigable weakness throughout the R UE. Neurodynamic testing was positive with median, radial and ulnar nerve biases. Cervical rotation was over 60 degrees and Spurling's, compression, and distraction tests did not reproduce symptoms.

Outcomes:

At discharge, the patient had returned to full function with all ADLs and work duties with full pain free A/PROM in all directions. FOTO scores improved from 29 at initial evaluation to 73 at discharge.

Discussion / Conclusion:

The evaluation focused on ruling out competing diagnoses to subsequently confirm PTS. Adhesive capsulitis was ruled out due to the difference in AROM versus PROM, history and lack of appropriate progression. A large neural component was present, which helped rule out other isolated shoulder pathologies, however, cervical radiculopathy was ruled out as well. Neurological symptoms were wide spread over multiple peripheral nerve distributions, raising likelihood of a brachial plexopathy. Additionally, the patient's history of a prolonged infection supported PTS as the most likely diagnosis. The primary treatment focus was on active and passive neural mobilizations in progressively more challenging functional positions. The clinical reasoning process to support PTS helped guide grading and progression appropriate for an acute neuritis, rather than other plexopathies, such as entrapments throughout the upper quarter.

Abstract - ID: 78

Authors: Helene Strange, Duke Physical Therapy and Occupational Therapy at Hillsborough

Title: Don't forget ankle patients have a pelvic floor: a case study in differential diagnosis post-surgical trimalleolar ORIF with paresthesias

Background / Purpose:

Lumbosacral neural pathways enter and exit through the pelvic floor. Pelvic floor dysfunction with hypertonicity can result in neural mechanosensitivity, therefore producing lower extremity (LE) symptoms. The purpose of this case study was to highlight the clinical reasoning process for differential diagnosis and treatment of a patient with unresolving foot and ankle paresthesias following trimalleolar fracture.

Case Description:

The patient was a 33-year-old female 10 months s/p fall from a 4 ft height resulting in a trimalleolar fracture. Signs and symptoms consisted of pain and paresthesias in the foot and ankle, as well as mobility and functional limitations. Repair via ORIF was followed by 5 subsequent flush surgeries due to infection. Patient attended PT for 8 months with improvements in ankle ROM, strength and functional mobility. However, patient reported remaining paresthesias in non-dermatomal pattern in the R foot and ankle. Treatment of the foot and ankle did not change paresthesias leading the treating PT to consult with Pelvic PT for further differential diagnosis, after having cleared the lumbar spine, hip and LE. At this point, remaining symptoms were paresthesias rated 4/10 at rest and 7/10 with any activity other than supine, requiring the patient to still take 600 mg gabapentin every day. Assessment of the internal pelvic floor musculature (PFM) revealed hypertonicity and present contraction with delayed and incomplete relaxation. Concordant symptoms were reproduced fully with greater intensity (9/10) upon gentle internal palpation of the PFM. Initial treatment focused on relaxation techniques with internal trigger point release of the PFM. Treatment progressed to functional activities like squatting and progressing to jumping with appropriate relaxation of the PFM.

Outcomes:

Upon the 6th and final visit, the patient was able to perform appropriate relaxation techniques at rest and with activity, allowing her to perform up to 20 jumps and squats without paresthesias. Furthermore, patient was able to perform all ADLs without any paresthesias. Remaining deficit was reproduction of paresthesias at 2/10 after 6 sec of R side SLS. Her PSFS for squatting and jumping was 0/10 and negotiating stairs was 1/10 at initial evaluation. At her final visit, her scores were 9/10, 8/10, and 7/10 respectively.

Discussion / Conclusion:

The initial evaluation and plan of care supported the importance of differential diagnosis and regional interdependence. With appropriate evaluative techniques and treatment, the patient was able to eliminate paresthesias through pelvic floor relaxation and trigger point release within 2 visits and resume all ADLs without paresthesias within 6 visits. As a result, the patient was able to eliminate the use of gabapentin. This case illustrates the importance of considering the pelvic floor in seemingly unrelated MSK conditions and the effect on treatment efficiency and drug use.

Abstract - ID: 79

Authors: Bradley Myers, Campbell University; Frank Tudini, Campbell University

Title: Scholarly productivity of FAAOMPT credentialed faculty in accredited DPT programs

Background / Purpose:

Academic faculty have an expectation to engage in scholarly work, which usually includes publication of journal papers, even though other forms of scholarly work exist. It seems logical that faculty of higher academic rank and training would achieve more robust career scholarly productivity. However, currently little information is available on the scholarly productivity of faculty within physical therapy education programs, or if recognition as a Fellow of the American Academy of Orthopaedic Manual Physical Therapists (FAAOMPT) is an influence. The purpose of this study was to compare scholarly output of FAAOMPT versus non-FAAOMPT faculty, and to compare FAAOMPT faculty productivity based upon academic rank and highest earned degree.

Methods:

A systematic search of all DPT faculty members, from accredited programs in the United States (US), was conducted to identify academic rank, highest earned degree, FAAOMPT status, and scholarly metrics. The search utilized Publish or Perish software to query Google Scholar between February and April 2019 for total papers, citations, *h*-index, *g*-index, and *e*-index. Non-parametric analyses were conducted, due to violations of normality as assessed via Shapiro-Wilks test ($p < .001$), with Mann-Whitney U to compare FAAOMPT to non-FAAOMPT faculty and Kruskal Wallis with pairwise comparisons for FAAOMPT across academic rank and by highest earned degree. Effect sizes were calculated for statistically significant results utilizing eta-squared (η^2).

Results:

A total of 120 FAAOMPT faculty members were identified representing 4.9% of total PT Faculty in the US. Median productivity of FAAOMPT faculty was papers (7.5), citations (51), *h*-index (3), *g*-index (5), and *e*-index (5.34). Scholarly productivity did not demonstrate statistically significant differences between FAAOMPT and non-FAAOMPT faculty ($p = .2$ to $.30$). However, significant differences between academic fellows were noted, across all scholarly metrics, based on academic rank ($H(2) = 20.53$ to 25.16 ; $p < .001$) with low to moderate effect size ($\eta^2 = .16$ to $.20$). Pairwise comparisons suggest statistically significant differences between Assistant Professors and higher ranks but not between Associate Professor and Professor across all metric ($p < .05$), except papers which did not show statistical difference between Assistant and Associate Professor. Significant differences were noted across all scholarly metrics between FAAOMPT faculty by highest earned degree ($H(3) = 28.717$ to 36.49 ; $p < .001$) with moderate effect size ($\eta^2 = .22$ to $.29$). Pairwise comparisons suggest no significant differences between DPT and other professional doctoral degrees (EdD, DSc, DHS, etc.), but both statistically differ from the PhD ($p < .05$).

Discussion / Conclusion:

Scholarly productivity of FAAOMPT faculty is not different than non-FAAOMPT faculty within US PT education programs. However, within the FAAOMPT cohort, scholarly productivity is higher for those holding a PhD, and as academic rank increases.

Abstract - ID: 80

Authors: Lynne Hughes, University of Texas Medical Branch; Rebecca Galloway, University of Texas Medical Branch; Kirby Capps, University of Texas Medical Branch; Ben Glidden, University of Texas Medical Branch

Title: Effectiveness of a 4-week physical therapy intervention using manual therapy and therapeutic exercise to improve posture and function in older adults with hyperkyphosis: a preliminary report

Background / Purpose:

Excessive thoracic kyphosis (hyperkyphosis) is a common spinal deformity among the elderly population. Hyperkyphosis has been linked with higher risk of falls and gait abnormalities including decreased gait velocity and widened base of support. There is little evidence for the use of manual therapy in the treatment of hyperkyphosis. The purpose of this study was to investigate the effect of a 4-week intervention of manual therapy and therapeutic exercise on posture, function, and gait in older adults with hyperkyphosis.

Methods:

Community dwelling adults over the age of 50 with hyperkyphosis or forward head posture received manual therapy and therapeutic exercise 3 times a week for 4 weeks. Manual therapy included targeted joint mobilizations in the spine, rib cage, shoulders, pelvis, and hips in addition to soft tissue mobilization of the pectoralis, scalenes, sternocleidomastoid, suboccipitals, trapezius, and erector spinae. The treating therapists agreed on a protocol; however, the treatment was individualized to each patient. Data was collected on the 1st, 6th, and 12th visits. Postural measures of height, flexicurve or kyphotic index (KI), and block test; functional measures of Timed Up and Go (TUG), functional reach, Short Physical Performance Battery (SPPB), and two-minute walk test (2MWT); and gait parameters (GAITRite) of gait velocity, stride length, percent double limb support, and base of support were recorded. Data analysis was performed by descriptive statistics, paired t tests, and comparison to clinically meaningful change.

Results:

Five females and one male with mean age of 68.5 (SD \pm 12.3) participated in this study. Postural measures showed significant improvement including height (mean 0.63cm; median 0.75cm), KI (mean -2.4; median -2.37), and block test (mean -1.36cm; median -1.05) with p-values of 0.05, 0.03, and 0.01 respectively. The change in functional measures of TUG (mean -0.91sec; p=.10), functional reach (mean +0.83cm; p=.74), SPPB (mean +0.8; p=.14), and 2MWT (mean 10.18m; p=.006) showed positive trends with only the 2MWT showing statistical significance and approaching clinical significance. Spatial measures of gait also demonstrated statistical significance in gait speed (mean +0.09m/s; p=.035) and stride length (mean +4.09cm; p=.036) as well as positive trends in decreased double stance time (mean -.94% of cycle; p=.28) and narrower base of support (mean -0.55cm; p=.32).

Discussion / Conclusion:

The results of the current preliminary data suggests that a 4-week physical therapy intervention of manual therapy and therapeutic exercise may have a positive impact on hyperkyphosis and forward head posture as evidenced by statically significant changes in all postural measures. In addition, this intervention holds promise of having an effect on the function and gait parameters of older community dwelling adults particularly with the measures of 2MWT, gait speed, and stride length that showed statistical significance with this small sample size. Further study is in progress with a larger sample size.

Abstract - ID: 81

Authors: Alison Vargo, Texas Woman's University; Brad Allen, Texas Tech University Health Sciences Center; Phillip Sizer, Texas Tech University Health Sciences Center; Gary Kearns, Texas Tech University Health Sciences Center; Janna McGaugh, University of Texas Medical Branch; Katy Mitchell, Texas Woman's University

Title: Effectiveness of teaching advanced cervical and thoracic manual physical therapy to entry-level physical therapy students in a continuing education format

Background / Purpose:

Student physical therapists learn orthopedic manual physical therapy (OMPT) skills in the classroom, which are reinforced on at least one of the students' clinical experiences. These skills require the integration of anatomical and biomechanical knowledge as well the application of psychomotor skills. In addition, students are expected to use appropriate clinical reasoning for skill selection and implementation, as well as to determine technique effectiveness. Guided mentorship opportunities in a low stress environment may help improve students' knowledge, motor skills, clinical reasoning abilities and confidence. The purpose of this study was to determine if a hybrid learning (online/in-person) model with a weekend-intensive laboratory environment, would lead to improved learning across the cognitive, psychomotor, and affective domains in student physical therapists.

Methods:

Twenty-three third-year student physical therapists who completed their musculoskeletal content at the University of Texas Medical Branch but had not started their orthopedic clinical rotation attended the course. Following pre-course cognitive and affective domain testing, students were given on-line course content to study. Prior to the psychomotor laboratory sessions, pre-course psychomotor testing via the Objective Structured Clinical Exam (OSCE) was conducted. This test was divided into verbal reasoning and performance ability. Laboratory content was presented in a condensed weekend course similar to a continuing education format. Post-course cognitive, psychomotor, and affective domain testing occurred one week following completion of the content. Following descriptive statistical analyses, differences in the pre- and post-course written exam scores (cognitive) were analyzed using a repeated measures t-test. Differences in pre- and post-course OSCE (psychomotor) scores for each domain and scores from the Confidence and Values Scale (affective) were analyzed with Mann-Whitney U tests. The alpha level was set at .05.

Results:

In the cognitive domain, there were significant improvements in written exam performance at the post-test ($p \leq .001$). The students demonstrated significant improvements in the psychomotor domain for both verbal reasoning ($p \leq .001$) and performance ability ($p \leq .001$). In the affective domain, the students showed significant improvements in both confidence ($p \leq .001$) and values ($p = .021$) at the post-test.

Discussion / Conclusion:

This study found that an intensive OMPT selective course, provided to entry-level student physical therapists did improve the students' knowledge base, ability to develop and apply clinical reasoning frameworks, psychomotor skills, confidence, and values. The experience provided students with clinical mentorship in a low stress/non-graded environment in hopes that increased exposure and confidence may translate to earlier and more effective incorporation of OMPT into their future clinical work. Physical therapy programs may wish to consider offering these supplemental educational sessions to improve students' preparation and confidence prior to clinical experiences.

Abstract - ID: 82

Authors: Sharon Wang-Price, Texas Woman's University; Jason Zafereo, UT Southwestern Medical Center; Zachary Couch, Texas Physical Therapy Specialists; Kelli Brizzolara, Texas Woman's University; Taylor Heins, Texas Woman's University; Lindsey Smith, Texas Woman's University

Title: Immediate effects of two deep dry needling techniques on lumbar multifidus muscle activation and pressure pain thresholds in patients with low back pain

Background / Purpose:

Two common dry-needling (DN) techniques are used by physical therapists for treating patients: with and without needle manipulation. Needling with manipulation (e.g. rotating or sparrow-pecking the needle) was designed to elicit local muscle twitches, leading to biophysiological effects, thus reducing pain and facilitating muscle training. However, recent literature has shown that local twitch responses may not be necessary for successful outcomes. Because common side effects, such as increased soreness and nausea, are often associated with needle manipulation, needling techniques without manipulation may be preferred if they demonstrate benefits similar to those of needling with manipulation. The purpose of this study was to compare the effects of two deep DN techniques (with and without manipulation) on lumbar multifidus (LM) muscle activation and pressure pain thresholds (PPTs) in adults with low back pain (LBP).

Methods:

Thirty-two participants with LBP were randomized into two treatment groups: 16 in the in-situ (i.e., no needle manipulation) group, and 16 in the needle manipulation group. Electromyography (EMG) activity of the LM muscle and PPTs were collected from each participant before and immediately after DN. Two surface EMG electrodes were applied to the painful side of the LM at the L5 and S2 segments. EMG activity was collected while each participant performed contralateral arm lifts under two conditions: holding a 1.5 or 2 lb. hand weight, and during a maximum voluntary isometric contraction (MVIC). EMG activity collected during contralateral arm lifts was normalized to that collected during MVIC. PPTs were collected from the two painful points of the low back, one at the L5 level, and the other at the S2 level.

Results:

Statistical analysis showed no significant differences in either LM EMG activity ($p = 0.738$ at L5, $p = 0.539$ at S2) or in PPTs ($p = 0.166$ at L5, $p = 0.539$ at S2) between the two DN techniques. Although all participants demonstrated an increase of EMG activity immediately after DN, the increase was not statistically significant ($p = 0.700$ at L5, $p = 0.454$ at S2), primarily due to the participants' differing muscle activation responses to DN. However, all participants had a significant increase of PPTs (i.e., decrease pain sensitivity) immediately after DN ($p < 0.001$ at L5 and S2).

Discussion / Conclusion:

The results of the study showed that needling with or without manipulation demonstrated similar effects on LM muscle recruitment and pressure pain sensitivity. Although DN can potentially change sensory input and modulate pain sensitivity, it does not appear to change motor neural excitability in the central nervous system.

Conclusion / Significance:

If the primary goal of the physical therapy is to reduce local pain sensitivity, needling with or without manipulation may result in similar positive outcomes.

Abstract - ID: 84

Authors: James Dunning, University Rey Juan Carlos, Madrid, Spain; Raymond Butts, Research Physical Therapy Specialists-Columbia, SC; César Fernández-de-las-Peñas, University Rey Juan Carlos, Madrid, Spain; Suzanne Walsh, Copper Queen Community Hospital; Ian Young, CORA Physical Therapy; Christopher Goult, BenchMark Physical Therapy; Jose L Arias-Buria, Universidad Rey Juan Carlos; Brandon Gillett, Eastside Medical Care Center

Title: Cervicothoracic manipulation and electrical dry needling versus mobilization, exercise and interferential electrotherapy in patients with subacromial pain syndrome: a multi-center randomized clinical trial

Background / Purpose:

Exercise and manual therapy, particularly thrust joint manipulation, nonthrust joint mobilization and soft-tissue mobilization, are commonly applied for the management of individuals with subacromial pain syndrome (SPS). In addition, dry needling is being increasingly used by physical therapists for the treatment of SPS; however, to date, its supporting evidence is limited. No studies have directly compared the effectiveness of combining high-velocity low-amplitude thrust spinal manipulation with electrical dry needling to nonthrust joint and soft-tissue mobilization, exercise and interferential electrotherapy in individuals with SPS. Therefore, the purpose of this clinical trial was to compare the effects of cervicothoracic thrust manipulation and electrical dry needling to mobilization, exercise and interferential electrotherapy in individuals with SPS.

Methods:

One hundred and forty-five participants (n=145) with SPS were randomized to receive cervicothoracic thrust manipulation plus electrical dry needling (n=73) or nonthrust joint and soft tissue mobilization, exercise and interferential electrotherapy (n=72). The primary outcome was shoulder pain and disability as measured by the Shoulder Pain and Disability Index (SPADI). Secondary outcomes included shoulder pain intensity (NPRS), medication intake, and the Global Rating of Change (GROC). The treatment period was 6 weeks with follow-up assessment at 2 weeks, 4 weeks, and 3 months after the initial treatment session. The primary aim was examined with a 2-way mixed-model analysis of covariance (ANCOVA), with treatment group (manipulation and electrical dry needling versus mobilization, exercise and interferential electrotherapy) as the between-subjects variable and time (baseline, 2 weeks, 4 weeks and 3 months) as the within-subjects variable after adjusting for baseline outcomes.

Results:

The 2x4 ANCOVA demonstrated that individuals with SPS receiving both cervicothoracic thrust manipulation and electrical dry needling experienced significantly greater reductions in related-disability (SPADI: $F=22.047$; $P<0.001$), shoulder pain intensity (NPRS: $F=21.356$; $P<0.001$) than those receiving mobilization, exercise and interferential electrotherapy at a 3-month follow-up. Based on the cutoff score of $\geq+5$ on the GROC, significantly ($X^2=31.029$; $P<0.001$) more patients (n= 52, 71%) within the cervicothoracic thrust manipulation and dry needling group achieved a successful outcome compared to the mobilization, exercise and interferential electrotherapy group (n=18, 25%) at 3 months follow-up. Effect sizes were large for related-disability (SPADI: $SMD=1.11$) and shoulder pain intensity (NPRS: $SMD=1.06$) in favor of the manipulation and dry needling group at 3 months. In addition, significantly ($X^2=25.710$; $P<0.001$) more patients in the cervicothoracic thrust manipulation and electrical dry needling group (n=54, 74%) completely stopped taking medication for their pain compared to the mobilization, exercise and interferential electrotherapy group (n=23, 32%) at 3 months.

Discussion / Conclusion:

Cervicothoracic high-velocity low-amplitude thrust manipulation and electrical dry needling was more effective for pain and disability reduction than non-thrust joint and soft-tissue mobilization, exercise and interferential electrotherapy in patients with SPS, and the effects were maintained at 3 months.

Abstract - ID: 85

Authors: Marc-Olivier St-Pierre, University of Quebec in Trois-Rivieres; Stéphane Sobczak, University of Quebec in Trois-Rivieres; Mickaël Begon, University of Montreal

Title: Assessment of hip joint intra-capsular pressure within the acetabular cavity and the lateral chamber during hip testing: a cadaveric preliminary investigation

Background / Purpose:

The hip labrum increases the contact surface of the acetabulum and helps to regulate the fluid exchange between the acetabular cavity (AC) and the lateral joint chamber (LJC). A previous study has demonstrated the sealing capacity of the labrum by using cadaveric specimens and reported that the hip positions influence fluid exchange between both compartments. To date, no information is provided concerning the pressure modifications into both, the AC and the LJC of the hip joint during hip clinical assessment. The purpose is to evaluate the intra-capsular pressure into the AC and the LJC of the hip joint in different movements relative to the hip clinical assessment.

Methods:

Two hips from the same fresh-frozen pelvis-to-toe cadaveric specimen were skeletonized from the lumbar spine to the distal femur. The hip capsular ligaments were carefully preserved. The coxal bones were stabilized in anatomical position on an experimental frame using two external fixators. Two intra-osseous tunnels were drilled to reach the inside of the joint capsular chamber. The lateral tunnel was drilled below the greater trochanter and the medial tunnel was drilled in the coxal bone to reach the LJC and AC, respectively. One disposable injection chamber was glued at the entrance of each tunnel to insert the two fibre optic pressure sensors. Before pressure measurement, 2.5 ml of water were injected into the LJC. Hip joints were tested in six different positions: 90° of flexion, max-EXT, max-ABD, max-ADD, flexion-abduction-external-rotation (FABER), Flexion-adduction-internal-rotation (FADIR) and decoaptation. Each movement was repeated five times and the hip was replaced in a neutral anatomical position between each repetition.

Results:

The results showed that the greatest pressure fluctuations were present in the AC for all movements tested. The 90° of flexion showed a positive pressure in the first 45° and negative pressure in the last 45° of flexion. The max-EXT showed an increase of pressure in both compartments with means pressure of 18.04 ± 6.73 mmHg and 4.92 ± 1.81 mmHg in the AC and the LJC. The adduction movement showed, simultaneously, an increase of pressure in the AC and a decrease in the LJC. The FADIR movement showed a mean pressure of 10.41 ± 2.05 mmHg in the AC and of 1.86 ± 0.61 mmHg in the LJC. The decoaptation at 90° of flexion and at max-EXT showed respectively a mean depressurization of -67.26 ± 13.69 mmHg and -32.89 ± 8.42 mmHg both in the AC. The FABER movement showed no clear pressure behaviour in both compartments.

Discussion / Conclusion:

This preliminary investigation showed that pressure measurement is dependent on the compartment being evaluated and on the movement being tested. This study shows greater depressurization in the AC at 90° of flexion when compare at max-EXT, demonstrating similar results reported in previous studies.

Abstract - ID: 86

Authors: Brian Russ, Nova Southeastern University; Ovidio Olivencia, Nova Southeastern University; Amanda Feldstein, Tampa General Hospital; Cameron Lombardi, Nova Southeastern University; Mong Seyla-Touch, Nova Southeastern University; Andrew Miller, Nova Southeastern University; M. Samuel Cheng, Nova Southeastern University

Title: Sliders or tensioners: Does it matter?

Background / Purpose:

Neurodynamic mobilization is a commonly used treatment modality. Despite evidence supporting the usefulness of neurodynamic techniques, little is known about the most effective administration of these interventions. Studies that demonstrate positive effects on pain and range of motion often lack a standard means of application. Additionally, there is inconclusive evidence regarding whether or not the manner of application is relevant. Two techniques commonly used in clinical practice, known *as* sliders *and* tensioners, *are* believed to have different mechanical effects. The goal of this study was to investigate the short-term effects of the two most common forms of neurodynamic intervention.

Methods:

Subjects were excluded if they reported current neurological or orthopedic injury or lacked full range of motion of cervical spine and upper extremity. Baseline measures of elbow flexion range of motion during the upper limb tension test (ULTT) median and pain pressure threshold (PPT) at three locations (C5/6, lateral epicondyle, and tibial anterior) were collected. Participants were then randomly allocated to perform either a median nerve slider *or a* tensioner. Neurodynamic intervention was administered for 1-minute, 3 times, with a 1-minute rest in-between sets. Subjects were then instructed to perform the exercises one additional time the following day and return for follow-up assessment in 48-hours, at which time the ULTT and PPT measures were repeated. Data was analyzed using SPSS software.

Results:

57 subjects completed the study with no adverse effects. 28 subjects were allocated to the slider groups and 27 to tensioner group. A repeated measures ANOVA demonstrated no significant between-group difference on all measures at any of the time points. However, there were within-group difference in ROM ($F=23.265$, $p<.001$) and PPT taken at the tibialis anterior ($F=4.258$, $p=.044$). The ROM in the slider group changed overtime from 40.68° elbow flexion at baseline to 36.04° immediately post intervention to 33.14° at 48 hours post, whereas the tensioner group changed from 41.85° to 37.56° to 34.81° , respectively.

Discussion / Conclusion:

The results of this study indicate that sliders *and* tensioners may have similar effects. While evidence did not suggest a difference between the two, both interventions demonstrated improvements of neural mobility and global pain modulation when administered over a 48-hour period. Clinicians should consider the characteristics of each individual patient and the response to the selected neurodynamic intervention when deciding which technique may be most appropriate to employ. An interesting finding was the significant change in PPT at the tibialis anterior over time. This finding is consistent with previous studies on the global effects of pain modulation with spinal manipulation and may indicate a similar response with neurodynamic mobilization.

Abstract - ID: 87

Authors: Robert Fluegel, Manhattan Orthopaedic & Sports Therapy; Robert Fleming, Fleming PT Consultants; Chris Showalter, Maitland Australian Physiotherapy Seminars

Title: Manual therapy for the treatment of a patient with mixed headache presentation: a case report

Background / Purpose:

The International Classification of Headache Disorders (ICHD3) classifies headaches into 2 base categories: primary including migraine, and secondary including the cervicogenic (CGH). Approximately 44% of patients with complaints of headaches have more than one type of headache. A proposed mechanism of CGH is a convergence between trigeminal afferents and afferents from the upper three cervical nerve roots in the trigeminocervical nucleus. The purpose of this single case report was to describe the effect of manual therapy in treating the cervicogenic component for a patient with mixed headache presentation.

Case Description:

A 34 year-old female presented with complaint of constant left-sided headache of 3 months duration. Patient had cerebral palsy (CP) and a 20-year history of left-sided migraine headache. Migraine triggered by barometric pressure changes with a typical frequency of once a month for a duration of 8 hours. The pain intensity was 6-7/10 on the Numeric Pain Rating Scale (NPRS). Her symptoms had been treated with Rizatriptan. Prior treatment for this episode included a nerve block, which decreased symptoms for approximately 3 weeks. A second nerve block had no effect. On the initial evaluation, her self-reported outcome measures scores were 35.5% on the Neck Disability Index (NDI), 64 on the Headache Disability Index (HDI) and 5/10 for the current NPRS, 2/10 for best NPRS and 8/10 for the worst NPRS. In addition, the patient reported that her current headache was on the same side as her typical migraine headache, but indicated that it felt different, and not responding to Rizatriptan. The objective examination findings included significant forward head posture and rounded shoulders. Her active cervical range of motions (ROMs) was moderately limited in all planes, and reproduced localized neck pain, but did not reproduce her headache. However, passive unilateral posterior-anterior (UPA) tests on the left at C1 and C2 in neutral reproduced the patient's headache complaint. The patient was subsequently treated with a combination of manual therapy, neuromuscular re-education and therapeutic exercises for a total of 10 sessions over the course of 8 weeks. Manual therapy included left UPA grades II-IV to C1 and C2 in neutral as described by Maitland.

Outcomes:

At discharge, her NDI score was decreased to 8.8%, her HDI score was decreased to 24, and she had no headache. Her Global Rating of Change (GROC) score was +7.

Discussion / Conclusion:

Patients presenting with complaints of headache can be difficult to treat due to the overlap of headache types. This case report illustrates the successful treatment for the cervicogenic component of a patient with mixed headache presentation using manual therapy and clinical reasoning.

Abstract - ID: 89

Authors: Ibidunni Alonge, University of Ibadan, Nigeria; Omoyemi Ogwumike, University of Ibadan

Title: Effects of a twelve-week exercise therapy programme on pain and quality of life of extension responders with chronic mechanical low back pain

Background / Purpose:

Chronic mechanical low back pain (CMLBP) has been reported not to be simply a physical problem but a persistent disabling condition that has a profound effect on the life of the sufferer with high demand on the health services, particularly primary care. It would thus be encouraging if an exercise therapy programme could benefit such individuals by reducing pain and improving their quality of life. This study was therefore designed to investigate the effects of a twelve-week exercise therapy programme on the self-reported pain intensities and quality of life of individuals with CMLBP.

Methods:

Seventy-six consenting individuals with CMLBP seeking physical therapy in a primary care setting were purposively recruited over a one year period, and randomized into Exercise Group (EG; n= 38) and Self-management Group (SG; n= 38). The participants demonstrated directional preference for extension with pain centralization, or constant pain based on the McKenzie Institute's Lumbar spine assessment, to ensure homogeneity of sample. They received back care education on good posture maintenance during activities of daily living. In addition to this education, the EG received muscular endurance exercise programme (stretching and endurance exercise training to the back, anterior trunk, hip, thigh and leg muscles). Exercise classes were held thrice weekly for twelve consecutive weeks. Assessments of Pain Intensity (PI) and Quality of Life (QoL) were done using Visual Analogue Scale and European 5-dimension QoL questionnaire. Data were analysed using descriptive statistics and Student *t*-tests at $\alpha_{0.05}$.

Results:

At baseline, participants in the EG and SG were comparable in age (33.4 ± 9.8 years) and (38.8 ± 12.3 years), for PI (5.2 ± 1.9 , 5.1 ± 1.8), QoL (0.7 ± 0.1 , 0.7 ± 0.1) respectively at baseline. Within the EG, there were significant improvements when the scores at baseline and at the end of the 12th week were compared for PI (5.2 ± 1.9 and 0.9 ± 0.3) and QoL (0.7 ± 0.1). Within the SG, there were significant improvements in PI [5.1 ± 1.8 and 1.8 ± 0.3], and QoL [0.7 ± 0.1 and 0.8 ± 0.0]. Overall, at the end of twelfth week, there were significant improvements in PI (0.8 ± 1.1 , 1.8 ± 1.3) and QoL (0.8 ± 0.1 , 0.8 ± 0.1) of EG compared to SG.

Discussion / Conclusion:

Twelve-week exercise therapy programme accompanied with back care and pain prevention education offered better improvement in pain and quality of life of individuals with chronic mechanical low back pain than self-management as defined in this study. It is therefore recommended that physical therapists should employ supervised group exercise along with back care and pain prevention education in management of CMLBP

Abstract - ID: 90

Authors: Kellie John, Holy Cross Hospital Orthopaedic Physical Therapy

Title: The use of cervicothoracic thrust manipulation in the treatment of rotator cuff tendinopathy: a case report

Background / Purpose:

Anterior shoulder pain, such as symptoms caused by rotator cuff (RTC) tendinopathy, is commonly treated with exercise and manual interventions directed to the glenohumeral joint and its surrounding muscular complex. Recent research has further investigated interventions based on the concept of regional interdependence, or how a seemingly unrelated impairment in an anatomical region may contribute to one's primary complaint. Recent evidence demonstrates the effectiveness of interventions directed to the cervical, thoracic, and rib regions on shoulder pain. The purpose of this case report is to describe the outcomes of cervicothoracic thrust manipulation on a patient who presents with RTC tendinopathy.

Case Description:

A 38 year-old female presented to physical therapy with a primary complaint of left posterior shoulder pain after sleeping on her left side. Symptoms worsened over a 2-week period, restricting her ability to reach above shoulder height, lift or carry heavy objects in left arm, or perform self-care, ADLs or work tasks. Examination revealed forward head, abducted left scapula, dyskinetic scapulothoracic rhythm with shoulder elevation, positive Hawkins-Kennedy, Neer's, left Spurling's, and hypomobility of lower cervical and upper thoracic spine. Past medical history was unremarkable with the exception of systemic lupus erythematosus. A cervicothoracic thrust mobilization was delivered at each session, including initial evaluation, followed by exercises promoting cervico-scapulo-thoracic stability.

Outcomes:

The patient was seen for four visits in which a cervicothoracic thrust manipulation was performed bilaterally at each session. Following each manipulation, the patient demonstrated increased active left shoulder elevation, decreased shoulder pain, increased cervical AROM, and negative Neer's test. Although improvements were seen within each session, no change in shoulder symptoms or on functional outcome measures (QuickDASH) evident between sessions.

Discussion / Conclusion:

Recent research has emerged showing successful treatment of shoulder pain with thoracic spine manual interventions; however, limited research exists on the effect of cervicothoracic manipulation on rotator cuff pathology. A systematic review by Peek et al. determined that the use of thoracic manual therapy in the treatment of nonspecific shoulder pain led to accelerated rehabilitation, decreased pain, and reduced disability. Cervical and thoracic spine thrust mobilizations can be immediately effective in reducing shoulder pain. Future investigation on the effect of cervicothoracic manipulation on rotator cuff tendinopathy versus standard treatment of shoulder pain would further guide clinical practice.

Abstract - ID: 91

Authors: Praneeth Purimetla, Regis University

Title: Chronic left anterior hip and medial knee pain managed with joint mobilization to lumbar spine and neurodynamics to femoral nerve

Background / Purpose:

Dysfunction originating from the upper lumbar spine alone is rare. The expected complaints may involve lower back pain and referral pain to the lower extremity. However, actual clinical presentation and neurological findings are variable and non-specific. The purpose of the case report is to describe a patient with hip and knee pain and absence of low back pain who was managed successfully with lumbar spine and femoral nerve mobilizations.

Case Description:

An 80 year-old female with left anteromedial hip and medial knee pain for 10 months was referred to physical therapy (PT) because she was unable to perform activities of daily living or exercise without pain. She was treated for hip and knee pain, but failed to have relief of her symptoms. On her initial examination, she denied back pain and rated her hip and knee pain from 5 to 8 out of 10, depending on the type of activity. She also rated her ability for walking and biking at 3 and swimming at 4 out of 10 on the Patient Specific Functional Scale (PSFS). She denied any signs and symptoms consistent with red flags. Examination revealed that lumbar flexion and right sidebending reproduced her hip pain and that patient had decreased lumbar motion by 50%. Hypomobility was present at L2 to L4 on the left. Groin pain was elicited with left unilateral posterior-to-anterior (PA) mobility tests at L2 to L4, particularly at L2/3. Prone femoral nerve tension and sidelying femoral nerve slump tests were positive on the left. There was tenderness along the anterior and medial portion of the left thigh. She could not perform a left single leg sit-to-stand, secondary to weakness. Dermatome, myotome, and reflex testing were unremarkable. Initial intervention focused on left unilateral PA mobilizations at L2 to L4, which improved symptoms. Femoral neurodynamics and inferior/lateral hip mobilizations were incorporated to address reduced nerve mobility. Home exercises prescribed were prone lumbar extension, sidelying femoral nerve glide, resisted terminal knee extension, and proximal hip and core strengthening.

Outcomes:

The patient received nine PT sessions over five weeks. At discharge, the patient no longer had hip and knee pain. She rated walking and swimming at 7/10 on the PSFS, Her remaining complaint was muscular soreness in her quadriceps if she walked more than 60 minutes. She reports feeling "a great deal better" (+6) on the Global Rating of Change Scale. At the 1 month follow-up, she reported swimming without limitations and that she had gone for a 4-mile hike at a moderate pace without pain.

Discussion / Conclusion:

This case highlights the importance of recognizing the ambiguous nature of upper lumbar spinal pathology. Incorporation of a thorough lumbar assessment with consideration of femoral nerve tension, despite absence of back pain, could help guide treatment in patients complaining of anterior/medial hip or knee pain.

Abstract - ID: 92

Authors: Hayden Jinright, University of Kentucky; Clay Williams, University of Kentucky; Natalie Kassoff, University of Kentucky; Charles Hazle, University of Kentucky

Title: Spurling's test: inconsistencies in clinical practice

Background / Purpose:

The value of Spurling's test has been variously reported toward its intended purpose of diagnosis or classification of patients with cervical radiculopathy. Disparities in description, methodology, and interpretation of the test are plentiful. Such variation leads to concern for the initial diagnosis/classification of patients and subsequent care that follow usage and interpretation of Spurling's test and warrants exploration.

Methods:

An invitation to an anonymous web-based survey was distributed to members of the Academy of Orthopaedic Physical Therapy (AOPT) of the American Physical Therapy Association. Respondents were asked about their preferred methods of utilization, criteria for test interpretation, and the value of Spurling's test among other examination findings towards decision-making in patients with potential cervical radiculopathy. As part of the survey, respondents viewed video simulations of methods of Spurling's test execution, results, and interpretations. Additional survey items addressed use of Spurling's test in electronic documentation, participant familiarity with literature and education on Spurling's test, and practitioner professional profile characteristics.

Results:

A total of 452 physical therapists completed the survey, including 66 American Academy of Orthopaedic Manual Physical Therapists (AAOMPT) Fellows. The preferred test methodology described by respondents had low levels of agreement with no single combination of up to seven passive movement positions of the patient's cervical spine accompanied by compression being preferred by more than 35% of respondents. While 96% of respondents reported symptoms to the hand/distal symptoms were criteria for a positive test, 82% reported symptoms only to the suprascapular region without distal symptoms and 67% with symptoms provoked to the scapular/periscapular region without distal symptoms would also qualify for positive tests. Fisher's exact test revealed no statistical difference between AAOMPT Fellows and non-fellows in responses to test performance methodology or test interpretation. Additional professional profile characteristics, including clinical specialization, other manual therapy credentials, and years of practice were analyzed for correlations of test performance and interpretation.

Discussion / Conclusion:

The results of this survey, if representative, suggest remarkable inconsistency may exist in physical therapy clinical practice with Spurling's test performance and interpretation. The potential impact of these inconsistencies may be especially noteworthy for decision-making in the process of diagnosis/classification and subsequent clinical care. Contextually, the test and its interpretation are important, considering a positive Spurling's test is a predictor variable in derivation level clinical prediction rule for diagnosis of cervical radiculopathy and also specifically cited as a prominent examination procedure in the current Neck Pain: Clinical Practice Guidelines Revision (2017) and its associated classification system by the AOPT. Given the presence of clinical and imaging evidence regarding Spurling's test methodology and interpretation, entry-level educational curricula and post-graduate educational efforts may be well-served with instruction in performance and interpretation consistent with that evidence.

Abstract - ID: 93

Authors: Andrea Westbrook, Method Manual Physical Therapy and Wellness; Vincent Kabbaz, HEAL Physical Therapy; Chris Showalter, Maitland Australian Physiotherapy Seminars

Title: Cervical hypomobility or sinister pathology: a case report of Eagle's syndrome

Background / Purpose:

Eagle's syndrome is an underdiagnosed, complex symptom assortment produced by provocation of the sensitive structures of the carotid space by distinct anomalies of the styloid process, including approximation of the styloid and C1 transverse process. As the styloid traverses between the internal and external carotid arteries, provocation of the vessels and periarterial sympathetic nerve fibers can lead to various neural, vascular, and autonomic symptoms. In rare cases, it has produced transient ischemic attack (TIA), stroke, and death. Eagle's syndrome commonly presents as neck pain, facial/jaw pain, headache, arm paresthesias; problems physical therapists frequently evaluate and treat. This study aims to outline the common signs, symptoms, and functional limitations of patients with Eagle's syndrome, and describe a case in which the therapist was able to assess poor response to treatment and assist in surgical referral. Autonomic dysfunction is not a commonly recognized feature of Eagle's syndrome, but this case highlights a multitude of autonomic symptoms associated with Eagle's syndrome, and displays the prevalence of autonomic features in the literature.

Case Description:

A 37 year-old female presented to physical therapy (PT) for neck and facial/jaw pain/stiffness, headaches and arm paresthesias (with history of previous bouts of PT years prior with beneficial results). Current functional limitations included end range cervical/jaw movements, sustained neck flexion activities, and difficulty sleeping. Mild limitations in upper cervical mobility were noted actively and passively, especially left lateral flexion/rotation. Negative tests were determined for ligamentous laxity, arterial insufficiency, cranial nerve testing, and cervical radiculopathy. Transverse and posterior-anterior joint mobilizations targeting C1 hypomobility produced the patient's comparable sign and showed marked improvements in neck pain, headaches, and epiphora in the short-term only. Adverse reactions to manual therapy and therapeutic exercise interventions were recognized with further progression and self-care, including right facial paresthesias, dizziness, ear muting/ringing, chest pain, hoarse voice, and dyspnea, resulting from irritation of the neural and vascular structures involved with Eagle's syndrome, and PT was discontinued. These poor responses to PT, the multitude of autonomic and vascular symptoms, and palpatory findings, assisted the therapist in referral for Eagle's syndrome assessment and eventual surgery.

Outcomes:

Initial Neck Disability Index (NDI) of 34% improved by 8%, from moderate to mild disability after the four PT visits, with progressive worsening in the following weeks. No disability (6%) was reported 3 months post-surgically. Epiphora was measured by Schirmer's test, and tears produced per hour. Both measures improved with PT and post-surgically. Near-complete resolution of all symptoms was reported at six months post-surgically.

Discussion / Conclusion:

Patients who unknowingly have Eagle's syndrome frequently pursue PT interventions in their search to obtain relief. Thorough assessment of the entire clinical picture can assist the therapist in treating the patient safely, avoiding potentially serious complications from inappropriate upper cervical interventions, and expedite referral.

Abstract - ID: 94

Authors: Frederic Froment, IAMPT; Kenneth Olson, IFOMPT; Troy Hooper, Texas Tech University Health Sciences Center; Stephen Shaffer, High Point University; Phillip Sizer, Texas Tech University Health Sciences Center; Linda Woodhouse, University of Alberta; Jean-Michel Brismée, Texas Tech University Health Sciences Center

Title: Musculoskeletal advanced physiotherapy scope of practice: an international exploratory survey throughout WCPT and IFOMPT member organizations

Background / Purpose:

The World Confederation for Physical Therapy (WCPT) supports the right of member organizations (MOs) to develop national policies that encourage practice specialization by promoting high Physical Therapy (PT) standards. The International Federation of Orthopaedic Manipulative Physical Therapists (IFOMPT), as sub-group of the WCPT, provides educational standards for musculoskeletal PT care. One potential PT profession development relates to advanced practice physiotherapy (APP) privileges. To date, no study has investigated in detail musculoskeletal APP privileges within countries that are WCPT MOs.

Methods:

An electronic survey was sent to all WCPT and IFOMPT delegates. Descriptive statistics were used to assess the variability of APP privileges prevalence between WCPT MOs. Inferential analyses using *Pearson Chi-Square* and *Fisher's Exact tests*, *Spearman rank correlation coefficient*, *Point-biserial correlation coefficient*, and *Phi coefficient* examined the strength of the relationships between the number and types of APP privileges and: (1) Country affiliation to IFOMPT; (2) Entry-level professional degree; (3) Post professional training. The alpha level for significance was set at .05.

Background/Hypothesis:

To investigate the status of musculoskeletal APP privileges for physical therapists worldwide, and correlate education degrees, post-professional educational training for countries that are and are not IFOMPT MOs.

Results:

The number of APP privileges allowed for each country was not correlated with the country affiliation to IFOMPT, with countries not affiliated with IFOMPT such as Bangladesh, Pakistan and Macau reporting 15 or more APP privileges allowed, while others affiliated with IFOMPT such as Austria, Japan, and Germany reporting one or zero APP privilege allowed. The three most frequently allowed APP privileges among the 20 listed in the survey for all WCPT MOs were: (1) manipulation (85.0%), (2) perform dry needling (67.5%), and (3) direct access (55.0%). The five APP privileges that had statistically significant higher prevalence in countries that were IFOMPT MOs versus those that were not IFOMPT included: (1) direct access 72.7% versus 44.4% ($p=.029$), (2) perform dry needling 81.8% versus 55.6% ($p=.035$), and (3) Perform acupuncture 68.2% versus 40.0% ($p=.03$), (4) perform and interpret diagnostic ultrasound imaging 45.5% versus 20.0% ($p=.03$), and (5) perform injections of medications into joints, soft tissue 27.3% versus 6.7% ($p=.02$). Only IFOMPT MOs displayed fair correlation ($r_s=.48$, $p<.03$) between entry-level PT degrees and APP privileges number. Countries that were IFOMPT MOs were less likely to require post-professional training to obtain the right to practice direct access and manipulation.

Discussion / Conclusion:

Only IFOMPT MOs showed a correlation between entry-level PT education program degree and the number of APP privileges suggesting that the number of APP privileges allowed for each country is a multifactorial process. The IFOMPT MOs were less likely to require post-professional training for direct

access and manipulation APP privileges. We hypothesized that educational standards requirements to become IFOMPT MOs and the influence of the presence of musculoskeletal PT specialists in these countries may play a role in these findings.

Conclusion / Significance:

Advanced scope of practice development is crucial for the expansion of PT profession autonomy. Our study serves as a foundation for future research aimed at evaluating the mechanisms regulating PT scope of practice.

Abstract - ID: 95

Authors: Elayna Theiss, University Hospitals and Daemen College; Ronald Schenk, Daemen College

Title: Physical therapy intervention for the treatment of thoracic spine pain and POTS: a case report

Background / Purpose:

While there is an abundance of information regarding the clinical course and treatment of back pain in the cervical and lumbar region, there is less evidence describing the clinical course, management, and prognosis for individuals experiencing thoracic spine pain. The purpose of this case report is to describe the application of Mechanical Diagnosis and Therapy (MDT) and exercise prescription for a 28yo female patient with thoracic spine pain and the diagnosis of POTS.

Methods:

A multi-faceted treatment approach for the treatment of the patient's symptoms included: increasing her salt intake, taking Lexipro, and a PT-supervised exercise plan. Physical therapy intervention included thoracic shift correction at the T4 level and a graded cardiovascular exercise program.

Case Description:

This case study describes the clinical presentation, physical therapy intervention, and outcomes of a 28-year-old female athletic trainer presenting for the treatment of central mid-thoracic spine pain with a subsequent diagnosis of Postural Orthostatic Tachycardia (POTS). The patient received a mechanical examination for a chief complaint of constant thoracic spine pain and intermittent right upper extremity pain following the ulnar nerve distribution. While initially found to have a directional preference for thoracic extension, and improvement with prescribed repeated end range thoracic extension, the patient's clinical presentation changed after receiving a thoracic distraction manipulation from a colleague (other than the treating physical therapist) while at work. The following day, the patient returned to the treating physical therapist with worsened thoracic complaints, and re-examination of the patient's status indicated no directional preference, along with what appeared to be a relevant thoracic lateral shift. Additionally, the patient began describing symptoms of heaviness in her legs, dizziness, increased fatigue, and a feeling of her "heart racing." While these atypical symptoms may have been related to T4 syndrome, the patient was referred to her PCP, who ordered a tilt-test which confirmed the suspected diagnosis of POTS.

Results:

The patient's adherence to the POTS exercise program, combined with home exercises to include thoracic shift correction and thoracic extension, led to a discharge from physical therapy in March 2018. A change in the patient's work situation led to difficulty with exercise adherence and the patient saw the treating physical therapist for consultation. Although her thoracic complaints were now manageable, her POTS symptoms had returned (as indicated above) and she was again experiencing heightened anxiety due to the exacerbation of POTS related symptoms.

Conclusion / Significance:

Although thoracic complaints with an atypical symptom distribution may be related to T4 syndrome, and dizziness may be of cervical spine origin, musculoskeletal conditions may present concurrent with POTS. A lack of response to mechanical treatment in people with concurrent orthostatic tachycardia may require other strategies and an emphasis on the importance of exercise adherence.

Abstract - ID: 96

Authors: Jacob Wright, Achieve Physical Therapy

Title: The use of cervical spine graded passive movements for treatment of cervicogenic headaches: a case report

Background / Purpose:

Headaches and reduced cervical active range of motion are a common patient presentation in the orthopedic physical therapy setting. These conditions can limit the patient's ability to perform activities of daily living. The purpose of this case report is to describe the Maitland-Australian intervention approach consisting of graded passive movements of the cervical spine with traditional therapeutic exercise for an individual with cervicogenic headaches.

Case Description:

A 32-year-old female was referred to the outpatient clinic for cervical pain and headaches. Her chief complaint was a five-year history of right-sided headaches with an average intensity of 5/10 on the Numeric Pain Rating Scale (NPRS). She reported reduced cervical range of motion, limitations with job related computer work, and difficulty performing activities of daily living such as scrap booking, cleaning her home, and playing with her children. The patient was assessed and treated for 5 visits over a 16-day period including a 3-week discharge follow-up. The intervention included comparable cervical passive movements to the right C1-2 zygapophysial joint utilizing the Maitland-Australian approach, commonly referred to in the literature as the patient response approach. She also received active physiological cervical range of motion exercises and stretches to the levator scapula and upper trapezius muscles.

Outcomes:

Patient reported a 98% reduction in her headaches and improved Neck Disability Index (NDI) scores from 18/50 to 8/50 by discharge at the 5th visit. At 3-weeks post discharge, she reported 99% reduction in headaches and NDI score of 4/50. The patient also demonstrated improvements in cervical joint mobility, active/passive cervical range of motion, cervical muscular strength, and pain rating (NPRS).

Discussion / Conclusion:

In this isolated case, the results suggest that passive movements utilizing the Maitland-Australian Concept in combination with conventional therapeutic exercise is effective in reducing comparable cervical spine impairments and pain in persons experiencing headaches.

Abstract - ID: 97

Authors: Marie Corkery, Northeastern University; Alexandra Avilov, Northeastern University; Blake Asis, Northeastern University; Ryan Kim, Northeastern University; Matthew O'Brien, Northeastern University; Alex Pinto, Northeastern University; Emily Stearns, Northeastern University; Jason Parente, Northeastern University; Sheng-Che Yen, Northeastern University

Title: A comparison of diaphragm muscle thickness in different body positions using ultrasound imaging

Background / Purpose:

Altered diaphragm muscle activation is associated with dysfunctional breathing patterns, is thought to affect core trunk muscle activation and may adversely impact athletic performance. Diaphragmatic breathing instruction is commonly used in clinical practice by physical therapists to improve muscle activation. Various body positions are used to facilitate optimal diaphragm muscle performance. Diaphragm muscle thickness can be measured using ultrasound imaging to assess contractility, however little information is available regarding the effect of patient position on diaphragm thickness. The purpose of this study was to compare diaphragm muscle thickness in 3 different body positions.

Methods:

Eleven college-age athletes (9 females, 2 males, mean age 23 ± 2 years old) participated in this descriptive repeated measure study. Diaphragm muscle thickness was measured using B-mode ultrasound and a linear probe, with participants in 3 different positions in random order: (1) high kneeling, (2) supine with knees and hips flexed to 90° (supported) and shoulders flexed to 90° and (3) quadruped. The right hemi-diaphragm was measured at the 8th or 9th intercostal space, at the mid-axillary line. Measurements were taken during quiet breathing end expiration, peak inspiration, and peak expiration. Mean diaphragm thickness values were calculated for each position and mean thickness ratios (inspiration thickness/expiration thickness) were calculated to compare relative diaphragm contraction during each condition. A paired t-test was used to compare measurements in different positions.

Results:

Mean diaphragm thickness measurements and inspiratory to expiratory ratios did not differ significantly between body positions.

Discussion / Conclusion:

Preliminary data indicates that body position did not affect diaphragm muscle thickness. Additional research with more participants and varied patient populations is needed to understand the role of body position on diaphragm muscle contractility. This will improve our understanding of the function of this muscle and help determine if there are optimal positions for activation.

Abstract - ID: 98

Authors: Tara Lillemon-Caberwal, United States Army - Civilian Contractor

Title: Delayed diagnosis of a chronic alar ligament rupture in a special operations soldier

Background / Purpose:

There are limited reported cases of isolated alar ligament ruptures. Motor vehicle accidents (MVA) and/or blunt trauma are cited as common mechanisms of injury. The clinical presentation of alar ligament injury can pose a challenge for clinicians and radiologists, leading to a delayed diagnosis. This is attributed to complex symptomatology, limited cervical evaluation tools, and unsatisfactory reliability with magnetic resonance imaging (MRI). Alar ligament injuries are rare, but can be deadly. It is crucial that an examination, of the cervical spine, include specific ligamentous stress tests for early identification and management of these injuries. The purpose of this case study is to present a patient with a delayed diagnosis, chronic alar ligament rupture, who's original MRI was unremarkable.

Case Description:

A 40-year-old male, active duty Special Operations soldier, was involved in a 2016 deployment-related MVA, resulting in blunt trauma to the head. Over the next two years, his chronic neck pain and headaches were evaluated and treated, with minimal improvements. Eventually, the patient was referred to the primary author for evaluation. Active motion revealed limitations in bilateral rotation, extension, and left side bending. Neurological screen was unremarkable. Side bending and rotational stress tests for the alar ligament revealed excessive motion and cardinal symptom provocation (loss of balance and bilateral limb paresthesia). The patient was immobilized in a hard collar, radiographic imagery reviewed, and consultation with primary care physician about findings. This case's significance lies in the delayed diagnosis of chronic alar ligament injury, despite the extensive medical care from specialists. Headache and neck pain were attributed to traumatic brain injury (TBI) symptomatology. Craniovertebral stress tests had never been performed. Additionally, the original radiographs and MRI were unremarkable; however, it was discovered that the views did not assess craniovertebral levels. A second high-resolution contrast MRI (3-Tesla) was performed, focusing on craniovertebral levels, and a right alar ligament rupture was appreciated. A referral was placed to the orthopedic spine surgeon for consultation.

Outcomes:

The patient's initial Neck Disability Index (NDI) was 70%, and he rated his daily headache pain 4-8/10 on a numerical pain rating scale. After 1 month of cervical immobilization, the NDI was 34%, and daily headache pain varied between 2-4/10 on a numerical pain rating scale.

Discussion / Conclusion:

Alar ligament injuries pose a challenge for diagnosis by clinicians and radiologists. The overlay of concussive/TBI symptomatology and unremarkable imagery, adds to the challenge of accurate diagnosis. Delays in correctly identifying alar ligament injuries, lead to chronic pain, loss of function, and increased death rate. Case findings suggest physical therapists should be cognizant of craniovertebral symptomatology and perform specific ligamentous stress testing, prior to therapeutic interventions to this region. Additionally, further exploration of craniovertebral stress testing is necessary for validation.

Abstract - ID: 99

Authors: James Curtis, Regis University and University of North Carolina; Bryan Dennison, Regis University; Cameron MacDonald, Regis University

Title: combining pain neuroscience education with manual therapy and exercise management for an individual with an exacerbated 10-year presentation of bilateral foot pain

Background / Purpose:

Chronic pain in the United States is associated with increased falls risk, lower quality of life, and reduced overall function. The purpose of this case report is to describe a multimodal approach for an individual with a 10-year history of chronic bilateral foot pain exacerbated by an acute right ankle fracture.

Case Description:

A 53-year-old female presented to physical therapy (PT) with chronic bilateral foot pain exacerbated by a recent right ankle fracture. Prior to the ankle fracture, she saw multiple medical providers, including physical therapists; all of which provided no symptomatic relief. She was originally diagnosed with bilateral plantar fasciitis and began avoiding standing activities. After five years of worsening symptoms, she began to spend the majority of her day in a wheelchair using it for mobility. Following the ankle fracture, she was placed in a controlled ankle motion boot and was non-weight bearing for approximately one month. When she was cleared for weight-bearing activities, she continued to limit any weight-bearing activity. PT management began seven weeks following her ankle fracture. A multimodal treatment approach incorporating pain neuroscience education (PNE), manual therapy (MT), and therapeutic exercise (TE) was initiated. PNE interventions utilized “Why You Hurt” by Adriaan Louw at the start of each of the first seven treatment sessions. In addition to PNE intervention, non-weight bearing exercises was initiated on the first visit, including ankle movements with a resistance band and calf stretching with a strap. Treatment then progressed to weight-bearing activities, including lateral weight shifting and standing calf stretching first and then bridges and squats on a Total Gym. MT was initiated on the fourth visit with talocrural joint mobilizations.

Outcomes:

After eight sessions, she was ambulating over three minutes without an increase in her symptoms. As her symptoms improved, her visit frequency was reduced and focused on progression of TE. At discharge (15th visit), she was no longer using her wheelchair, averaging 2,700 steps/day, and standing and walking continuously for 11 minutes. At the eight-week follow-up phone call, she was walking 30 minutes daily with her dogs, having no standing limitations, and averaging 4,000 steps/day.

Discussion / Conclusion:

This case report describes a positive patient outcome following a multimodal treatment approach utilizing PNE, MT, and TE in a patient with a chronic history of bilateral foot pain and functional limitations exacerbated by a recent ankle fracture. PNE attempts to help understand pain to reduce fear with musculoskeletal injury. Studies have shown that PNE can reduce fear and change perceptions about pain resulting in immediate improvement in physical performance during tasks as well as improved outcomes after TE. Early use of PNE may help reduce central sensitivity allowing for MT to produce short-term activation of endogenous analgesia allowing for improved tolerance with TE.

Abstract - ID: 100

Authors: Roy Film, University of Maryland; Michael Caruso, Michael Caruso PT, PA

Title: Emphasizing fascia in the treatment of a former weightlifter with low back pain after five years of stalled functional progress: a case report

Background / Purpose:

Low back pain (LBP) is the leading cause of disability worldwide, yet its cause usually does not correlate to pathoanatomical findings. The guiding principles of the APTA's vision for the physical therapy profession include identification with the movement system and the responsibility to provide interventions targeted at optimizing movement to improve the health of society. There are contributors to movement that are not commonly considered in the treatment of LBP. One of these contributors - cited in the anatomical and physiological literature but rarely addressed in the clinical literature - is the fascia network. Trauma creates changes in fascia which impact biomechanics as well as nociceptive, proprioceptive, and interoceptive inputs. This may represent a translational gap in the literature when discussing the assessment and treatment of painful movement.

Case Description:

The patient is a 33-year-old male former amateur weightlifter presenting 5 years post-injury resulting from a fall onto his buttocks. He worked as a dietary technician in a correctional facility and had been unemployed for 5 years. He presented to an outpatient physical therapy clinic with complaints of LBP and taking 30mg/day oxycodone daily. Previous treatment included surgical decompression two years post-injury at L4-S1 with revision to these same spinal levels four years post-injury. He underwent numerous pre- and post-surgical courses of physical rehabilitation, including a work hardening program, with no functional improvement. Sitting and standing tolerance were limited to a few minutes each; lifting tolerance was 20 pounds. The patient attended 16 visits of physical therapy over 11 weeks followed by a three-week work hardening phase of rehabilitation. The program included a variety of whole-body, low-load long-duration stretching. Clinic time was used to support the home program, monitor progress, reinforce appropriate pacing, support opioid weaning, and address questions and concerns.

Outcomes:

Opioid use decreased to 5mg/day of oxycodone. Lifting tolerance increased to 60 pounds. Sitting tolerance increased to 90 minutes; standing tolerance increased to over 2 hours. While in the work hardening phase he completed all physical performance requirements to return to his previous job.

Discussion / Conclusion:

This case demonstrates a favorable response for a patient with LBP and a complex movement dysfunction whose recovery had stalled for 5 years after failing to respond to common approaches to physical rehabilitation. Fascial contributions to movement were considered in designing a successful rehabilitation program. Identification as movement experts requires that physical therapists have a working knowledge of all contributors to human movement. Fascia represents a mechanical and neurological contributor to movement with significant potential for clinical translation that warrants increased scrutiny.

Abstract - ID: 101

Authors: Lynne Hughes, University of Texas Medical Branch; Rebecca Galloway, University of Texas Medical Branch; Adrianna Ellis, University of Texas Medical Branch; Jeanne Smith, University of Texas Medical Branch; Steve Fisher, University of Texas Medical Branch

Title: Cognitive mapping illustrates student learning through participation in a simulated research case

Background / Purpose:

DPT student participation in research is often difficult due to scheduling and other logistic considerations. By allowing students to perform data collection, treatment, and experience the research process from beginning to the end on a simulated subject it was believed they would develop a greater appreciation for and understanding of research methods. The purpose of this exercise was to assess student learning through participation in a simulated research case using cognitive mapping. The topic of the research was the effectiveness of manual therapy and therapeutic exercise on posture, function, and gait. Student learning was measured using a qualitative technique called cognitive mapping.

Methods:

Four students scheduled their simulated patient, collected data on the pre, mid, and post treatment assessments, and delivered the intervention. Treatment was performed with supervision from a licensed PT, who is a faculty member, familiar with the study protocol. The students also received feedback from the patient, who is licensed PT, regarding the delivery of the treatment techniques. At the conclusion of the patient case, the students were asked the question “What did you learn from this experience?” Each student was given a stack of post-it notes to write their responses. They were instructed to write one thought per post-it. Once they had written their thoughts, they were asked to arrange their post-its on a poster board. Lastly, the students were asked to tell the story of their post-it notes verbally and this narrative was recorded for analysis purposes. From these quotes, common themes and concepts were identified.

Results:

Two main themes of 1) gaining confidence in manual therapy skills and 2) this is a great learning experience. Five common concepts found were: 1) new evaluation skills (quotes = gaitrite, tekscan, cognitive mapping); 2) new manual therapy skills (quotes = joint mobs, Dallison’s technique, total motion release); 3) proper treatment techniques (quotes = patient specific care, comfort for the patient and PT); 4) feedback is helpful (quotes = cueing, proper instruction, like different perspectives of different supervising therapist and patient); 5) more to research than expected (quotes = team, organization, time consuming, detail, precision, standardization, exciting to see changes).

Discussion / Conclusion:

These four students reported benefits in learning skills and proper technique by performing the data collection and treatment of a simulated patient case following a current research protocol. The students also report learning in the area of research by participating in the simulated case as well as participating in the data collection of the current research. This type of simulated research provides the students opportunity to learn skills and to appreciate the processes necessary for clinical research.

Abstract - ID: 102

Authors: Timothy Lira, Saco Bay Orthopaedic & Sports Physical Therapy; Brian Swanson, University of Hartford

Title: Knee pain, fibular mobility deficits, and adverse neural tension: a case report

Background / Purpose:

Adverse neural tension (ANT) is a condition involving sensitivity of the nervous system. Causes include neural tissue scarring, mobility deficits, chemical irritation, or compression. Treatment goals involve neural desensitization with concomitant reduction in ANT, and may focus on nerve mobility and/or decompression at any sites of compression. Double crush syndrome occurs when proximal neural compression, which may be asymptomatic, results in attenuation and susceptibility to sensitization distally. In this case, fibular joint mobilizations were performed as primary treatment for neural decompression/desensitization secondary to mobility deficits found in the presence of knee pain and lumbar spinal stenosis (LSS). This case report describes the differential diagnosis of local nociceptive vs. neuropathic pain, and the effects of fibular mobilization on ANT in a female with a history of LSS and acute onset lateral knee pain.

Case Description:

A 76 y/o female presented to PT with lateral knee pain and difficulty walking after falling 4 weeks prior. Patient presented with antalgic gait lacking full knee extension, lateral joint line region tenderness, pain with McMurray's test, and no provocation with lumbar motions. Due to the local nature of symptoms and negative lumbar ROM screen, local treatment was initiated. Due to a lack of progress and LSS history, reassessment was performed at visit 4 to rule in/out lumbar involvement. Lumbar AROM did not elicit symptoms. However, straight leg raise testing (SLR) reproduced concordant lateral knee pain. Subsequent testing revealed a (+) Tinel sign at the peroneal nerve & superior tibiofibular joint (TFJ) hypomobility. TFJ mobilizations were performed, with immediate improvement of SLR. Neural flossing techniques yielded further improvement. After 6 visits the patient was discharged with full return to function.

Outcomes:

Patient reported pain improved from 2-10/10 at IE to 0/10 at discharge. SLR improved from 45° with pain to 75° without, (-) Tinel sign, and normalized gait between addition of fibular mobilization and discharge.

Discussion / Conclusion:

Differentiation of local knee pain may not be as straightforward as pain location might suggest. In this case, the primary pain generator was neuropathic secondary to distal articular dysfunction, which became evident following a comprehensive screen performed in the absence of improvement. ANT can be influenced by structures both proximally and distally, and subclinical factors such as LSS may play a role in susceptibility to distal neural compression. The combination of joint mobilization and neural flossing was beneficial in reducing neural irritation, resulting in resolution of ANT and the resulting knee pain.

Conclusion / Significance:

Thorough proximal-to-distal screening is required to identify potential sources of pain referral. The absence of obvious neurologic symptoms does not preclude the possibility of a neuropathic pain generator. In this case, once identified, local treatment led to prompt resolution of symptoms.

Abstract - ID: 103

Authors: Patricia Nelson, University of Mary Hardin-Baylor; Cynthia Garcia, University of Mary Hardin-Baylor

Title: Improving accuracy in lower thoracic spine palpation: a new method pilot study

Background / Purpose:

Thoracic spine manual treatment can improve local muscle activation, reduce pain and help patient recovery if applied with skillful patient selection and technique. Identification of specific landmarks in the thoracic region lags that of the cervical and lumbar spine. Geelhoed et al. suggests the thoracic transverse processes (TP) is located at the level of the cranial vertebra spinous process (SP) in all but the lower thoracic region. Variability in the lower thoracic region is large and adds to the uncertainty in clear landmark identification with palpation. This leaves a gap in the literature to guide education and practice. The purpose of this study was to examine the reliability and accuracy of a specific thoracic spine palpation method confirmed by DXA.

Methods:

Twenty-one males (n=3) and females, between 18-40 who were healthy and without prior spinal surgeries or injuries, participated in this pilot study. Participants were excluded if pregnant or unable to lay prone. After consent, participants provided demographic and physical activity information, had height, weight, and BMI recorded, then underwent palpation and DXA scanning with the patient prone on the DXA table. Tester 1 (T1) used the 11th rib to locate the rib angle and 11th TP and from this, located the most prominent SP at the same vertebral level. These bony landmarks were connected by a line drawn using an ultraviolet (UV) marker. Then tester 2 (T2), blinded to the T1 results, repeated the same palpation and marking process using a different UV marker color. Metal markers were positioned under UV light for T1 and T2 lines and a DXA image was captured of the region. Images were processed by Image-J software to measure linear distance from mid-point of 11th SP to the metal mark for each tester and categorical (yes/no) data was collected for each tester. Data analysis included descriptive measures for T1 and T2 accuracy and Intraclass Correlation Coefficient for intertester reliability.

Results:

The accuracy of finding the SP at the same level as the rib angle was 92.86% for both testers. The accuracy of finding the 10th SP from the 11th rib angle (old rule) averaged 7.14%. The accuracy of finding the 11th SP from the 11th rib (new rule) for T1 and T2 averaged 69.05%; however, the accuracy of locating the 11th rib was 76.19% (16/21 subjects) for T1 and 90.48% (19/21 subjects) for T2. The average distance from marker to caudal aspect of T11 SP was 16.79mm±18.02 for T1, and 15.01mm±10.35 for T2. Intertester reliability was moderate, ICC (2,1)= 0.422.

Discussion / Conclusion:

The current methods taught for SP identification in the thoracic region may be inaccurate based on results from this pilot study. Further studies, with a larger sample, are needed to confirm that the rib angle articulating with the transverse process is at the level as the SP of the same vertebra in the lower thoracic region.

Abstract - ID: 105

Authors: Matthew Pugliese, Hospital for Special Surgery

Title: The use of joint specific manual therapy and somatosensory training in an adolescent female presenting with medial knee pain: A case report

Background / Purpose:

Medial knee pain in a skeletally immature athlete is often associated with pathology of the medial meniscus. Patients typically present with impairments in neuromotor and somatosensory control, restricted range of motion and joint line tenderness. Individuals with knee pain have been found to have alterations of joint repositioning sense and threshold to detection of passive motion. This case study details the use of a meniscotibial mobilization and somatosensory training to improve the pain, proprioception and balance in an adolescent female athlete presenting with medial knee pain.

Case Description:

A 13-year-old female presented with an 8-week history of medial right knee pain after landing from a jump during a basketball game. She reported pain during prolonged standing, ambulation, stair negotiation and activities involving terminal knee extension. Her symptoms prevented her from running and participating in basketball activities. Her pain was initially reported to be 6/10 on the Numerical Pain Rating Score (NPRS) and 49 on the Lower Extremity Functional Scale (LEFS). Her concordant symptoms were reproduced with passive knee extension and increased when combined with varus stress. The patient displayed impaired single leg stance (< 5 seconds) on the right lower extremity and her anterior reach was limited (32 centimeters). Medial joint line tenderness and a positive Steinmann's Test was also observed. A posteriorly directed mobilization was applied to the proximal tibia at varying degrees of knee extension to emphasize the mobility of the meniscotibial complex. Neuromotor control was progressed from a non-weight bearing to weight bearing and extended knee position. Joint repositioning training involved the use of an inclinometer positioned on the proximal tibia. Perturbation exercises were performed using an inflatable band secured to the lower leg to limit tactile stimuli. The patient was instructed to perform a self-mobilization of the proximal tibia and conduct somatosensory control activities at home.

Outcomes:

Physical therapy was discontinued after 5 visits as the patient reported 0/10 knee pain, 75 on the LEFS and +6 on the GROCC. The patient had full ROM of the knee, symmetrical anterior reach, and single leg stance and resumed basketball activities without incident or limitation.

Discussion / Conclusion:

An adolescent patient with medial knee pain and proprioceptive deficits was managed successfully with a combination of joint specific manual therapy and proprioceptive exercises. A meniscotibial joint mobilization may be beneficial to reduce pain and improve function in the setting of meniscal pathology.

Conclusion / Significance:

Joint specific mobilization and exercises promoting joint proprioception may be an effective strategy in managing individuals with medial knee pain and meniscal pathology. Further research into the use of meniscotibial mobilization and the use of proprioceptive training in individuals with meniscal pathology is warranted.

Abstract - ID: 106

Authors: Laura Iglar, The Ohio State University; Cody Mansfield, The Ohio State University; Jake Bleacher, The Ohio State University; Matt Briggs, The Ohio State University

Title: Clinical decision making in implementation of manual therapy after hip arthroscopy: a fellow's case problem

Background / Purpose:

Approximately 2,581 patients undergo hip arthroscopies (HA) each year and with the incidence of HA rising 117% from 2007 to 2014, there are a growing number of patients requiring post-operative hip rehabilitation. HA rehabilitation guidelines encourage the use of manual therapy (MT), but due to the paucity of evidence in the literature, there is little guidance as to which techniques to use and how to properly implement these techniques. The purpose of this Fellow's Case Problem is to describe the clinical decision making of implementing MT techniques and the clinical outcome of a patient following HA.

Case Description:

A 35-year-old female who previously failed six months of hip rehabilitation and steroid injections, underwent HA to manage her anterior groin pain. She was referred to physical therapy and approximately five weeks post-op the patient reported increased groin pain with sitting greater than thirty minutes, ambulation without crutches, and returning to work. At 10 weeks post-op, the patient presented with active and passive hip flexion ROM to 88°, increased muscle tone and tenderness to hip flexors and adductors, hip weakness at 3+/5 into flexion, abduction, and internal/external rotation, limited flexion, abduction and external rotation (FABER) mobility and inability to wean off crutches. Due to her continued heightened pain (7/10) with exercise-centered rehabilitation, the treating therapist incorporated MT techniques to address joint mobility deficits, soft tissue restrictions, and anterior groin pain. More specifically anterior-posterior (AP) and lateral hip mobilizations were utilized based on evidence that they have been shown to improve posterior hip mobility in FAI populations.

Outcomes:

Following two treatments sessions focused primarily on a combined AP lateral glide mobilization, the patient's hip flexion improved to 100° but with end range pinching still present. Within two weeks, FABER mobility was restored by 25% of previously assessed range and sitting tolerance improve to one hour. Following an additional month of PT with MT and exercise, the patient reported a decrease in pain (2/10) and improved strength to 4/5 in all directions. Seven weeks following her first MT treatment session she was able to wean off crutches. Six months post op, the patient's Lower Extremity Functional Scale score improved from 23 to 60, hip flexion to 110°, and FABER mobility equal to contralateral hip.

Discussion / Conclusion:

This case describes the clinical decision making and on-going outcomes of a patient post HA that benefited from an AP lateral glide mobilization combined with other MT techniques to reduced anterior hip pain and restore mobility. The outcome described above reflects similar results by Lebeau et al. that found MT effective when an exercise-based therapy approach has failed. Future steps include finding attributes that would create a clinical profile of patients post hip HA that would benefit from MT.

Abstract - ID: 107

Authors: Shawn Stoute, Army-Baylor University; Jon Umlauf, Army-Baylor University; Christopher Allen, Army-Baylor University; Bryan Pickens, Army-Baylor University

Title: Diagnosis of an intramedullary thoracic cavernous malformation in a patient referred for chronic lower back pain

Background / Purpose:

Intramedullary spinal cavernous malformations (ISCMs) are a rare type of vascular malformation in the central nervous system. The prevalence of cavernous malformations is 0.4% to 0.6%, of which, ISCMs account for only 5-12%. The scarcity of ISCMs creates a diagnostic challenge and a poorly understood prognosis. Ninety percent of patients with ISCMs undergo surgical resection due to the risk of an abrupt destabilization of the neurologic system. The purpose of this case report is to describe the clinical presentation of an ISCM evaluated in an outpatient physical therapy clinic and the differential reasoning that lead to the identification of this rare condition. A detailed physical therapy subjective and objective exam, to include magnetic resonance imaging ordered by the physical therapist were part of the diagnostic process.

Case Description:

A 24-year-old man was referred to physical therapy from his primary care provider with intermittent central lower lumbar pain (ranging from 0-9/10) and left whole leg numbness. His symptoms began insidiously four months prior. The back pain was mostly associated with prolonged standing and the leg numbness was only provoked with running, but would resolve completely within 20 minutes if he continued to run. The patient was referred with a normal flexion-extension lumbar radiograph, but no advanced imaging. Physical examination revealed a normal neurologic evaluation of his lower quarter at baseline. His lower back pain was reproduced with a standard movement assessment of the lumbar spine, but no lower extremity symptoms were provoked. Left unilateral passive intervertebral motion of the lumbar spine reproduced his left leg paresthesia, described as the entire leg feeling numb and weak. A repeat neurologic reassessment identified grade 4 ankle hyperreflexia, a sustained clonus, and general spasticity throughout the left lower extremity. Due to concerns for a myelopathic condition, the physical therapist ordered an immediate magnetic resonance imaging of the lumbar spine. No abnormalities existed throughout the lumbar spine; however, due to a high index of suspicion for a space-occupying lesion, the referring physical therapist reviewed sequence images that also captured the thoracic spine and noted a spheroidal intramedullary abnormality that was not identified during the initial MRI report. A neurosurgeon was contacted for a second opinion. A subsequent immediate thoracic MRI was ordered by the physical therapist and an intramedullary thoracic cavernous malformation was identified at T9 warranting an urgent neurosurgery consultation for further management.

Outcomes:

The patient was diagnosed with an intramedullary thoracic cavernous malformation at T9 warranting urgent neurosurgery consultation for further management. Due to his age and surgical complication risk, the patient is under close observation by neurosurgery.

Discussion / Conclusion:

This case highlights the degree of physical therapist differential reasoning competency and clinical decision making. A comprehensive hypothesis-driven examination, intervertebral movement assessment, and repeat neurologic examination lead to the diagnosis of this condition. While ISCMs is a rare condition with a poorly understood patient presentation, serial neurologic assessments may be helpful to a clinician's differential reasoning when there is a significant alteration in neurologic findings during the physical examination.

Conclusion / Significance:

This case highlights the role physical therapists have in the identification of non-musculoskeletal pathology. Basic examination skills with systematic clinical reasoning lead to the diagnosis of a rare lesion.

Abstract - ID: 109

Authors: Will Conrad, Gannon University; Gerard Gorniak, Gannon University; Erin Conrad, Gannon University

Title: Lower lumbar facet joint articular wear

Background / Purpose:

Lumbar facet osteoarthritis results from excessive articular cartilage wear. Few studies describe the location(s) of lower lumbar facet wear, and none from a United States population. This study describes locations and patterns of articular wear for L3-S1 and compares these for gender and sidedness, and relates these to joint motion.

Methods:

This is a descriptive anatomical study of the articular facets bilaterally for lumbar joints L3- L4, L4- L5 and L5-S1. Articular facet wear locations from L3 – S1 were measured and mapped for the percentage of occurrence from a US population of 12 male (78.6 y.o.) and 13 female (80.9 y.o.) cadavers. Facet wear was compared at each vertebral level for males and females combined, for only males and only females, and for right and left sides. All statistical distribution and analysis was performed using version 21 of IBM SPSS Statistics (2010). Means \pm 1SD for the percentage of wear at each vertebral level were calculated with significances between gender and sidedness determined using the Independent Samples Mann-Whitney U Test. A Pearson Correlation (2-tailed) was used to correlate the percentages of wear with age, gender, side and among facet levels. The level of significance was $p < .05$.

Results:

There are differences in the wear patterns among level, gender and side, there was no significance differences in the mean number of wear areas per facet, mean degree of damage at each facet level, the mean overall percentage of wear area per level, and the mean percentage of wear area for gender and side. However, the percentage of wear was generally highest in females and on the right side and some wear patterns differed between upper and lower facets. Wear patterns are compared to lower lumbar facet wear in other populations are discussed relative to joint motion.

Conclusion / Significance:

Lower lumbar facets show common locations of wear. These locations were similar to those of previous studies on non-US populations, but there were also differences that may relate to movement and behavior.

Abstract - ID: 110

Authors: Caitlyn LeClair, University of Florida Health; Sabrina Wang, University of Florida Health; Jason Beneciuk, Brooks Rehabilitation and University of Florida

Title: The importance of combining manual therapy and neuromuscular reeducation in managing a TMD patient with aural fullness

Background / Purpose:

A relationship between aural fullness and temporomandibular joint (TMJ) occlusion has been previously described in literature. Patients with temporomandibular disorder (TMD) demonstrate co-activation of the SCOM and masticatory muscles during eating, which has been interpreted as a compensatory method for jaw stabilization. This case report describes the importance of assessment and management of SCOM hyperactivity and TMJ movement dysfunction in a patient presenting with TMD associated right ear fullness.

Case Description:

A 32-year-old woman was referred to physical therapy with a 12-year history of right ear fullness and constant right sided jaw pain. Pertinent medical history included post-traumatic stress disorder (PTSD) and anxiety following military combat service. Previous treatments included an OTC night mouthguard and antibiotics for ear infection; neither of which resulted in symptom improvements. Physical examination revealed limitations in right SCOM flexibility, TMJ mobility, upper cervical and upper thoracic mobility. Initial intervention included manual therapy techniques for improving spinal mobility and SCOM flexibility. When ear fullness and jaw pain decreased 60% and 70% respectively by visit #5, the masticatory musculature was addressed and observed to be in spasm. Subsequent manual therapy targeting deep masseter and temporalis musculature was followed up with Rocabodo's 6x6 exercises to improve TMJ function.

Outcomes:

Following fourteen visits over 3-months, ear fullness intensity improved from a constant 8–9/10 to an average intermittent 4/10 using the Numeric Rating Scale (NRS). Jaw pain intensity also improved from a constant 7/10 to 2.5/10. Increased tolerance to full range mouth opening allowing for increased eating tolerance was also observed. Right cervical rotation was improved from 69° with pain at end range to 80° with no symptoms (within 10 visits). Maximal mouth opening also increased from 37 mm (with painful symptoms) to 46 mm (with no symptoms). The overall function was reported to be 70% better upon discharge.

Discussion / Conclusion:

This case report describes how manual therapy as well as neuromuscular reeducation (NMR) exercises were utilized during physical therapy management of a patient with aural fullness. Maximal mouth opening improved to within normal limits after decreasing masticatory muscle spasm and SCOM flexibility. Prolonged stretch to the sternocleidomastoid provided immediate alleviation of fullness symptoms; however, this relief was short lasting. To maximize full functional return it is important to provide NMR to the TMJ and cervical spine as they will have more mobility than previously allowed. Future studies are needed to validate the importance of TMJ neuromuscular re-education exercises after applying manual therapy to the SCOM and masticatory muscles in TMD patients with ear fullness.

Abstract - ID: 111

Authors: Laurie Devaney, University of Connecticut; Emily Paliulis, University of Connecticut

Title: Neck mobility adaptations in college baseball pitchers

Background / Purpose:

Throwing a baseball is a complex motion that results in repeated stresses to the upper extremity, and it is well established that repeated throwing leads to adaptations in glenohumeral mobility. Recent evidence suggests that neck mobility is associated with throwing-related upper extremity injury risk, yet little is known about normal adaptations in neck mobility in this population. A population specific neck mobility profile would add clinical relevance to neck mobility measures. The purpose of this study was to determine whether neck mobility differs between baseball players and non-baseball players.

Methods:

This was an observational study. Thirty-eight throwers (21 pitchers; 17 fielders) were recruited from a Division I university baseball team, and twenty non-throwers were recruited from the general university student population. Cervical spine active range of motion was assessed with the CROM® device, and upper cervical mobility was measured using the Cervical Flexion-Rotation Test. Multivariate ANOVA and pairwise comparisons were used to analyze group differences ($p < .05$, $B = .80$).

Results:

Results: Throwers were taller ($p = .002$), heavier ($p = .003$), and had a different overall neck mobility profile versus non-throwers ($p = .02$). Univariate analysis indicated that throwers had significantly more neck extension than non-throwers ($10^\circ \pm 3.12$; $p = .001$). Further pairwise comparisons revealed that pitchers, not fielders, accounted for the observed differences between throwers and non-throwers. Pitchers demonstrated significantly more neck extension mobility than both fielders ($8^\circ \pm 3.6$; $p = .029$) and non-throwers ($14^\circ \pm 3.4$; $p = .000$). Additionally, pitchers had greater neck flexion mobility than fielders ($8.8^\circ \pm 3.6$; $p = .017$) and non-throwers ($7.4^\circ \pm 3.5$; $p = .037$), and more non-dominant side bending than fielders ($5.4^\circ \pm 2.65$; $p = .048$). There were no significant neck mobility differences between fielders and non-throwers.

Conclusion / Significance:

Neck mobility differed between baseball players and non-baseball players in a cohort of college males. Pitching accounted for the observed adaptations of greater neck extension, flexion, and non-dominant sidebending mobility. These novel findings provide a framework for neck mobility adaptations that occur in response to repetitive overhead throwing in pitchers and allow for improved understanding of the mobility profile of overhead athletes. This may allow clinicians to better distinguish between normal and potentially impaired neck mobility in this population.

Abstract - ID: 112

Authors: Harry Nguyen, University of Southern California; Jessica Evaristo, University of Southern California; Raymond Hah, University of Southern California; Justin Lantz, University of Southern California

Title: The use of orthopaedic manual physical therapy in an early initiated physical therapy program following single-level anterior cervical discectomy and fusion: a case report with 1- year outcomes

Background / Purpose:

Cervical radiculopathy (CR) is a clinical condition resulting from nerve root compression which can lead to significant pain and disability. Anterior cervical discectomy and fusion (ACDF) is the most common cervical surgical procedure for CR after initial conservative management has failed. Despite popularity of the surgical procedure, there is little published literature concerning the post-operative management of ACDF and there are currently no evidence-based guidelines or standard for treatment progression. With the potential advent of bundled payment models after spine surgery, it is imperative to determine if orthopaedic manual physical therapy (OMPT) is beneficial to clinical outcomes post-operatively. Therefore, the purpose of this case study is to describe the 1-year outcomes of an early initiated physical therapy (PT) program following ACDF, which included OMPT, in the successful management of an individual with CR as it relates to pain, function, and quality of life.

Case Description:

The patient was a 49-year-old male presenting with significant neck and right arm pain, C7 myotomal weakness, and limited cervical range of motion (ROM) negatively affecting his sleep, exercise, activities of daily living and ability to work. Upon failure of conservative management, he subsequently underwent a C6-7 ACDF and began physical therapy (PT) 2 weeks later. Post-operatively, he presented with limited cervical active ROM, neck pain and arm weakness, however, much of the arm pain had resolved. Treatment included patient education, OMPT, neuromuscular re-education, cryotherapy, and therapeutic exercises. OMPT included soft tissue, scar and neural mobilization and physiological/accessory joint mobilization. Treatment prescription and progression were dictated by tissue healing timelines and patient response. He was treated in PT nonconsecutively for 1 year. Radiographic confirmation of arthrodesis was monitored at 6 weeks and at 3, 6, 9 and 12 months.

Outcomes:

Outcomes were administered at 6 weeks, and at 3, 6, 9, and 12 months. Significant improvements were demonstrated concerning Focus On Therapeutic Outcomes (Physical Functional Status 55% to 81%), Global Rating of Change (+7), Patient Specific Functional Scale (1.6/10 to 8/10), Neck Disability Index (14% to 2%), Numeric Pain Rating Scale (2/10 to 0/10), SF-36 (Physical Function 85% to 95%) Patient Acceptable Symptom State questionnaire (YES) and cervical active ROM (within functional limits).

Discussion / Conclusion:

Improvements in pain, functional mobility and quality of life were demonstrated up to 12 months post-surgery, without adverse effects, following ACDF and an early initiated multimodal PT program which included OMPT. The outcomes highlight the importance of supervised PT up to 1 year following ACDF and suggest that OMPT, used in an early initiated PT program, may be safe and effective at all stages of healing after ACDF on an individual basis.

Abstract - ID: 113

Authors: Josue Gan, Zurich University of Applied Sciences, Jean-Michel Brismée, Texas Tech University Health Sciences Center; Josefina Maranzano, Université du Québec à Trois-Rivières Antony Bertrand-Grenier, Centre Intégré Universitaire de la Santé et des Services Sociaux de la Mauricie-et-du-Centre-du-Québec, Université du Québec à Trois-Rivières, Daniel Bösch, Physiotherapie Bösch; Gary Kearns, Texas Tech University Health Sciences Center; Phillip Sizer, Texas Tech University Health Sciences Center; Laurent Pitance, Faculté des sciences de la motricité - Université catholique de Louvain Stéphane Sobczak, Université du Québec à Trois-Rivières

Title: Accuracy of a novel approach to dry needle placement in the lateral pterygoid muscle in cadavers

Background / Purpose:

The prevalence of muscle dysfunction in temporomandibular disorders (TMD) is estimated up to 52%. The lateral pterygoid muscle is commonly described as responsible for hypermobility, disk displacement and motor control dysfunction due to hyper-activity. Treatment techniques including stretching, manual release addressing the lateral pterygoid muscle are commonly used in TMD management. However, the palpation has been shown unreliable, questioning the effectiveness of manual approach. Deep dry needling is one approach used in clinical practice to treat myofascial TMD to improve pressure pain threshold and jaw opening. However, no study has evaluated the accuracy of dry needling technique to penetrate the lateral pterygoid muscle using CT-scan, while only one study investigated accuracy of needle insertion using dissection. Therefore, the purpose of this research was to validate lateral pterygoid muscle dry needling accuracy of penetration using CT-scan.

Methods:

Eight heads from Thiel cadavers, including 3 males and 5 females age 80.5+/-9.5 years were used to assess both right and left lateral pterygoid muscle penetration (superior and inferior heads) by means of acupuncture needles 60*0.3 mm. One physical therapist with 9 years of clinical experience and teaching dry needling introduced needles. The needle was inserted anterior to the mandibular condyle and posterior to the coronoid process and advanced lateral to medial, slightly anterior for the inferior head and slightly posterior for the superior head. After each needle placement CT-Scan was performed. A radiologist recorded the needle location using a CT and graded needle penetration as “reach/not reach” the superior and inferior heads of the lateral pterygoid muscle. Needle placement was considered accurate when the needle penetrated heads of the lateral pterygoid muscle. Percentages were used to evaluate needle placement accuracy.

Results:

Accuracy of needle penetrating the lateral pterygoid muscle superior and inferior heads was 75% and 62.5%, respectively for the right side, versus 62.5% and 87.5% for the left side. Accuracy was augmented to 80% for both heads on the right side, versus 71.4% and 85.1% on the left side when palpation grading was taken in account.

Discussion / Conclusion:

This novel dry needling approach of the lateral pterygoid muscle displayed good needle placement accuracy. Using this approach, more studies are needed to assess the safety and the optimal distances to reach both heads of the lateral pterygoid muscle to avoid piercing nerves and arteries located medially to both heads.

Abstract - ID: 114

Authors: Adam Lutz, University of South Carolina; Thomas Denninger, ATI Physical Therapy
Ellen Shanley, ATI Physical Therapy; Brett Windsor, North American Institute of Orthopaedic Manual
Therapy and ATI Physical Therapy; Charles Thigpen, ATI Physical Therapy

Title: Criterion validity, MCID and SCB calculation of the MDQ and SANE for patients with LBP

Background / Purpose:

The collection of patient reported outcomes (PROs) is increasingly important as the physical therapy profession moves toward value-based reimbursement. Efficient and appropriate collection of PROs is in the best interest of both physical therapists and patients. The Single Assessment Numeric Evaluation (SANE) is a single item survey that asks a patient “What percentage of normal is your [body region of interest]?” and has been validated across several body regions. The Modified Low Back Pain Disability Questionnaire (MDQ) is the most commonly used PRO for patients with low back pain (LBP) but only 1 study has examined its psychometric properties. The purpose of this study was to test criterion validity of the SANE relative to the MDQ and determine an anchor-based Minimal Clinically Important Difference (MCID) and Substantial Clinical Benefit (SCB) using the Global Rating of Change (GRoC) for each questionnaire for patients with LBP.

Methods:

Patient data, including MDQ, SANE, and GRoC, were obtained for a convenience sample of patients seeking care in upstate South Carolina between 2016 and 2018. Patients were considered only if pre/post PROs were present for each (MDQ, SANE) and follow-up PROs (MDQ, SANE, GRoC) were obtained between 2 and 12 weeks of initial PRO. Patients with surgery or injection in the 90 days prior to initial evaluation were excluded. Criterion validity was established using Pearson’s correlation for all matching observations of MDQ and SANE (including initial and follow-up observations). Anchor-based MCID and SCB measures were calculated using a ROC curve for each PRO (MDQ, SANE). “Success” for MCID included all patients reporting that symptoms were “moderately improved” or better; while “success” for SCB included only patients reporting that their symptoms were “a great deal better”.

Results:

The final analytical sample included 206 patients (412 total matching MDQ, SANE outcomes). Pearson correlation across all matched observations was -0.567 ($p < 0.001$) indicating moderate correlation. Values of 11.2 and 14.2 were calculated for MCID ($n=157$, 76.2%) and SCB ($n=103$, 50%) for the MDQ; while like values of 17.0 and 23.9 were identified for the SANE.

Discussion / Conclusion:

The SANE is moderately correlated with MDQ and therefore demonstrates criterion validity for evaluation of symptoms in patients with LBP. Accordingly, it may be a useful, efficient tool to use for intermediate PRO collection in these patients—providing valuable information on status change that might warrant administration of the more comprehensive MDQ. This study also offers a follow-up MCID calculation for MDQ and introduces calculations of MCID for the SANE—and SCB for both SANE and MDQ for patients with LBP. Future studies can further explore the relationship between the MDQ and SANE in this patient population.

Abstract - ID: 115

Authors: Richard Hubler, Seton Hall University; Meghan Schoenberger, Kessler Rehabilitation Center

Title: Glutes for the win: a modified clamshell technique

Background / Purpose:

Gluteal muscle strength deficits are associated with numerous musculoskeletal disorders including hip and knee joint pathology, as well as low back pain. Proper gluteal activation is necessary to control hip internal rotation and adduction that contributes to dynamic knee valgus, which is a potentially injurious coupled motion. While recent studies have demonstrated that the clamshell exercise (CLAM) elicits activation of the gluteus medius (GMED) and gluteus maximus (GMAX) muscles, there is less consensus data available on the amount of tensor fascia lata (TFL) activity during the exercise. The TFL is an abductor and internal rotator of the hip and imbalance between the gluteal muscles and the TFL is associated with lower extremity (LE) disorders. The common TFL manual muscle test (MMT) is side lying (SL) with 30-45 degrees of hip flexion and resisted hip abduction, while the most common CLAM position is SL in 30 degrees of hip flexion. A recent study examining the activation of the infraspinatus versus the posterior deltoid in shoulder external rotation strength assessment suggests that using reciprocal inhibition will improve the elicitation of the infraspinatus and decrease activation of the posterior deltoid. The purpose of this presentation is to describe a modified CLAM, where the use of active adduction (AA) of the LE would produce reciprocal inhibition of the TFL, thus enhancing GMED and GMAX activation.

Case Description:

To perform this technique, the clinician first assesses a comparable sign (COM). The COM for this exercise is GMED strength assessment, which may vary based on the patient case. Common COMs for this include GMED MMT, single-leg balance assessment, and squat assessment. For the modified CLAM, the clinician positions the patient in SL and 30-45 degrees of hip flexion. The clinician then places his or her fists between the medial malleoli of the patient's LEs and instructs an AA isometric. Once an appropriate AA isometric is achieved, the patient must continue the AA isometric while performing the CLAM in a shortened range. The clinician may also use a piece of equipment between the patient's LEs and perform palpation of the TFL and GMED to confirm appropriate technique.

Outcomes:

Following completion of the technique, the clinician re-assesses the COM. Clinical results include improved GMED MMT, decreased LE pain during movement, and improved LE biomechanics.

Discussion / Conclusion:

Using AA during the CLAM can assist clinicians in providing a therapeutic exercise to decrease TFL activity and improve gluteal activation. Incorporating the modified CLAM into a multimodal treatment program consisting of orthopaedic manual therapy and therapeutic exercise may assist physical therapists in improving patient outcomes in the management of lower quarter musculoskeletal disorders.

Abstract - ID: 116

Authors: Mark Wilhelm, Walsh University; Jean-Michel Brismée, Texas Tech University Health Sciences Center; Roger James, Texas Tech University Health Sciences Center; Kerry Gilbert, Texas Tech University Health Sciences Center; Chad Cook, Duke University; Phillip Sizer, Texas Tech University Health Sciences Center

Title: The effect of low back pain history on multifidus co-contraction during common lumbosacral voluntary stabilizing contractions

Background / Purpose:

Despite pain remission, individuals who experience low back pain (LBP) are four times more likely to experience another episode within the next year. Low back pain has been shown to relate to multifidus morphological and sensorimotor control changes that tend to persist despite pain remission, thus potentially increasing the likelihood of pain reoccurrence. The abdominal drawing in maneuver and abdominal bracing maneuver are two common clinical strategies used to provide spinal protection, improve multifidus morphology, and improve sensorimotor control in hopes to prevent low back pain reoccurrence. The objective of this study was to determine the effect of a low back pain history on deep and superficial multifidus co-contraction during volitional abdominal contractions. Additionally, this study aimed to determine if deep and superficial multifidus fibers demonstrate different co-contraction patterns during the abdominal drawing-in maneuver (ADIM) and abdominal bracing maneuver (ABM). Furthermore, this study aimed to determine the influence of position on the co-contraction response.

Methods:

Thirty subjects with a recent LBP history (36.83 ± 13.79 years of age) and 30 subjects without a recent history of low back pain (37.8 ± 14.46 years of age) were included in this study. Subjects completed three trials each of the abdominal bracing maneuver (ABM), abdominal drawing-in maneuver (ADIM), and resting in standing and quadruped positions. Root mean square EMG activity of the superficial and deep multifidus fibers was normalized to submaximal reference contractions and averaged across each of the three repeated trials.

Results:

ANOVAs revealed no statistically significant differences between subjects with a LBP history and healthy controls. Significant differences in co-contraction activity were observed when comparing deep and superficial multifidus muscles during standing ADIM ($p=0.04$), quadruped resting ($p<0.001$), and quadruped ADIM ($p=0.022$). These differences were not significant during standing resting ($p=0.339$), standing ABM ($p=0.079$), and quadruped ABM ($p=0.111$). Within both groups, the ADIM and ABM resulted in significantly greater multifidus activity than the resting condition in standing and quadruped positions ($p<0.001$). No differences in multifidus co-contraction were identified between the ADIM and ABM conditions in either positions. In the HxLBP group, multifidus co-contraction was significantly greater in standing than quadruped during all three contraction conditions.

Conclusion / Significance:

Subjects with a LBP history can use both ADIM and ABM strategies to facilitate multifidus contraction similar to individuals without a recent history of LBP. Deep and superficial multifidus fibers co-contrast during the ADIM and ABM in subjects with and without a recent history of low back pain. However, neither contraction strategy facilitated greater multifidus co-contraction than the other. Additionally, abdominal contractions in standing resulted in greater multifidus co-contraction versus the same in a quadruped position.

Abstract - ID: 117

Authors: Mahnan Darban, Indian Health Service; Cameron MacDonald, Regis University

Title: A pilot exploration of patient discontinuation from care across varied settings in OMPT care. Is it just insurance limitations?

Background / Purpose:

Exploring the various reasons as to why patients chose to discontinue care has not been completed in orthopaedic manual physical therapy (OMPT). Understanding the specific reasons for discontinuation within OMPT settings and contrasting this to the overall PT population base can potentially help us better optimize care and improve outcomes.

Case Description:

Information was sought from current OMPT Fellows-in-Training servicing both rural and non-rural clients seeking the most common reasons patients in their clinic were being lost to no-showed and cancelled follow-ups. A primary qualitative inquiry was established.

Outcomes:

Initial findings across seven different locations identified that direct out-of-pocket expenses for PT services such as insurance co-pays and high deductibles was a leading factor for discontinuation of services in 100% of the seven clinics polled. On the other hand, clinics also reported that those on public assistance healthcare plans were among those to more likely be lost-to-follow-up. Other common reasons in this setting included: unable to miss work, transportation issues, attending because they were asked to by their doctor, did not like their physical therapist, and their symptoms seemed worse after therapy. In a hospital-based PT setting on the Navajo Nation, 10 patients were polled and asked about their primary reason for disengagement from PT. In this particular setting, PT services are provided free for nearly all the patients, and the more common reasons for patients not showing included: transportation issues (50%), did not find enough benefit in previous visit(s) (20%), unable to miss work (10%), and forgot about appointment and didn't reschedule (20%). Ongoing data collection is being conducted in order to obtain a larger sample sizes and to identify the impact that hands-on OMPT may have on attrition rates.

Discussion / Conclusion:

In this pilot study, those paying out-of-pocket costs directly for PT services were more likely to end PT services early due to high costs. In the same setting, those on public assistance healthcare plans were also among the most likely to discontinue PT services early. In a rural setting where there was no direct cost to the patient for PT services, reasons such as transportation issues, and inability to miss work, were present, and may also relate to loss due to costs needed to attend PT services.

Socioeconomic factors seemed to play a large part in why patients discontinued PT services. For those patients who chose to discontinue PT due to not finding benefit in returning to PT, closer consideration towards individual patient values, expectations, and goals when it comes to care may be important. Further studies to identify more specific reasons that patients provide should be performed in an effort to help guide OMPT therapists to optimizing treatment methods and improving patient attitudes' towards care.

Abstract - ID: 118

Authors: Janice Lwin, American Career College

Title: Modeling an empathetic partnership with students to develop an effective therapeutic alliance as clinicians

Background / Purpose:

Research demonstrates the importance of creating a therapeutic alliance with patients to build rapport, trust and enhance clinical outcomes. Establishing a patient-centered approach to therapy can help clinicians identify psychosocial factors affecting rehabilitation. Students must develop this critical communication skill to effectively treat patients. In the classroom, instructors can utilize a similar student-centered approach and recognize students often demonstrate similar psychosocial issues throughout their program. By modeling empathy and compassion towards student concerns, instructors establish a trusting partnership which students can emulate during patient care. The purpose of this study is to explore the influence of instructors modeling an empathetic partnership through understanding, compassion and concern for student well-being on their ability to imitate this behavior and create an effective therapeutic alliance with patients as student clinicians.

Methods:

Online surveys were sent to 37 students and their clinical instructors following their final clinical internship. Clinical instructor surveys included a Likert scale for feedback on the student's ability to create a therapeutic alliance through communication, confidence and rapport with patients. Students rank ordered factors influencing their development of skills required to build therapeutic alliances including repetition through practical exams, auditory classroom instruction, watching videos of clinician interviews establishing a therapeutic alliance and instructors modeling an empathetic partnership with students. Supporting short answer responses were encouraged.

Results:

Thirty-seven students and 25 clinical instructors returned surveys. All clinical instructors rated students at "entry-level" for ability to establish a therapeutic alliance with patients. Sixty-seven percent of students ranked "instructors modeling an empathetic partnership" as the greatest influence on developing skills to create a therapeutic alliance with patients. Students elaborated that having instructors demonstrate concern and compassion for their psychosocial factors helped them understand the importance of addressing these issues with patients to effectively establish a therapeutic alliance.

Discussion / Conclusion:

A patient-centered approach to therapy has been shown to positively influence clinical outcomes. Facilitating student development of skills necessary to build a therapeutic alliance with patients will improve patient care. Results of this survey suggests students are most impacted from instructors modeling a similar student-centered style of teaching. Compassion, empathy and trust between student and instructor can translate into students emulating this behavior through a strong therapeutic alliance as a student clinician. While research supports the significance of a patient-centered approach to therapy and addressing psychosocial aspects of clinical care, it behooves instructors to support development of this critical skill in the classroom by modeling an empathetic partnership with students.